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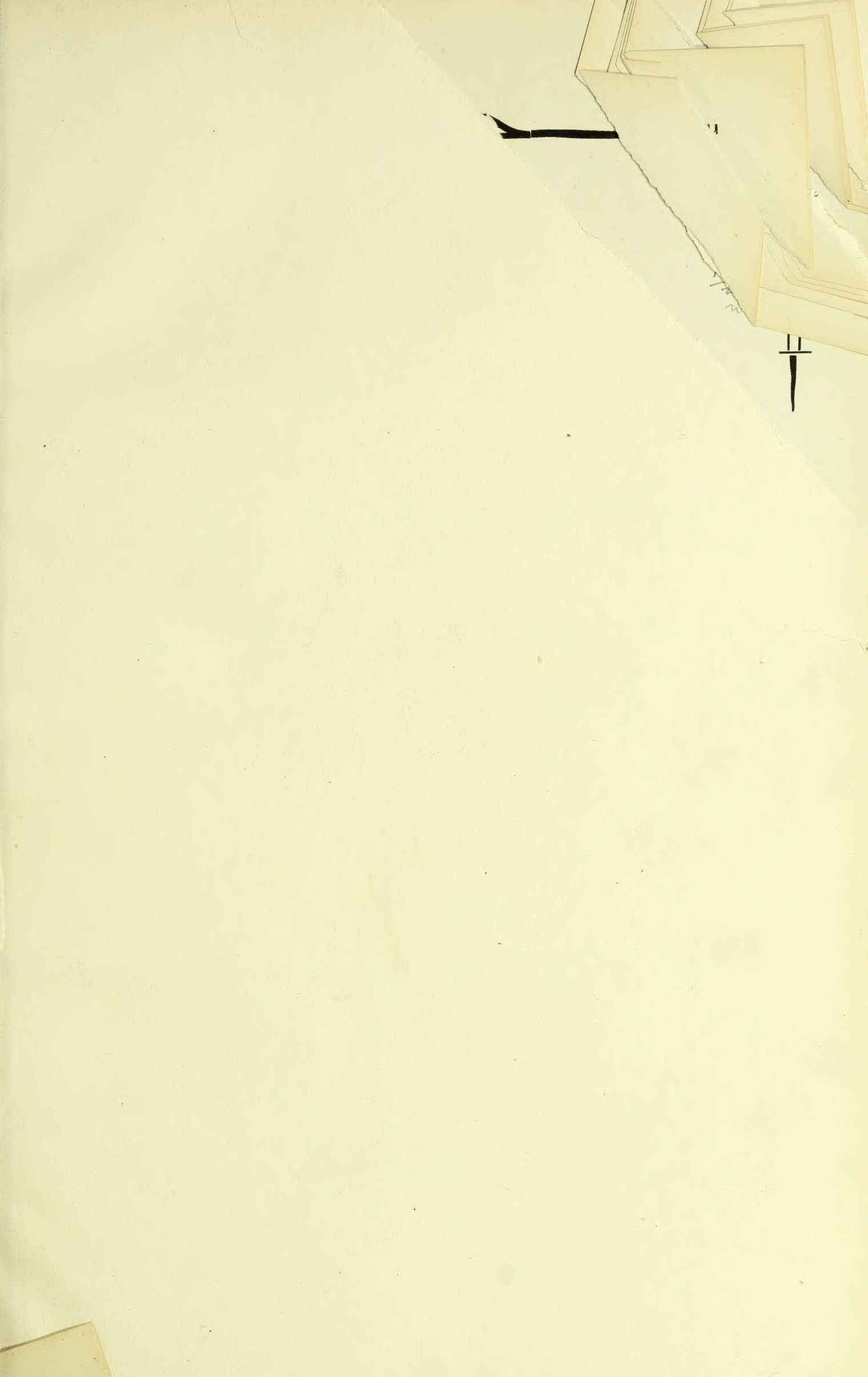
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Volume

III

REMOTE STORAGE
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EDITORIAL NOTES—GAS, &c.

The Commercial Situation.

IT does not matter to what quarter we look—whether it be at home, or Germany, France, or other Continental countries, or further afield in Australia, at the Cape, or in North or South America—we see the same vigorous consideration being paid to the commercial interests of the gas industry. This indicates, without further explanation, that the gas industry everywhere has been thrown completely open to more strenuous competition, and increasingly so, in both its primary and secondary products. The industry, however, is fortunate in that the magnitude and diversity of its business place in its hands a power that its competitors do not, and cannot from the very nature of their productions, possess. The magnitude and diversity of business must be maintained and extended by every possible means; and one of the means is by the production of cheap gas of suitable and fairly uniform calorific power. On this point of uniformity of calorific power, we see Professor J. T. Morris, of the East London College, is still hammering away at the question of the (so he supposes) variable calorific power of gas in different parts of London—a matter to which reference was made in our "Electric Supply Memoranda" for June 14 last, in relation to some lamp tests made by Professor Morris two years ago. We think the Professor must have made his calorific tests during some temporary defection, because, in view of his statements, we have examined, over a long period, the official calorific returns signed by Dr. Frank Clowes, the Superintending Gas Examiner of the County Council; and between one part of London and another, there is not, in the results of this daily systematic testing, at twenty-two points of the Metropolitan gas-distribution system, any very marked variation between the gas in one district and another. But Professor Morris's statements in 1908, and his reiteration of them now in the face of fairly uniform official results, is doing the gas industry no good in its commercial work. The manufacturers of electric lamps are making use of his name and statements in their advertising literature; and when once a statement of the kind that is false in its general applicability obtains circulation, the ill-effects cannot possibly be entirely wiped out, no matter the amount of trouble and expenditure to which the industry and individual gas undertakings go in the attempt.

This by the way. Another means by which the magnitude and diversity of the business of the industry must be sustained and extended is by technical advances in the methods of using gas. We are not dissatisfied with the progress that is being made in this direction. It is good; and by the help that is being extended to the industry through scientific research, the future promises that the advances made in the methods of utilization will in themselves create a much larger use. The interests of gas suppliers and manufacturers are mutual in this respect. In the production of cheaper gas and in making technical advances in gas appliances, work is proceeding apace; but there is another thing we do urgently want in the gas industry—it is a development that has been much talked of of late—and that is a central agency in connection with the Institution to deal with publicity and with the subtleties, extravagancies, and public beguilements in competitors' propaganda. We know what is being done in aid of commercial gas work in America; and we are learning more about the Central Organization for the Promulgation of the Sales of Gas in Germany that was established in Berlin last March, and concerning which Herr Lempelius gave information at the annual meeting of the German Association, as noticed last week in our Review of the Proceedings. Herr Lempelius (formerly Manager of the Barmen Gas-Works, and who resigned the position to take up the management of the Central Organization) has been making a survey of all the promising fields for gas

exploitation; and he has come to the conclusion that there is ample scope for development. For the work done by the Central Organization he also asks for funds; and his appeal (judging from the way gas research has been financed in Germany) will not, we think, fall on deaf ears. It is to be hoped that it will not be long before the British gas industry as a whole wakes up to the necessity of doing something, and something of a worthy and effective character, in this direction; for it is seen that every day produces fresh work that it is fatal to set aside to be dealt with at (that common refuge of procrastinators) a more convenient season.

We may echo the claim of Herr Prenger, of Cologne, the President of the German Association, that the gas industry should now be allowed free scope to work their undertakings as commercial enterprises. Gas enterprise has now to shoulder all the responsibilities of the ordinary tradesman, and more; but it has not the same freedom. We also endorse his view that, in the interests of both undertakings and communities, all gas undertakings should be relieved of the incubus which the demand for heavy and constant contributions to the municipal chest lays upon them. But there will have to be a fearful wrench on the part of municipal bodies before they will part with this handy source of revenue, however desirable the act may be. The chief point, however, is that the recording-finger of our technical and other organizations the world over directs to the universality of the commercial tensity; and we in this country must not be behind other countries in meeting the situation. One of the ways of doing this is by active co-operation.

The Economic Aspects of Calorific Power.

No one can read the reports published in the "JOURNAL" last week of the meetings of the German Association and the French Society (especially the former) without being struck with the important place that calorific power is destined to play in the future in the economics of the gas industry, both in regard to manufacture and utilization. The papers which are chiefly in mind, it must be said, are more directive and constructive than conclusive, though they are conclusive in so far as the lessons derivable from them are concerned. In the first place, it is clear, from the technical investigation and experience that are presented from these meetings, that, if we can put an end to the British gas industry's detention by the illuminating power standard, and have a reasonable calorific power standard (conformable with local conditions) applied, there will be ability to draw coal supplies from more extensive sources; and, in the second place, the new methods of carbonization will, at the same time, assist in producing compensations, in connection with residual products, for any depreciating effect that, under the old circumstances of gas-works carbonization, might arise from the employment of the lower grade varieties of coal. We anticipated—the anticipation is being realized—that from the Instructional and Experimental Gas-Works at Karlsruhe, under the superintendence of Dr. Karl Bunte, there would issue much that will be valuable in the technical and commercial progress of the gas industry. There will be no disappointment in this regard; and the German Association deserve the thanks of the universal gas industry for what they have done, and what they are doing.

Already we are being shown that the calorific value of British gas coals (which are largely used in Germany) does not vary to such an extent as we know the illuminating power of the gas varies that is obtained from the different varieties; and the work at Karlsruhe is assisting in placing more and more in view the conditions that are desirable in recovering greater proportions of the calorific power of the coals used in the form of gas, and generally in broadening the operating ground and resources of the industry. Take the raw material itself, much systematic research has taken place there into different varieties of gas coal; and Dr. Karl

Bunte's "Information about Gas Coal" (p. 957) should be read in conjunction with the report from Karlsruhe on the "Chemical Composition and Calorific Power of Gas Coals." Dr. Bunte lays down a principle that will be acceptable to all gas makers, that a coal is the more valuable the greater the proportion of its calorific value that can be recovered in the form of gas. The property of calorific yield is what will have to be tested in future in the purchasing of coal when the British gas industry is no longer tied to the effete standard of illuminating power. But at the same time we must not, in seeking to recover in the form of gas a larger proportion of the calorific value of the coal, neglect altogether consideration for the coke, though seeing that this residual, speaking broadly, retains two-thirds of the original calorific power of the coal, there can well be without substantial injury a transference of a part of the calorific power to the prime commodity of the industry. Admittedly, the coal that will yield the greatest proportion of its calorific power in the form of gas is the best for the gas maker; but there are operations in the process of recovery that will contribute to the enhancement or degradation of the calorific result. As a rule, coals will yield more of their calorific power in the form of gas the more recent in origin they are at the time of carbonization; and experience of recent times has also taught us that the method of carbonization does make a difference in the calorific value of the gas produced. Though the illuminating power of gas may be appreciably diminished by one system of carbonization compared with another, it is quite possible for there to be an increase in the calorific power. But more on this point presently.

The authorities at the Instructional and Experimental Works of the German Association are to be thanked for the publication (with the names of the coals) of the results of investigations into the chemical composition and calorific power of certain well-known varieties of English gas coals. Confession must be made that published data obtained from uniform and systematic research as to the character of a representative number of our home gas coals do not possess that character for modernity that is advisable, now that, in so many districts, some of the more qualitatively lucrative seams are giving out. The tables that we published on p. 962 last week are therefore peculiarly interesting under present circumstances. In the column giving the results of calorific power in B.Th.U. per pound of coal, the figures show remarkable uniformity in the calorific values of the many Durham coals tested, while those for Yorkshire coals run but little lower, and the only Scotch coal tested comes last but one in the whole of the varieties that were tested from any source. The tables do not go the length of telling us which of the coals will yield the greatest proportion of their calorific value in the form of gas; and probably, even at the Karlsruhe experimental works, they are hardly in a position to tell us this (through lack of the necessary plant) under the various new methods of carbonization. We know what excellent calorific power results (with low illuminating power) are obtained in Berlin practice with the vertical retort system; and much was heard last week about the regularity of the hourly production of gas and of its calorific power from the chamber settings at Königsberg. In the paper by M. Paul Parsy before the Société Technique, he was talking of productions, with the Klönne chambers at Rotterdam, of 12,316 cubic feet of gas per ton of 616 B.Th.U. gross; and high yields are noticed elsewhere—at Padua and at Frankenthal. In the table (p. 950) in M. Parsy's paper, he shows that invariably a very much greater number of calories is obtained per ton of various coals carbonized in chamber settings compared with ordinary retort-settings, though we should like to know something more about the type of the latter, and whether heavy or light charges were used. There is nothing much said in the paper about illuminating power; but we see in one of the diagrams referring to the Rotterdam installation that, in twelve-hour charges, it varies from (in one instance) 6 to 22.9 Hefner units, with an average of 15.55, and in another from 15.7 to 23.5 Hefner units, with an average of 18. However, illuminating power is not the subject of this article. In these days in the gas industry, we are looking forward.

If we turn from the question of the production of gas of high calorific power to its use, some interesting information is to be obtained from the paper by Dr. Max Mayer, treating of the valuation of coal gas according to its calorific power. From this it will be seen that his researches have led him to the conclusion that, within certain calorific power limits, M. St.-Claire Deville's contention is justified—that

the illuminating power of a gas mantle is proportional to the calorific power of the gas used. But the reverse is also proved when it is seen that, with lower calorific power gases, higher illuminating efficiency is secured; this being due to the chemical composition of the gas. "The rich gases, containing more heavy hydrocarbons, show a lower duty, probably because of the smaller intensity of the combustion of these hydrocarbons."

We have said enough here to show that there is in these Continental meetings—especially that of the German Association—a large amount of material of educational value, bearing upon the economics and future of the gas industry; and the information is of a character that might with advantage be absorbed by those who are obsessed by feelings of righteousness and sentimental affection for gas consumers (while the consumers do not care a single straw about the matter, being free agents in respect of their patronage) in connection with the change over from the old test-burners to the new one. There is evidence and to spare, too, that the transition from an illuminating power standard to one of calorific power will redound to the economic benefit of the gas industry.

The Excellently Paid Gas Worker.

THE gas worker has nothing to complain of concerning wages and hours of labour, and regularity of his employ. Taking the whole number of gas workers of all classes, there is no doubt the altered conditions of gas utilization have been the means of greatly levelling-up the continuity line of employment. And regarding wages and hours, an interesting report has just been issued by the Board of Trade on the results of an inquiry instituted in 1906 into the earnings and hours of labour of the working classes throughout the United Kingdom. It is true that the figures, applying to 1906, have a somewhat remote appearance; but, in the past four years, there have not been any particular changes in the rates of pay of the classes of labour to which the statistics refer, so that their illustrative value remains. We have always claimed, seeing that it was subject to easy proof, that the gas industry has ever been a good employer; and the figures before us, bearing official seal, give the confirmation, though referring only to employment under local authorities. These bodies in these democratic days, when labour has large representation in local government, are often charged with paying higher wages, and getting less work from the men in the various branches of their service, than do private employers, simply through the power of the labour vote and representation. But in connection with gas supply, the charge has less application than in certain other branches of municipal service; for in districts comparisons between one works and the neighbouring ones of rates of pay and hours of labour, usually afford a sort of governing basis that brings about an approximation of actual figures where conditions are somewhat alike.

The classes of employ treated upon in the returns refer to road and sanitary work, gas supply, electricity supply, water supply, and tramway and omnibus work. Alluding only to the last four branches of municipal work, inasmuch as they are the four in which there is best payment, the men (excluding all lads and boys) who worked full time in gas supply obtained an average pay per week of 32s. 6d.; in electricity supply, 31s. 7d.; in water supply, 28s. 8d.; in tramway and omnibus work, 30s. 6d. The total number of gas workers to whom the returns relate is 68,234; of electricity supply men, 13,347; of water-supply men, 14,093; of tramway and omnibus men, 46,702. Now there are two points about these statistics of which the part of the workers of the country who are so ardently in favour of municipalization, and those representatives of labour who so consistently advocate everything possible being done that is in favour of electricity supply, and everything possible that is unfavourable to gas supply, should take special notice. The first is that, in the average rate of pay, gas supply stands at the head; and the second is that, though urban electricity supply is in greater part municipally controlled, gas supply gives the means of a considerably greater employment than electricity supply. For this reason alone, it has always been a mystery to us why representatives of labour on local bodies should seek to injure the better employment market, to benefit that which affords but comparatively small scope for employment.

Pursuing the statistics, it is observed that the average earnings for full time of men employed in connection with gas supply were 34s. 3d. in the large towns and 29s. 4d. in

the smaller ones. In the large towns, of the men who worked full time, 34.2 per cent. earned less than 30s., and 24.2 per cent. 40s. and above; compared with, in the smaller towns, 53.4 per cent. earning less than 30s., and only 9.5 per cent. 40s. and above. Then, looking back, it is found that the rate of pay in gas supply has made substantial progress. In 1886, similar investigation was undertaken; but, unfortunately, there are no corresponding figures for electricity and tramway and omnibus services. In respect of gas supply, however, the average full time earnings in 1886 were 26s. 10d., compared with 31s. 7d. in 1906—showing an increase of 17.7 per cent. In water supply, the corresponding figures are 24s. 6d. and 28s. 3d.—a percentage increase of 15.3. The gas-supply industry should indeed, in the eyes of labour, be the very paragon of virtue in regard to the treatment of its workers. The wages, the increase shown in payment, and the scope for employment, give to the industry the capital place in connection with the municipal services. As to the average hours of labour per week, there is little difference between gas and electricity supply—the respective figures being 52.6 hours and 51.9. Those engaged in the water-supply service, put in an average week of 55.1 hours. From our point of view, the return is a most satisfactory one as an indication of the excellent position occupied by the gas worker.

Mr. John Burns Favours Cheap Gaseous Fuel.

MUNICIPALITIES OWNING gas undertakings and using them as the channel for lifting money from the pockets of the consumers of gas for relieving the rates, must mind their P's and Q's. Not only is Parliament on their track, but the smoke nuisance abolitionists have turned the eyes of the Local Government Board and of the public upon them, and are resolved to do what they can to put an end to the robbery of the gas consumers, in order that the municipal gas undertakings may be placed in a better position to serve the object of their own actively prosecuted crusade. In this crusade, they have not, through their own particular lines of action and limitations, scored much success. We fear that, excepting perhaps through one suggestion made last week by a deputation to the President of the Local Government Board, their general proposals regarding legislation will not prove very effective; but, with Mr. John Burns, we do think that much more will be done by technical progress to gain the object in view. The economies of technical progress serve as very cogent arguments; and if the manufacturer can be shown how he can save money and obtain additional convenience by the adoption of gas heating and gas-engines and electric motors, and the householder how he can have greater convenience and economy than now, there will come about gradually, by such means, that purification of the atmosphere that the adherents to the smoke abatement movement are ever so desirous of seeing. This is one of those improvements in human conditions, with acknowledged sanitary and physical advantages, that cannot be effected by any revolutionary methods. It would be impracticable to apply to it a too drastic exercise of the arm of the law; and, while heartily sympathizing, Mr. Burns is of that way of thinking.

The members of the deputation whom he so courteously received, and on whose side he ranked himself, though not decisively in respect of ways and means of arriving at the long-sought goal, have done much to bring the matter of air pollution and purification to the notice of the Government and of the public; and in this they have done well. They urged general legislation on the lines of that proposed in the London County Council Bill (which has just been under the consideration of a Commons Committee, and which has been unsuccessful in the matter of eliminating the qualifying word "black" that appears before "smoke" in present legislation), high and cumulative fines for default, inspection by competent men, and other things. But the suggestion of more immediate interest to us is the one in their memorial which reads: "Believing that cheap gas will be a large factor in the ultimate solution of the smoke question, we trust that the Board, in dealing with the borrowing powers asked for by gas undertakings, will absolutely prohibit the pernicious practice of selling gas dear to relieve the rates. This leads to wasteful expenditure, is unfair to large users of gas, and prevents the development of this clean and civilized way of obtaining heat and power." Parliament has been working to that end (as witness the Salford Bill, the Oldham Act, and the Glasgow Bill) in this and last session; and the pointed reference to

the subject by the deputation, will give strong support to the new parliamentary policy. Mr. Burns said frankly that he fully sympathized with this particular view of those who had sought his assistance; and his words show—if it was not plain to all before—which way the legislative wind has set in the matter of the curtailment of abused liberty. If local facts were within the knowledge of Mr. Burns, it must have been interesting to him to hear Mr. Councillor Smith, of Glasgow, denouncing the taking of gas profits for the relief of the rates, and then to have before him Mr. Alderman Fildes, of Manchester, in which city not only are gas profits taken, but reserves have to be broken into, to satiate the municipal mania for rate relief. The Alderman spoke of the staff of inspectors that is maintained in smoke begrimed and enveloped Manchester; but he did not say why it is that Manchester does not render it largely uneconomical to use smoke-producing fuels by making it more economical to employ gaseous and therefore smokeless fuels.

With practical foresight, Mr. Burns had been to the trouble of informing himself what part the Gaslight and Coke and South Metropolitan Gas Companies had taken in relieving the atmosphere of London of its miasmatic conditions; and he had learned that of gas-fires, gas-cookers, ring-burners, and hot-water heaters—not counting privately purchased ones—the two Companies (omitting the Commercial Company) had fixed no less than 1,300,000. Such a considerable displacement of solid fuel as this represents has assuredly worked substantial good for London; for the myriads of domestic chimneys must be as harmful as, if not more so than, the lesser number of factory chimneys, though individually the latter may be equal to several active members of the less (individually) prominent order. This inquiry on the part of the President no doubt gave strength to his view that more good in regard to smoke suppression may be anticipated from the progress of facilities for using gaseous fuel than from any general legislation. This being so, Parliament will be conferring public advantage by relieving the gas industry of repressive legislation, and by discountenancing, in the case of gas companies, the demands of electricity-competing local authorities that aim at, and can only have the effect of, deterring that progress which is admitted by thinking men to be to the benefit of the public.

Some More Municipal Gas-Works Results.

Since reference was last made in these columns, some few weeks ago, to the results which have attended the past financial year's working of gas undertakings owned by local authorities, there has been a large call on the space in our news section for the setting forth of further statistics. The features which first claim attention vary according to the circumstances of different cases. But reports are, collectively and individually, of a satisfactory character; and it looks as though it will be long ere gas yields up the excellent position which it has so long held among the records of municipal trading departments. There is a balance at Bolton to carry to the profit and loss account of £49,788, compared with £50,398 the previous year; and out of a net balance of £24,243, the Committee have voted £20,000 in aid of the district rate. The gas made was 986 million cubic feet, against 970½ millions in 1909. A net profit of £18,191 is reported from Coventry, compared with £2296; and the Engineer (Mr. Fletcher W. Stevenson) has been given a considerable increase in his salary. Of the profits, £4000 is to be paid over to the general district fund in aid of rates, £13,000 set aside towards meeting the loss of capital occasioned by the abandonment of the old works, and £430 applied to the payment of a bonus to workpeople in the department. The price of gas is also to be reduced 1d. per 1000 cubic feet to ordinary consumers, and 2d. to prepayment meter users. Devonport has had one of its most profitable years as a municipal gas undertaking, with an increase of 4½ per cent. in the sales of gas, and a net profit of £3474. Since 1903, the first year in which the Corporation had control of the undertaking, the unaccounted-for gas has decreased from 7.1 to 2.1 per cent. The accounts of the Edinburgh and Leith Commissioners show a net balance of £30,774, and an increase in the quantity of gas sold of 80 million cubic feet. Consequent, however, on a reduction in price, the revenue from gas is less by £2894 than the preceding year—a falling off which was about balanced by a greater return from residual products. The report and balance-sheet at Hebden Bridge are stated to be "very favourable indeed." There is a bigger gross profit, partly owing to the lower cost of coal, and

partly to an increased make per ton, against which, however, had to be set a reduction in the price of gas. The gross profit at Leeds is £98,321, against £95,587 a year ago. The rates will benefit to the extent of £6000. There is a falling off in the sale of gas of $3\frac{1}{2}$ per cent.—attributable to depression in trade, larger use of incandescent burners, and also the extraordinarily bright winter. Naturally, the report is considered satisfactory by the Committee, seeing that there is a substantially larger gross profit, in spite of a falling off of 99 million cubic feet in the quantity of gas sold. At Lincoln, there is a gross profit of £14,235, compared with £12,996 for the preceding year. Of the net profit of £6300, a sum of £3000 is to go to the rates. The gas supplied was $8\frac{1}{2}$ million feet more than in the previous year, following an increase of $13\frac{1}{2}$ millions reported twelve months ago. This, again, is regarded as very satisfactory, considering the competition of the Electricity Committee.

The new Committee of the Council of the County Borough of Stoke-on-Trent also regard the accounts of the Longton Gas-Works for the past financial year as being "very satisfactory." Certainly, there are two or three salient features about the results which cannot be looked upon as anything else than eminently satisfactory. In the first place, the make of gas per ton of coal—12,900 cubic feet, of an average illuminating power of 15·8 candles, tested with the No. 2 burner—constitutes a record; as also does the sale of 12,100 feet per ton. Then the figure for leakage (for a mining district) is small, at 4·59 per cent. The price of gas during the whole year was 2s. 6d. per 1000 cubic feet for lighting, and from 2s. 3d. to 1s. 9d., according to quantity, for power. By the new Act federating the Pottery Towns into the united County Borough of Stoke-on-Trent, gas has to be sold at cost price; and the price at Longton has therefore been reduced to 2s. 1d. per 1000 cubic feet. Under the old conditions, cottages have been supplied with slot meter and fittings at the rate of about 300 per annum; and in this way, 2200 consumers have been added, and the installations paid for out of revenue. A remarkable fact about the Longton gas undertaking is that there are about 5800 slot consumers and only 1637 ordinary meter users. The gas sold last year was 1·9 per cent. more than in the preceding twelve months. A sum of £5000 has been paid over to the borough fund in relief of the rates, compared with £3000 for the previous year. The gross profit at Market Harborough remains about the same at £2700; a reduction made in the price of gas a year ago having adversely affected the revenue. Coal cost less, though the production of gas increased by nearly 2 million cubic feet; the make being 11,800 cubic feet per ton, against 11,567 feet the twelve months before.

Better trade has led to an increased consumption at Ossett; but the growth has been checked by the more general use of incandescent burners. A good feature of the accounts is the fact that, though the sale of gas last year was a record one, the make was not; there having been a great saving in unaccounted-for gas. There is a good showing, too, at Smethwick, where the consumption through prepayment meters has gone up 9·28 per cent.; small ordinary consumers have taken 2·28 per cent. more; and there is an increase of 2 per cent. in the quantity supplied for public lighting. On the other hand, a slight reduction is shown in the large consumers for lighting; but the quantity sold for power and manufacturing purposes is recovering. The total quantity sold shows an increase of 2 per cent. Public lighting supplied free of charge is valued at £4367; and £1000 was contributed to the cost of the new Council House. At Stafford, the unaccounted-for gas has reached the lowest figure in the history of the concern—1·07 per cent. The gross profit was £15,281, as compared with £14,754 preceding year. Under the profit-sharing arrangement, the clerks and workmen get a bonus of 9·25 per cent. on their wages; reductions are made in the charges for gas; and a sum of £3500 goes in relief of the rates. Stourbridge gives £1880 to the rates; and a feature of the accounts is the reduction of leakage. Sales of gas show an increase of $7\frac{1}{2}$ million cubic feet; while the make has increased by less than 4 millions. This means a reduction in the unaccounted-for gas of almost 2 per cent. on the amount made. In seven years, at Teignmouth, there has been an increase of 75 per cent. in the output of gas; and reductions in price are the order of the day. The make of gas at Wolstanton was 12,255 cubic feet per ton. There is a sum of £4747 to go to the profit and loss account.

The Report of the Chief Inspector of Alkali Works.

The annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued yesterday, and some extracts from it will be found elsewhere. It is the forty-sixth of the series, and deals with the proceedings during the past year of the Chief Inspector and his various colleagues who have the supervision of districts. It is satisfactory to find it recorded that, though 1857 works were under inspection, involving 5600 visits and the making of 6252 tests, no action had to be taken against the owners of registered works for infraction of any of the penal clauses of the Act; and testimony is borne to the readiness with which manufacturers meet the requirements of the Legislature. The report contains, as usual, statistics, furnished to the Chief Inspector, in regard to the production of ammonia from all sources in the United Kingdom last year. They show an increase in all cases but gas-works, the supply from which fell off to the extent of about 1000 tons. Coke-oven works, on the other hand, furnished upwards of 18,000 tons more. A large portion of the report is occupied with a continuation of the important series of studies in coal carbonizing, which have of late years occupied the Chief Inspector and his Assistant (Mr. S. E. Linder, B.Sc.); the interaction of methane and ammonia in the presence of carbon being investigated. Although the report bears the signature of Mr. R. Forbes Carpenter, he was unfortunately unable, owing to continued ill-health, to do more than supervise its preparation by Mr. Linder. He has now, as readers are aware, relinquished the position of Chief Inspector, which he had held since the retirement of Mr. A. E. Fletcher in 1895. These annual reports have always had a certain amount of interest for our readers; but it has increased immensely of late years, owing to the investigations bearing upon matters affecting the gas industry initiated by Mr. Carpenter, a fitting recognition of which was recently made by the Institution of Gas Engineers by his election as an honorary member. It may be hoped the new Chief Inspector, Mr. William S. Curphey, will have opportunities of continuing the work of his predecessor in the direction indicated.

The Eight Hour Act Again.

Once more, it seems, South Wales coal miners are between the—coal owners and the Miners' Federation of Great Britain. The new wages agreement recently signed for that field, by one of its clauses, provided for overlapping shifts being worked when required by the owners—the first shift starting at 6 a.m., and finishing at 2 p.m.; and the second starting at 9 a.m., and finishing at 5 p.m., which gave eleven hours continuous winding, and also time for repairs to machinery, &c. So far so good; but the second shift men raised a problem by refusing to work later than 2 p.m. on Saturdays, thus making their shift one of five hours, which the owners declined to regard as a day's work. Hence the clause referred to was made to provide that on Saturdays the second shift should start and finish at the same time as the first shift. But inasmuch as an earlier start would be impossible under the present Act for the men who finished at 5 p.m. the preceding day—in view of the section which prohibits any miner from entering the pit for a second shift of eight hours within one period of twenty-four hours—it was understood that the miners and owners would co-operate in supporting an amending Bill, in order to get rid of the obstacle. The Board of Trade were approached; and the President undertook, conditionally on the miners agreeing to the settlement, to introduce a measure to legalize the beginning of the working shift on Saturday within the twenty-four hours from the starting of work on Friday morning. In these circumstances, a conference of the Miners' Federation of Great Britain was held last week to consider the position and determine whether the Federation should oppose any amending Bill, assist in getting it passed, or remain inactive. The decision came to was absolutely against the introduction of any amending Bill; for the conference agreed that any such measure should be opposed. Seemingly, their attitude is that the double-shift system has worked well elsewhere, and so should do for the South Wales miners—instead of any overlapping shifts. But the South Wales workers have entered into an agreement which they are now unable to keep—for it would be futile to introduce the amending Bill under existing circumstances. What are they to do? Will the men agree to work till 5 p.m. on Saturdays; if not, will the employers reopen the whole question of the settlement, on the ground that this enforced breaking of the terms

of the agreement by the men justifies fresh consideration of the entire matter? Probably this trouble will be surmounted as previous ones have been in connection with the Eight Hour Act; but in the meantime it affords still one more object-lesson on the shortsightedness of the Government in passing such a measure. The continuous friction which has been in evidence since the Act came into being, is, however, nothing more than might reasonably have been expected as the result of State interference with such a highly organized industry as that of coal mining.

The Nitrate of Soda Market.

The first six months of the present year have proved an active period for the nitrate of soda market; the world's consumption having amounted to 1,577,000 tons, compared with 1,273,000 tons in the corresponding period of 1909—or an increase of 24 per cent. Belgium took 20 per cent. more, France 16 per cent., and Germany 13 per cent. In the case of America, the increase is no less than 61 per cent., and Holland 51 per cent. The United Kingdom absorbed 10 per cent. more than in the corresponding period. In their half-yearly report, with a copy of which we have been favoured, Messrs. W. Montgomery and Co. give statistics of the growth of the nitrate industry through the past thirty-five years. In 1876, in the United Kingdom and the Continent of Europe, the consumption was 270,000 tons. During the ten years to 1886, the increase was 33 per cent.; while in the following ten years, the growth was no less than 166 per cent. From 1896 to 1906, the consumption went up 28 per cent.; and since the last-named year, an increase of 34 per cent. has been registered. In 1831, the world's consumption of nitrate—all of which was absorbed in the United Kingdom—was 100 tons. Up to 1876, Europe was practically the only consumer; but after this time, nitrate rapidly took a more prominent position in other places. For instance, in the United States, from 1882 to 1892 the increase in consumption was 66 per cent.; from 1892 to 1902, 90 per cent.; and from 1902 to date, 171 per cent. In "other countries," the increase in the period extending from 1896 to 1906 was 400 per cent.; and since the last-named year, an addition of 95 per cent. has been registered. Combination among producers has during the past six months received the usual amount of attention; but always with the same negative results. The consequence has been a period of low prices and, as already shown, large consumption. Prices during the half year have varied to the extent of about 10d. per cwt. for prompt nitrate in Chili, and 1s. 1d. per cwt. for arrived cargoes. Early in January the quotation for arrived cargoes was 7s. 11d. to 8s. per cwt., cost and freight; while the coming of June found the price of cargoes steady in the vicinity of 8s. 1½d. to 8s. 3½d. per cwt., cost and freight.

The Financial Aspect of Municipal Trading.

Reference was made last week to the Inaugural Address of the President of the Institute of Municipal Treasurers and Accountants, some of whose conclusions on the subject of municipal trading were briefly noted. This is a question which concerns officials of local governing bodies; and therefore it is not surprising to find that there was also a paper read by one of the members at the meeting, on "Municipal Trading from the Financial Standpoint." The author was Mr. S. S. Dawson, the Chairman of the Finance Committee of the Wallasey District Council, and Professor of Accounting at the Birmingham University; and, assuming the advisability of municipal trading, he submitted that the requirements of sound finance in this connection could be summarized somewhat as follows: (1) The capital invested in a municipal trading undertaking being raised by loans, the redemption of such debt, the provision for depreciation of assets, and the raising of reserve funds to provide for possible contingencies, should be arranged so as to adjust the position fairly as between present-day ratepayers and their successors. (2) The control of a municipal trading undertaking being in the hands of the representatives of the ratepayers, and ratepayers not being quite synonymous with consumers or users, the prices charged for the commodity, supply, or benefit (as the case may be), and the quality or extent thereof, should be such as will adjust the position fairly as between ratepayers and consumers or users in their respective capacities. They might, he thought, take it that, on the average at any rate, the period fixed for the redemption of a loan on a wasting asset was fairly commensurate with the life of the asset; and that in the case of lasting assets,

the period of loan redemption was necessarily less than the life. Under these circumstances, as between present and future ratepayers, they were not called upon to do anything further out of revenue than keep the undertaking in good repair and working order, keep down the annual interest on the loan, and provide the periodical instalments necessary to redeem the debt within the stipulated period—"such instalments being equivalent to depreciation in every sense of the term." A sum for contingencies, it was admitted, was obviously necessary; but the amount of this must depend upon, and vary with, the circumstances of each particular case.

Depreciation and Reserve.

Mr. Dawson went on to argue that, under existing regulations affecting municipal finance, either adequate depreciation fund contributions or the statutory sinking fund contributions, whichever be the greater, should be charged against revenue, in order to ascertain the true profit. There should, he contended, be a more careful consideration of circumstances affecting proposed loans than was afforded at present by either Parliament or the Government Departments. Local authorities should be given such a period within which the loans should be redeemed that it would involve such contributions to the sinking funds as might certainly be regarded as fully sufficient to protect the succeeding generation, "thus dismissing the discretionary question of depreciation from the province of each local authority, and bringing the voluntary provision of reserve funds within a comparatively small compass." Referring to the report of the Joint Select Committee on Municipal Trading issued some years back, Mr. Dawson pointed out that one of the recommendations was that the professional auditors whose appointment was contemplated should be required to express an opinion upon the necessity of reserve funds, the sums set aside to meet depreciation and obsolescence of plant, in addition to the contributions to the statutory sinking funds, and the adequacy of such amounts. While hoping that some day the recommendations of the Select Committee with regard to audit would be carried into effect, he also expressed the wish that at the same time some statutory guidance would be afforded to auditors on this important point. It would, he concluded, be of little use instituting "a uniform system of audit" if one of the dominant factors of the financial position was to be left dependent upon the personal opinion of a single individual however able, who had neither statutory precepts nor a united profession to assist him.

Thermal Conductivity of Fire-Clay.—The thermal conductivity of fire-clay has been investigated by Messrs. J. K. Clement and W. L. Egly at the Engineering Experiment Station of the University of Illinois, to obtain information concerning the loss of heat through the walls of boiler furnaces. A resistance coil was inserted in a fire-clay cylinder about 16 inches long and 4.8 inches diameter, provided with a hole about 1.4 inches diameter for the coil. Four small longitudinal holes were made for the insertion of thermocouples for measuring the temperature. The test cylinder was then inserted in a larger fire-clay cylinder, in order to maintain higher temperatures in the former, and obtain a more uniform radiation from it. The ends were covered to prevent any loss of heat there. The electrical apparatus was arranged so that a current could be kept constant within a variation of 0.1 ampere for several hours. Twelve cylinders were tested, embracing three varieties of fire-clay. The conductivity ranged from 0.00221 to 0.00362, averaging 0.00267.

Siphonic Action with Wells.—Siphonic action is the means by which water from 50 2½-inch driven wells of the Woburn (Mass.) supply is conveyed to the pit from which it is pumped into the distribution system. The wells are connected to the pump pit by a 14-inch cast-iron pipe, which extends downwards almost to the bottom. The high point in the line where air may collect is tapped by two 2½-inch pipes, which are connected to a closed tank at the pumping-station. Air is exhausted from this tank and the pipe-line by a small vacuum pump operated by a water-wheel using ordinary town pressure, and siphonic action occurs, filling the pipe and tank with water. The air-pump is put out of action by a float regulator in the tank as the water rises in it. Air which accumulates during the operation of the siphon enters the tank, and consequently lowers the water level in it. The float therefore descends, and the air-pump is started automatically, exhausting the accumulated air. With this device practically no attendance is necessary. The cost of conveying the water by this method is about 12c. per day, according to the last annual report of Mr. W. H. Conway, the Commissioner of Water and Water Supply. It is said that the vacuum pump requires about 10,000 gallons of water daily, and that this is sufficient to draw from 1 to 1½ million gallons from the wells, if the ground water stands sufficiently above the level in the pump well.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 65.)

THE Stock Exchange has not had an entirely happy week. First, there was discontent at the persistent and intolerable stagnation of business; and next, the collapse of the American Railway Market under the Government thunderbolt launched against traffic rates. This engine assumed a less menacing aspect before the close; but it had already upset things a good deal. The opening day was dull and languid, and movements were mostly for the worse. Gilt-edged securities were weaker, and Consols fell $\frac{1}{4}$; but Home Rails were fairly firm. The tendency on Tuesday was quite as bad. Consols were unchanged, but Rails were weaker; the Foreign Market was heavy, and Americans shaky. Wednesday was not so gloomy, and one or two spots brightened up. Consols advanced $\frac{1}{8}$, Railways hardened, and even Americans were not quite so bad. Thursday was the worst of the week. The rout of American Rails caused much agitation; and its evil influence imparted great uneasiness elsewhere. Consols fell $\frac{1}{4}$, and Home Rails gave way, while most of the rest were worse. But on Friday calmer views prevailed, and a feeling of relief was promoted by some recovery in Americans; so that prices looked up a bit. The improved feeling lasted through Saturday; but Consols were put down on the announcement of a £4,000,000 Irish loan at what looked a cheap price. In the Money Market, there was a strong demand for the Stock Exchange settlement and for the half-year's end that kept rates up; but discount terms were easier. Business in the Gas Market was on a fair average scale; and the general tendency was good. There were not many changes in quotations excepting those caused by *ex div.* adjustments. In Gaslight and Coke issues, the ordinary was only moderately busy, but firm as a rock—all transactions being within the limits of 104 $\frac{1}{2}$ and 104 $\frac{3}{4}$. In the secured issues, the maximum realized 90, the preference 104 $\frac{1}{2}$ and 105 $\frac{1}{2}$, and the debenture 82 *cum div.* and 80 $\frac{1}{2}$ and 81 $\frac{1}{4}$ *ex div.* South Metropolitan was very quiet and firm, marking from 121 to 122. In Commercials, there were dealings in the 4 per cent. at from 107 $\frac{3}{4}$ to 109, and one in the 3 $\frac{1}{2}$ per cent. at 103 $\frac{1}{2}$. The debenture fetched 80 and 81 $\frac{1}{4}$ *ex div.* Among Suburban and Provincial, Alliance and Dublin changed hands at 81 $\frac{1}{4}$ (a fall of 1), Brentford old at 253 $\frac{3}{4}$, ditto new at 189 $\frac{1}{2}$, British at 44 $\frac{1}{4}$ and 44 $\frac{3}{4}$, and South Suburban at 122. On the local Exchange, Chester was done at 109 $\frac{1}{2}$, and Liverpool "A" at 220. In the Continental companies, Imperial was steady at from 178 $\frac{1}{2}$ to 179 $\frac{1}{2}$, ditto debenture realized 94 $\frac{1}{2}$ and 95 $\frac{1}{2}$, and Tuscan 91 $\frac{1}{8}$ and 92 $\frac{1}{8}$. Among the undertakings of the remoter world, Bombay was dealt in at 6 $\frac{3}{8}$, Cape Town mortgage at 49 $\frac{3}{4}$, Hong Kong at 17 $\frac{5}{8}$ and 17 $\frac{3}{4}$, Primitiva at from 7 $\frac{1}{8}$ to 7 $\frac{1}{2}$, ditto preference at from 5 $\frac{1}{4}$ to 5 $\frac{1}{8}$, ditto debenture at from 97 $\frac{1}{2}$ to 98 $\frac{1}{2}$, and San Paulo at 15 $\frac{5}{8}$ and 15 $\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

The Indirect Financial Disadvantages—Poor Commercial Abilities of Municipal Electrical Engineers—Municipal Combination for Securing Electrical Powers—As Others See Us, and We Them.

IN several towns in which the electric supply is run by municipalities, the ratepayers have learned to their cost that such possession and management have their disadvantages. Rates in aid and heavier bills for public lighting have largely accompanied this form of municipal speculation. But there are other ways in which the ratepayers have suffered injury, which perhaps are not so obvious, but are nevertheless existent. It is one of the illogical claims of municipal adventurers that, although municipal ownership of the electric supply has caused direct burdens to fall upon the ratepayers, there have to be set against this the reductions in the price of gas that competition has forced. Such claims sliding-scale gas companies can afford to treat good-humouredly, knowing full well that, without any electrical competition, the incentive to reduce prices is quite sufficient; seeing that, only by reduction of price, can increased dividends be paid to the shareholders. And it is a well-recognized fact that the lower the price of gas, the greater, under normal conditions, is the tendency to increased consumption; and the greater the output, the lower the productive and distributing costs, per unit of gas sold, under circumstances ruling at the time. Moreover, the whole development of the process of gas manufacture has been to bring about productive economy, resulting in lower charges to consumers. That there are companies who are in a position now to sell, because they produce, from 1000 to 2000 cubic feet of gas more per ton of coal carbonized than they did formerly, is not by any means due to electrical competition. But this increased production means an ability to sell at a lower cost than would be the case if the development in manufacturing economy had not taken place. If there had not been rate-aided competition, and withdrawal of the public lighting from the gas company (causing a smaller demand for gas than would otherwise have been the case), and if there had not been heavier payments through the rates in support of the municipal electricity concern, gas could have been, and would have been by sliding-scale gas companies, supplied at a still lower price than the present. That would have been a decided gain to the community. Both it and the costs inflicted upon the ratepayers by the electricity concern are, however, losses to the community.

Besides, seeing that gas making and distribution employ more labour proportionately than electricity, the extent to which electricity has prevented the development of gas supply has been derogatory to the wage-earning power of the working classes. These considerations clearly show that municipal speculation in electricity supply has had its indirect, as well as its direct, financial disadvantages.

The contributor of Electrical Notes in "The Times Engineering Supplement" does not think much of the commercial abilities of the part of the electrical profession in municipal service; and his remarks on the subject draw from the background of our memory criticism that has been passed here on the financial failure of their work and endeavours. But if the charge is true as to the mediocre character of the commercial abilities of these professionals, it is not from want of much talking and writing; and some of it has been rather bizarre in character, as has often been disclosed in the "Memoranda." Only last week we were pointing to some examples of grotesque thought on commercial subjects, extracted from certain papers read before the Incorporated Municipal Electrical Association at Glasgow. And it seems that the same papers have provoked "The Times" writer to speak his mind. He alludes especially to the paper by Mr. A. C. Cramb, of Croydon, on "Commercial Advancement of Electric Supply;" and he hits hard when he says that there is a good deal of vague generality about Mr. Cramb's remarks on the subject, and that, as usual, it is easier to discuss the diagnosis than the treatment. It may seem daring to indict a whole electrical profession; but the writer in our contemporary asks, What use is there in disguising the fact that the members of the Municipal Electrical Association, in conference assembled, represent a body of men who have not succeeded in the vigorous commercial exploitation of electric supply, and have not succeeded for the best of all reasons—viz., that they do not possess the right qualifications? As station engineers, they have acquitted themselves ably; but, says their critic, they are not tradesmen, nor are they really fitted even to discuss among themselves the arts of the pushing tradesmen, as they may or may not be applied to electric supply.

The easy contempt of this engineering writer for the commercial abilities of municipal station engineers, makes his criticism, however true it may be, read a little caustic, though he goes on to show that the blame cannot be entirely put upon the backs of these much harassed officials. He tells his readers that the strength of gas competition mainly arises from the money power of the gas industry; we claim also that it arises from practical commercial ability. He fails also to perceive how at the moment electric supply can get on level terms with the gas industry in regard, for example, to the cheap hiring of apparatus. The fact of the matter is that the electricity industry is handicapped in not having as cheap and efficient apparatus as the gas industry; and the very nature of all that is required to produce useful effects from electric energy debars equality in simplicity and in low cost. And as to efficiency—well, that is a subject which we can afford to let pass. The criticism of the contributor to "The Times" stands in strange contrast to the fantastic statements (noticed last week) of the Electrical Engineer of Newport (Mon.), as to the gas industry being effete and moribund. Mr. Collings Bishop, the gentleman in question, is probably at home again sitting in his office armchair, simply watching, now that gas competition is practically dead, the wave of business rolling into his department. Why worry about commercial ability on the part of the station engineer, or about the employment of sales and advertising managers? Commercial ability, and sales and advertising managers, are not required for merely opening ledger accounts with consumers all too willing to light, heat, and cook by means electrical. There is clearly something for our electrical friends to do in adjusting the statements of Mr. Bishop and the Engineering Correspondent of "The Times."

According to municipal dictum, it is decidedly wrong of certain gas companies to enter into any combination to secure the "Metropolitan" No. 2 burner as a standard for testing purposes. Combination of the kind, municipally regarded, is against parliamentary usage, and is a means of procuring legislative powers that are inimical to the interests of the public collectively and individually. It is, in short, an evil creation of ingenious gas companies that deserves to be trodden under foot, and be put an end to once and for all. The authorities who rule parliamentary procedure do not share these views. They are not convinced that it is any part of the duty of the Legislature to place any obstacle in the way of legislative economy. But municipal belief in its own great virtues, and disbelief in the commonsense views on this subject of the Legislature, led to the matter being put to the test the other day with ill-success, on the second reading of the Standard Burner Bills. Before this took place, the members of the Municipal Electrical Association, in conference in Glasgow, were considering whether some special concerted effort should not be made to extend, to all municipal undertakings identified with the Association, the power of supplying wiring, fittings, &c. After some discussion, a resolution was passed to the effect that subscriptions be invited from all municipalities, whether members of the Association or not, towards a fund in support of a Bill which would extend wiring powers to all municipalities. There are a good many people (electrical contractors among the number) who are opposed to any extension of municipal trading powers, and to any municipal competition with private local traders. Such a jointly promoted Bill for wiring and fittings powers would be opposed to

certain public and individual interests. And therefore, it would be interesting to hear from Liverpool and the other municipal authorities who were agitating over the combination of gas companies in connection with the Standard Burner Bills what they think of this municipal proposition for promoting legislation.

In the "Memoranda" for June 21, there appeared a few comments on an article, with a particularly historic flavour about it, on "Street Lighting: Electricity v. Gas," published by the "Electrical Review." We showed how completely, in this question of competition, our contemporary—whether deliberately or unwittingly—was living in the past. Either way, there is no excuse for not being up-to-date in the advances of gas lighting. However, our contemporary has not, up to the present, seen fit to reply to any of the points raised in the comments. Subsequent to the penning of these, another article on the subject appeared, which need not be noticed save one paragraph. In this we are told: "The gas interests are fighting hard in their last ditch; and the instances we refer to in the present article show how necessary it is for all engaged in the electricity supply industry to adopt the most active publicity methods in order to counteract their wiles." The "Electrical Review" is, it is patent, suffering from the same form of hyperbolism as Mr. Collings Bishop. "The gas interests are fighting hard in their last ditch;" and yet the electricity supply industry must "adopt the most active publicity methods in order to counteract their wiles." What a blood-thirsty old "Electrical Review" this is that advises such active measures against men struggling for existence in the last ditch. But talking of "wiles," those of the gas interests are nothing compared with those of the electrical interests in trying to make the public believe that certain things are different from what they actually are; and it behoves the gas interests to see that this sort of thing is met by "most active publicity methods."

For example, looking through "The Times," "Daily Telegraph," and other papers on Wednesday, we see a column advertisement article headed "The Lighting Problem—Gas v. Electricity—A Comparison of Cost—Important Tests." There is not, however, a single comparison of cost between gas and electricity in the article. Is it honest, or is it gross deception, to adopt a heading such as that quoted under the circumstances? The only statement—the only dogmatic assertion we can find referring to gas in the article is that, "with the advent of metallic lamps, it is now cheaper to 'burn' electricity than gas." But the article goes on to allude to comparisons between electric carbon filament and metallic filament lamps—not between gas and metallic filaments. And if the authors of the article, who appear to be the makers of the "British Metalite" lamp, are speaking truthfully, there has been a good deal of hoodwinking of the public going on over the metallic filament lamp business; for of the metallic filament lamps tested, there was only one—and that the "Metalite"—that did not grow quickly dimmer with use, with concurrently an increase in electricity consumption. Now this does not speak well for the claims and statements freely advertised by the electrical people. But we notice that these particular advertisers, so as to make the hours of use look long on an expenditure of 1d. for electricity, merely take a 10-candle power lamp, and electricity at the rare low price of 3d. per unit. Some of the lamps only ran for sixteen hours for 1d.; others for twenty-six; but one—oh! the glory of it!—ran for thirty-two hours. Needless to say, that was the "Metalite" lamp. This only represents 1 watt per candle power! Well now with gas at 2s. 6d., 33 cubic feet can be purchased for 1d.; and this will run an inverted lamp, giving 20-25 candles, for 33 hours. So that on the 10-candle basis, the pennyworth of gas would represent at least 66 hours' similar illumination for 1d. "The most active publicity methods" are required to counteract such "wiles."

Next day another column advertisement article appeared, in which were a few very strange and somewhat contradictory statements. Consider this: "The cost of 'burning' electricity has been so much reduced through metallic lamps that a great many people find that it is now cheaper to use it for lighting than gas." And this: "With a great many people, the question of economy has to be primarily considered, and, for that reason alone, they have continued to use gas." What we gather from this is that modern incandescent gas lighting is more economical than electric lighting, even with the "Metalite" lamp; and that economy is what most people have to primarily consider. Yet there are certain people who, for some inscrutable reason, or reasons, find it is cheaper to use electric lighting. We would venture to suggest as possible reasons antiquated burners, and a barbarous waste of gas. Then we get a whole page advertisement in the "Daily Mail" booming "the wonderful Watkin switch," whereby electric lamps can be varied between "full on," "dim," and "off." Some of them are dim enough without the Watkin switch. But that is not the point. It is that by the use of the invention and by those who can afford from 17s. 6d. to 35s. per switch, "the full benefit of metallic filament lamps can be had, and the cost further reduced; thereby rendering gas an antiquated and expensive means of lighting, heating, &c." "The most active publicity methods" are needed, "in order to counteract the wiles" of these electrical people. The "Electrical Review" is thanked for the hint.

The Accession of the King, who as Prince of Wales presided over the Royal Society of Arts after King Edward came to the Throne, and subsequently became a patron of the Society, caused a vacancy in the presidency, which has been filled by the election of Lord Alverstone, the Lord Chief Justice of England.

PERSONAL.

Mr. R. HESKETH JONES has resigned the chairmanship of the Oriental Gas Company, Limited, and Mr. H. D. ELLIS, the Deputy-Chairman, succeeds him in the position. Mr. Hesketh Jones was elected Chairman in November, 1900, on the death of Mr. John Blacket Gill, who was also Chairman of the European and Commercial Gas Companies.

At the last meeting of the Co-Partnership Committee of the South Metropolitan Gas Company, Mr. Charles Carpenter, the Chairman of the Company, who presided, offered, on behalf of the Committee, a cordial welcome back to Mr. JOSEPH TYSOE, the Engineer-in-Charge of the East Greenwich Station, from his sojourn abroad, and said all were glad to learn that his enforced absence of some months had resulted in his regaining good health once more. Mr. Tysoe, it may be remembered, acting under medical advice, left England for Egypt early in February last to shake off some troublesome symptoms which had presented themselves.

A pleasing ceremony took place last Wednesday morning, when Mr. JOHN FAZAKERLEY was made the recipient of a fumed oak *secrétaire*, suitably inscribed, as a token of esteem from the officials and workmen of the Whitwood Chemical Company, Limited, of Normanton, on severing his official connection with the Company after twenty years' service. The meeting was presided over by Mr. W. Ackroyd Bower, the Engineer and General Manager, who expressed his regret at losing the services of Mr. Fazakerley, but at the same time congratulated him upon his new appointment as Gas and Water Engineer and Manager to the Goole Urban District Council, and wished him every success. He then called upon the Secretary (Mr. W. Bourne), as being the oldest official of the Company, to make the presentation. In doing so, Mr. Bourne fully endorsed the remarks made by the Chairman. Mr. Fazakerley, in accepting the present, spoke of the uniform kindness he had received during the whole of the time he had been connected with the Company. Mrs. Fazakerley was presented with a silver flower-vase.

Mr. A. MORTON FYFFE, who is leaving Dundee in the course of the next few days, to become Gas Engineer and Manager at Nelson, was the guest at a complimentary dinner in the Royal Hotel last Tuesday. The company, which was very representative, numbered about fifty, and was presided over by Mr. Alexander Yuill, the Engineer of the Dundee Gas-Works. The toast of "Our Guest" was submitted by the Chairman. Mr. Fyffe, he said, was a true Dundonian. He served his apprenticeship as an engineer in the Burgh Engineer's office, and for seven years had been connected with the Gas Department. He had done splendid work at the gas-works in connection with the reconstruction scheme; and he (Mr. Yuill) had a high appreciation of his ability, not only as an engineer, but for the inventive genius he brought to bear on all problems or work that required concentration of thought and professional ability. The Chairman, in closing, said they all hoped he would have much health and happiness in his new sphere in Lancashire. Mr. Fyffe, in his reply, said he was proud of the fact that he was a native of Dundee; and it was a great joy to him, on leaving it, that he took with him the good wishes and kindly thoughts of many of his friends. Returning thanks to Mr. Yuill for all he had done for him, he said that gentleman had taught him engineering and humanity; and he confessed that it was on the shoulders of Mr. Yuill's success that he had attained to the position he now occupied. He would look back upon the night as a beacon, lighted to have him remember that the eyes of his friends were on him, that they expected well of him, that he would do his level-best, and that he would go "dead-straight." He meant to try. Mr. Fyffe has been made the recipient of several parting gifts from the employees at the gas-works and friends; these including a silver-fitted dressing-case, and a leather suit-case.

NOTES FROM WESTMINSTER.

The Standard Burner Bills.

THE Standard Burner Bills entered upon their final stage yesterday; so that we shall soon know their fate. They have been included in Group F, and were first down to come before the Committee on Thursday of last week. But some Local Government Board Provisional Orders Bills had precedence, and so the date was altered to yesterday. It is noticed that the Wolverhampton Corporation have withdrawn their petition against the No. 3 Bill; but nevertheless the representatives of the Gas Company were present yesterday.

Over the Committee who are considering the Bills, Sir Henry Kimber is presiding; but yesterday morning one conscientious member—Mr. H. C. Mallaby-Deeley, the Member for Harrow—retired, owing to the fact that he is a shareholder in the Gas Company operating in his constituency, and that Company is interested in the present Bills. The promoters and the opponents have the same representation—legal and expert—as when the Bills were

before the Upper House; but in regard to the Bills themselves it has been decided to leave the Liverpool Gas Company out of No. 1 Bill, and give them the honour of a separate Bill, seeing that high-candle power gas invests their case with a special condition, which is thought by the opponents to require special discussion. But the principle of an unconditional change of test-burner (which has been settled by numerous precedents) is being fought all over again on the three Bills. It is a wearisome business this repeated tramping over the same ground. Mr. Fitzgerald, K.C., opened for the Bill yesterday morning; and the first witness was Mr. Charles Carpenter. His cross-examination by Mr. Ram, K.C., was the feature of the afternoon; and Mr. Ram found that he had rather a tough nut to crack. On all his main points there was an answer. With the merry assurance of a lawyer who thinks he has cornered his witness, the learned Counsel got Mr. Carpenter on to the question of the availability to gas consumers of the "Metropolitan" No. 2 burner from the cost point of view; and Mr. Carpenter produced a letter from a Birmingham firm, offering to make 10,000 burners at 102s. per gross net, or about 9d. each, to which would have to be added 2d. or 3d. apiece, in the first instance, for the dies, and something for the retailers' profit. If there were a demand for the burner (which there would not be in view of the incandescent burner), and 100,000 were ordered, the price would be still lower. Then Mr. Ram essayed to draw from Mr. Carpenter that the South Metropolitan Gas Company made a concession in price on having the "Metropolitan" No. 2 burner applied to them. That is a common mistake. And again learned Counsel learned—no doubt much to his disgust—that the concession applied to the reduction of the illuminating standard from 16 to 14 candles, and that the change from the No. 1 to the No. 2 burner did not take place until some four years later. Only in the case of the Brighton Bill, has there been any direct reduction of standard price owing to the change of standard burner, and then the Committee said the reduction was "mainly" due to that change, so that other considerations applied. Any other reduction of standard price in consequence of the adoption of the new burner has been by arrangement between the parties. Professor Vivian B. Lewes goes into the chair this morning.

Capital Redemption and Other Matters.

Not satisfied with what they obtained in the House of Commons, the Brighton and Hove Corporations have appeared in opposition to the Brighton and Hove Gas Bill before the Duke of Bedford's Committee, wasting (as was expected) time and money, and getting nothing. The result sizes-up very fittingly the character of their action—more especially that of the Brighton Corporation. It will be remembered that, among other things, the Company sought a capital redemption fund; and, as the measure left the Commons, and as it stands now, there is provision for a fund totalling to £57,000, whereby, by appropriations not exceeding £1800 each half year from revenue, capital to that amount is to be wiped out. Then the power ceases. The unproductive capital represents the abandoned Black Rock and Hove gas and residuals manufacturing plant. The Corporations were in a sort of quandary over the matter. They could not deny that the wiping out of unproductive capital is a financially sound and economic procedure; but the Brighton Corporation had the boldness to contend that such liquidation of dead-capital would be of no advantage to the consumers. It is distinctly to their disadvantage to perpetually pay dividends on unproductive capital. But what the Brighton Corporation seemed desirous of doing was to shift the responsibility of clearing off this capital to the successors of the present generation of consumers, and to let the present generation enjoy the reductions in price that would come to them from the money that would otherwise be employed to discharge the unfertile capital. But to the present consumers, as time advances, redemption of that capital must be more advantageous than continuing its existence. The Brighton Corporation seemed to have some floating notion that the proprietors would benefit more from the carrying out of the proposition than the consumers; but in what way their ideas were the most hazy. No doubt the Corporation had an eye to the Company being assisted, through the operation of the fund, to even a somewhat better competitive position than now; and this naturally, as electricity suppliers, they do not want. The Hove Corporation, in their wisdom, agreed it was prudent that dead-capital should be redeemed; but—and there's the rub—in their judgment the shareholders should provide the money for the purpose. Mr. Charles Carpenter put the position tersely from the shareholders' standpoint, when he said it would be unfair to compel them to provide the capital twice over; and the Committee thought so to, for they declined to touch the redemption clause.

Road Openings and Public Lamp Consumption.

The County Council succeeded in getting modified the general law regarding the three days' notice of the breaking-up of streets for pipe and other work. They unreasonably asked for a month's notice; and the Committee gave them a fortnight. But this only applies to 5 miles of roads, out of a total of 192 miles in the Brighton Company's area. At the same time, the fortnight is too long for general practical application. Another point of interest is that the agreement between the Brighton Corporation and the Gas Company provides for the supply of 4 cubic feet of gas per hour to each street lamp. The Corporation wanted to get parliamentary authorization for the revision of the terms, and the use of only 3 cubic feet per hour.

But the street-lamp burners are all arranged for a consumption of 4 cubic feet; and the Company strongly objected to any reduction of consumption that would produce a flame that would not properly fill the mantles, and so bring the public gas lighting into unfavourable contrast with the Corporation electricity supply. The Committee were against the Corporation in the matter; and so, as we last week predicted was likely to be the case, this second appearance in Parliament on their part has been fruitless and wasteful. The witnesses called in support of the Bill were Mr. A. M. Paddon (Chairman of the Company), Mr. E. L. Burton (the Secretary), Mr. Joseph Cash (Engineer), Mr. E. Herbert Stevenson, and Mr. Charles Carpenter.

Glasgow Gas Charges and Discounts.

The Glasgow Corporation deserve their Gas Consolidation Bill; for they have accepted unreservedly the policy of no rate aid from profits, and in respect of other matters have thrown themselves largely upon the judgment of Parliament. The past week has seen a rare fight over the Bill before the Duke of Bedford's Committee. It lasted the whole parliamentary week; and throughout the Corporation of Glasgow were largely in the position of interested spectators watching the struggles for advantage of one kind or another among those who were arrayed only nominally as opponents of the measure—moving merely to act upon the defensive when the interests of the city proper and of the gas undertaking and the consumers were in any way menaced, and carrying the fight a little further on one or two special points. Big and little interests were assembled there seeking the benevolent consideration of their Lordships from their special point of view; and, consequently, there was one of the largest shows of Parliamentary Counsel that has been seen in one room at one time for many a day. On the main questions, the Corporation were content with the Bill as amended in the Commons, and as it came before their Lordships, with, if agreeable to the latter, a few minor modifications. But at the same time they were not averse, if the opponents succeeded in proving to the Committee the wisdom of so doing, to having re-established some of the provisions contained in the original Bill, before the Commons Committee defaced it—in certain respects for the better. There were opponents who wanted changes; and there were "opponents" who wanted the Bill to pass just as it came before their Lordships. This was an extremely interesting state of things, and not one that is often found in the Committee rooms. The preamble of the Bill was not opposed; and virtually the Committee were merely, on several points, arbitrators between those who were seeking concessions. The main issue of the wordy warfare of the week is that the Committee have expressly confirmed the decision of the Lower House that no profits are to be taken in aid of the rates. But in certain other respects, the Gas Department have obtained a little relaxation in the terms that were put upon it in the Lower House.

In addition to the prohibition as to profits being transferred in aid of rates, the Commons Committee provided for equality of price, or flat-rates, throughout the area of supply (other than in a district known as the supplementary supply district), for various purposes; and in the supplementary area, they allowed a higher price by a maximum of 50 per cent. than is charged for the various purposes in the city area. A level discount of only 5 per cent. was granted for prompt payment for any class of business. Trading in water-tight compartments of this kind is not good for the traders. The Corporation and the Gas Department realized this; and therefore there was a friendly feeling towards those opposing manufacturers and traders who come along asking that there should be discounts allowed according to the class and volume of business. Over this matter, and over the attempt of the authorities in the supplementary district to get reduced the 50 per cent. maximum difference, the bulk of the evidence roamed. The supplementary district did not succeed in securing the favourable consideration of the Committee; and the 50 per cent. remains. All the well-worn and commonsense arguments favourable to a free hand, under like circumstances, in dealing with large consumers of gas—liberty wanted never so much as to-day—were placed before their Lordships, who showed a commercial appreciation of the matter by opening the door to differential prices in this manner: The price to be charged by meter is to be at all times charged equally, under like circumstances, to all consumers within the city supply district; the Corporation may supply gas for heating, cooking, motive power, warming, ventilating, for the various requirements of trade, &c., provided that the rate charged for the gas supplied is the same under like circumstances to all persons. The 10 and 15 per cent. discounts clause respectively for prompt payment and large consumption is inserted. The Committee have also allowed the creation of a reserve fund by accumulations of annual sums not exceeding $\frac{1}{2}$ per cent. on the amount of the outstanding borrowed money until the fund is equal to 10 per cent. of the money outstanding, when any subsequent excess will be carried to revenue. In addition to the Convener of the Glasgow Corporation Gas Committee (Mr. M. W. Montgomery), the witnesses included Mr. Alex. Wilson, Mr. Corbet Woodall, Mr. W. Doig Gibb, Mr. W. R. Herring, Mr. H. E. Jones, and Mr. E. H. Stevenson. And all these were favourable to the Gas Department being given more business latitude than was possessed as the Bill left the House of Commons. With their Lordships' decision, Mr. Wilson mentioned to our representative yesterday, the Glasgow Corporation are thoroughly well pleased. They did not care so much about the surplus profits as about the freedom in price.

GAS ENGINEERING AND SUPPLY EXAMINATIONS.

A Further List of Successful Students.

IN response to the invitation extended in our editorial columns last week to successful candidates in the last Gas Engineering and Supply Examinations to send in their names, we have received the following, in addition to those given on pp. 776 and 934.

GAS ENGINEERING.

Honours Grade, First Class.

Atley, W. Walker	Whitwood Chemical Works.
Bullen, A. E.	Plymouth.
Carmichael, Thomas . . .	Barrhead.
Coombs, Harold A. . . .	Cheltenham.
Jones, Harold	Stourbridge.
Myers, Ernest	Chesterfield.
Rudge, C. A.	Whitwood Chemical Works.
Williams, Samuel J. D. . .	Stourbridge.

Honours Grade, Second Class.

Bartlett, Oliver J.	Bromley-by-Bow.
Millen, R.	Whitwood Chemical Works.

Ordinary Grade, First Class.

Priest, F.	South Metropolitan Gas Company.
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Ordinary Grade, Second Class.

Henn, Karl	Dudley.
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GAS SUPPLY.

Honours Grade, First Class.

Briggs, F. C.	Bromley-by-Bow.
Twist, George	Doncaster.

Honours Grade, Second Class.

Bullen, A. E.	Plymouth.
Chandler, S. B.	South Metropolitan Gas Company.
Helden, R. E.	South Metropolitan Gas Company.
Highmore, J. G.	South Metropolitan Gas Company.
Noon, E. H.	South Metropolitan Gas Company.
Williams, Samuel J. D. . .	Stourbridge.

Ordinary Grade, First Class.

Bridgeland, A. H.	South Metropolitan Gas Company.
Forbes, E.	Glasgow.
Kay, Archibald	Glasgow.
Reed, W. B.	South Metropolitan Gas Company.
Sinclair, Robert E.	Glasgow.

Ordinary Grade, Second Class.

Aitken, Moses N.	Glasgow.
Bradford, —	South Metropolitan Gas Company.
Coggin, H.	South Metropolitan Gas Company.
Cooper, John A. R.	Fraserburgh.
Dolan, William	Glasgow.
Henn, Karl	Dudley.
Seyssert, —	South Metropolitan Gas Company.
Steele, William	Glasgow.
Strathearn, James	Glasgow.
White, James	Glasgow.
Wilson, Thomas J.	Glasgow.

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the ensuing session, containing the regulations for the examination of candidates in technological subjects. As usual, examinations will be held in the two subjects of "Gas Engineering" and "Gas Supply;" and intending candidates will find on pp. 49-54 an indication of the nature of the questions which will be set by the Examiners (Mr. Thomas Glover and Mr. J. H. Brearley) in the Honours and Ordinary Grades, and a list of the books they are recommended to consult. The examinations will be held on the 29th of April and the 6th of May next. The first prize in the Honours Grade is £3, given by the Goldsmiths' Company, and the Institute's silver medal; the first and second prizes in the Ordinary Grade being £2 and £1 10s., given by the Company (in each case accompanied by the Institute's bronze medal); and the third a bronze medal. The examinations in "Coal-Tar Distillation and Coal-Tar Products" will be held on the 4th of May; the Examiner being Dr. J. C. Cain. The new syllabus is under revision, and will be issued separately. It will be divided into two distinct sections, dealing respectively with tar distillation and immediate products, and coal-tar colouring matters. The programme, published by Mr. John Murray, Albemarle Street, costs 9d. net.

Some changes in the staff of the Chemical and Gas-Testing Department of the London County Council, consequent on the retirement of Mr. W. J. Livingston, a chemical assistant who also acted as chief clerk in the department, have now been sanctioned. It was decided, on the recommendation of the Establishment Committee, to promote Mr. E. R. Andrews, a chemical assistant of the first class, to be senior assistant; to appoint Mr. W. E. F. Powney, a second-class assistant, to fill the vacancy thus created; and to bring up into the second class one of the assistants of the minor establishment, as from the 1st inst. These changes will effect a saving of £271 in the current financial year, and an ultimate annual saving of £146.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

THE Forty-Sixth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued yesterday. It is signed by Mr. R. Forbes Carpenter, who, at the end, expresses regret that continued ill-health precluded his doing more than generally supervise its preparation, the work in connection with which was carried out by his Assistant, Mr. S. E. Linder, B.Sc. It contains, as usual, various matters of special interest to our readers; but to-day we can only give an indication of the contents of the report, leaving for subsequent issues a fuller notice of it, as well as of the reports of the District Inspectors. As our readers are aware, Mr. Carpenter has now retired, and Mr. W. S. Curphey, who for some years had entire charge of the work in Scotland, has been appointed Chief Inspector.

The report opens with the statement that the number of works registered on Dec. 31, 1909, was 1263. Of these, 71 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder—1192—carried on processes which were scheduled or subject to registration under the Act of 1906. These numbers show a decrease of one alkali works, and an increase of three scheduled and registered works, compared with 1908; the net increase being two. There are also 169 works registered in Scotland; bringing up to 1432 the total number of works registered in the United Kingdom. The number of separate scheduled and registered processes under inspection last year was 1857, compared with 1839 and 1821 in the two preceding years. There is again a noticeable increase in the number of works manufacturing sulphate and muriate of ammonia; these, with gas-liquor works, accounting for more than 31 per cent. of the processes under inspection. The Inspectors paid 5600 visits to works, and carried out 6252 tests, compared with 4860 visits and 5170 tests in 1908. It is satisfactory to find that no proceedings had to be taken against the owners of registered works for infraction of any of the penal clauses of the Act. But in the case of three works, serious warnings had to be given; and proceedings were only withheld on the owners undertaking to remedy the structural defects which led to the escape of noxious and offensive gases.

SULPHATE OF AMMONIA AND GAS-LIQUOR WORKS.

Mr. Carpenter reports that the total number of processes of this class now under inspection is 591—an increase of 13 on the year 1908. In the report for his district, Dr. Fryer records a serious occurrence—happily unattended with fatal results—that took place with the sulphate of ammonia plant at one works. It appears that two men were gassed while engaged in cleaning a seal in the foul-gas main in the lime-settling tank, which is placed under the cold-water condenser, and receives condensed liquor from a syphon placed on the foul-gas main just before it enters the purifiers. Samples of the liquors from the seal-pot and the syphon, taken at a later date, were examined in the Chief Inspector's laboratory, and found to contain sulphuretted hydrogen, carbon dioxide, and hydrocyanic acid; the syphon liquor containing cyanide equivalent to 0.475 gramme of hydrocyanic acid per 100 c.c. Mr. Carpenter says it is important that manufacturers should not overlook the presence of this extremely poisonous constituent of the foul gases evolved on distillation of gas liquor; and attention has been directed to the point in previous reports. It is desirable, also, to emphasize the fact that the specific gravity of such gases when cold much exceeds that of air, and that when a seal is broken at a low level, the gaseous content of the system will tend to empty itself downwards—air entering at any opening in the upper part of the system to take the place of the foul gases so displaced.

During the latter part of the year, plant was erected and put into operation at a gas-works for the elimination of sulphuretted hydrogen from crude coal gas and the recovery of the sulphur as a bye-product according to the patent specification of Herr Walther Feld. Mr. Carpenter gives an outline of the process, which, he says, is still somewhat in the experimental stage; and therefore it is too early to pronounce any opinion as to the efficiency of the plant for the purpose named, or the extent to which such plant would be applicable for the removal of sulphuretted hydrogen in other gaseous mixtures than that named above. Herr Feld has since developed a method for the simultaneous extraction of ammonia and sulphuretted hydrogen based upon principles similar to those applied in the method for the elimination of sulphuretted hydrogen alone; the active reagents being ferrous sulphate, thiosulphate, and thionates. Mr. Carpenter says the development of Herr Feld's processes will be awaited with interest. These remarks are followed by a further memorandum by Mr. Linder on the results of his analysis of ammoniacal liquors.

RECOVERY AND PRODUCTION OF AMMONIA.

Mr. Carpenter gives his customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. The figures are on the next page.

These figures show an increase from all sources of supply with the exception of that from gas-works; the increase in the produce

	1909.	1908.	1907.
Gas-works	164,276	165,218	165,474
Iron-works	20,228	18,131	21,024
Shale-works	57,048	53,628	51,338
Coke-oven works	82,886	64,227	53,572
Producer-gas and carbonizing works (bone and coal) . . .	24,705	24,024	21,873
Total	349,143	325,228	313,281

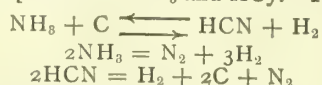
from coke-ovens being very marked—viz., more than 18,000 tons. Operations on the large scale in Ireland for the recovery of ammonia from peat are still in the experimental stage.

Difficulties continue to be experienced with water authorities having jurisdiction in the districts where coke-oven recovery plants are situated; the presence of sulphocyanides and phenoloid bodies in the effluent from such works causing much apprehension in the minds of those responsible for safeguarding the condition of the river courses receiving the drainage therefrom. The subject received extended notice in the report for 1907, where attention was drawn to the experiments of Professor Percy F. Frankland and Mr. H. Silvester on the bacterial treatment of spent ammoniacal liquors, and of Dr. Gilbert Fowler's work on the same subject at the Bradford Road residual works of the Manchester Corporation. Some designers of plant are now directing their attention to the recovery of the ammonia produced at coke-oven recovery works by direct methods designed to obviate the need of discharging effluent liquors of the character now complained of; and it is possible a solution of the difficulty may be found on these lines.

FURTHER STUDIES IN COAL CARBONIZING.

At the conclusion of the experimental work described in the report for 1908, it was seen that continuance of the work on the lines laid down in that research would be impossible, accompanied, as each experiment had to be, by gas analysis of a very laborious character. During the past year, however, it was felt that some effort should be made to continue the research, when opportunity offered, on a less ambitious scale, with the view, if possible, of clearing up some of the many problems left unsolved at the conclusion of the work in 1908, more especially those relating to the yield of hydrocyanic acid at different temperatures and varying rates of flow. It seemed desirable to confine attention entirely to the reactions taking place in presence of wood charcoal and graphitic carbon, and to exclude porcelain altogether from consideration, as the results obtained in 1908 clearly proved that, at temperatures exceeding 800° C., porcelain has a strong oxidizing effect on hydrocarbons, ammonia, and hydrocyanic acid. But, on endeavouring to repeat some of the results obtained in 1908 with wood charcoal, it was found that the material could not always be relied upon to yield the same results under the same conditions of temperature, rate of flow, and volume and composition of reacting mixture; in fact, that the efficiency of the contact-material itself was subject to variation. The cause of this variation is obscure; but Mr. Carpenter says there is reason to connect it with the fact that hydrocarbons and hydrocyanic acid are more or less unstable in contact with carbon at high temperatures. Under such conditions, carbon of possibly graphitic character is deposited on the surface and within the pores of the contact-material, and very considerably modifies its character. It was further found that after continued treatment with coal gas (freed from illuminants) and ammonia, the wood charcoal became uniformly coated throughout its substance, and that the catalytic power attained a value sufficiently constant to justify the use of the material for the purpose of determining the comparative effect of varying temperature and other factors under controlled conditions.

The wood charcoal was prepared for use in the comparative experiments by continuing the treatment with ammonia and coal gas under the same conditions until approximately constant results were obtained. The temperature or rate of flow was then altered, and a series of results obtained. Conditions were finally restored, and the original experiment repeated. Agreement between the first and last experiments was considered to be proof that the contact material remained unchanged throughout the series. Full particulars are given of these experiments, and the more important conclusions arrived at are summarized as follows: (1) That the efficiency of wood charcoal in effecting the conversion of ammonia into hydrocyanic acid decreases with use. Such decrease is attributed to the deposition on the surface of the charcoal of graphitic or other form of carbon derived from hydrocarbons or hydrocyanic acid as a result of thermal decomposition. (2) That the hydrocyanic acid so obtained is the product of a reversible reaction controlled by temperature, and accompanied by secondary reactions yielding carbon, nitrogen, and hydrogen, by thermal decomposition of NH_3 and HCN . Thus—



(3) That, in the presence of wood charcoal coated with graphitic carbon, hydrocyanic acid possesses a high degree of stability up to a temperature of 1000° C.; and at 1100° C. thermal decomposition begins to be rapid. (4) That the presence of hydrocarbons, methane, and especially ethylene, is favourable, but not essential,

to a high yield of hydrocyanic acid; ammonia acting directly on carbon to form hydrocyanic acid in presence of hydrogen alone as diluent.

As the work was approaching completion, attention was directed to the researches of Dr. G. A. Voerkelius on the formation of hydrocyanic acid from ammonia and wood charcoal, published in the "Chemiker Zeitung." Dr. Voerkelius, by independent research, and employing other apparatus and procedure, has arrived at conclusions similar to those stated above; and Mr. Carpenter says the two researches afford mutual support and confirmation.

Towards the close of the report, reference is made to the Glover-West system of vertical retorts at St. Helens, and to the results of Dr. Colman's tests made on different dates and with various coals. These have already been published in full in the "JOURNAL." Mr. Carpenter remarks that Dr. Colman does not give any temperature data, and that it is not possible from his figures to determine the time spent by the coal gas in the retort. Mr. Thomas Holgate has estimated that for a horizontal retort (partially filled) the time of the gas in the retort (calculated for gas at 60° Fahr. and 30 inches atmospheric pressure) would be 2·7 minutes (= 162 seconds) at the start to 5·6 (336 seconds) at the end of the distillation; but such limits would not be applicable to a fully-charged vertical retort continuously generating gas. In the laboratory experiments on "Graphitic Scurf" recorded in the report for 1908, the time of gas in the tube (calculated for 60° Fahr. and 30 inches of the barometer) would be about 77 seconds. He adds that "further data are required before any conclusion can be safely drawn as to the connection existing between carbonization temperature and the relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort. In the works, further knowledge is needed of the distribution of temperature in the retort and of the relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort, and before condensation has taken place. In the laboratory, the work has to be extended to include experiments on ammoniacal mixtures down to 1 per cent.; and, further, to study the effect of the varying nature and amount of ash in the graphitic contact used. It may well be found that a high percentage of ash, and especially of ash containing iron compounds, is very detrimental to the survival of ammonia and hydrocyanic acid in the reacting gases."

OBITUARY.

The death is announced of Mr. JOSEPH BICKERTON, one of the first Directors of the "National" Gas-Engine Company, of Ashton-under-Lyne. Deceased was in his 71st year.

The "Journal für Gasbeleuchtung" reports that the death occurred on the 23rd ult. of Herr ARNOLD SCHREYER, the Manager of the Corporation Gas and Water Works at Halle in Saxony. Deceased was in his 61st year.

The death occurred last Tuesday, at the age of 75, of Mr. JOHN SMITH, the Consulting Gas Engineer of the Bangor (North Wales) Corporation. He had been connected with the gas undertaking for 36 years, and was formerly Gas Manager—a position he relinquished two years ago. Deceased was an able and conscientious servant of the Corporation.

We regret to record the death last Sunday, at his residence, Woodthorpe Hall, Sheffield, in his 66th year, of Alderman THOMAS ROBERT GAINSFORD, J.P., whose name will be remembered by many of our readers in connection with the water undertaking of the Sheffield Corporation. Though there had been signs for some little time of the breaking-up of his health, he was able to attend to his public duties almost till the last, having been engaged in them up to Thursday, the 30th ult. He was closely identified with the acquisition of the water-works by the Corporation in 1888, and was Chairman of the Water Committee till his retirement at the end of 1907, when the Council placed on record, in an address, their appreciation of his unremitting and devoted services to his native city in connection with its water supply. The address was illuminated, and presented to him the following June. Alderman Gainsford was also Chairman of the Derwent Valley Joint Water Board. He leaves a widow, two daughters, and three sons.

The Board of Agriculture and Fisheries announce that they have recently published a memoir of the Geological Survey on the water supply of Hampshire, including the Isle of Wight. It is the eighth of a series dealing with the water supply derived from underground sources. The introduction contains particulars of the geological formations of the county, with special reference to the water-bearing strata. Wells, borings, and springs, with supplies therefrom, intermittent streams, contamination of water, and analyses of various waters are also dealt with in the succeeding chapters. In addition, the memoir is accompanied by a rainfall map of the county, with explanatory report and statistics; and also a map of the valleys of the Test and Itchen, showing the position of wells and the contour lines in the surface of the underground water. A bibliography of works relating to the water supply of the county is included. Copies may be obtained from any agents for the sale of Ordnance Survey maps, or directly, or through any bookseller, from the Ordnance Survey Office, Southampton, at the price of 5s.

THE FOREST (BRUSSELS) GAS-WORKS.

In the account which appeared in the "JOURNAL" last week of the gathering of gas engineers in Brussels, it was mentioned that a visit was paid to the Forest works of the Imperial Continental Gas Association. In connection therewith, an interesting pamphlet had been prepared by Mr. H. Salomons, the Engineer; and from it some particulars were reproduced of the vertical retorts in use. We are now able to give, from the same source, a description of other portions of the works.

The Compagnie Continentale du Gaz hold concessions for the supply of gas in Brussels and its numerous environs. Of their

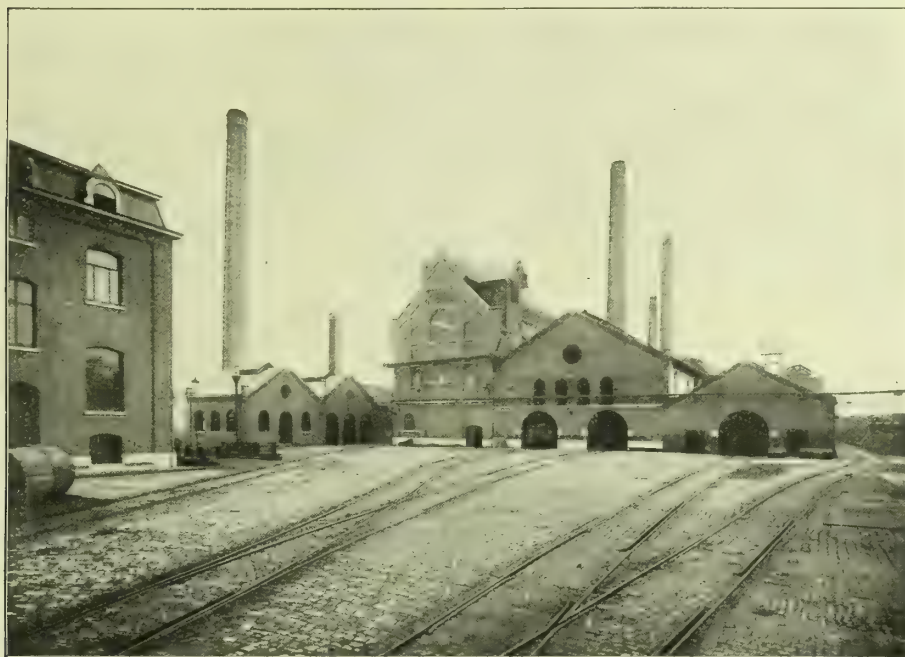
two series, each of four boxes, 4'5 by 4'5 by 1'3 metres, connected to a central distributor. These purifiers were worked with oxide of iron spread on four horizontal shelves. There were two station meters; the latter erected in 1882, and each supplying 1133 cubic metres of gas per hour. Each meter was placed in a cast-iron case, and each is in use at the present time.

There were three gasholders. The first, as already stated, was erected in 1866. A second, similar to it, was constructed in 1868. Both are of the two-lift type. The third, first constructed in 1882, was originally of the two-lift type also, but a third lift was added in 1892, giving the holder a capacity of 13,600 metres; thus affording a total storage of 25,250 cubic metres for a maximum make of 39,733 per twenty-four hours. Four Cowan regulators were used for the supply of the gas, permitting a maximum pressure during the night of 50 mm.

From 1892 to 1899 the works underwent little further change. The maximum make in 1899 was 48,140 cubic metres; but during this year a gasholder of 35,000 cubic metres was constructed, of three lifts, with a sheet-iron tank. The area of the works was considerably extended by the purchase of a site towards the north; but it was not until the period 1900 to 1910 that the most important extensions were carried out. At the present time, the productive capacity of the works is 135,000 cubic metres per 24 hours. It may also be said that, as regards the perfection of its plant, the works are not excelled by the most important establishments on the Continent.

THE HANDLING OF COAL.

Although provision has not yet been made for the handling of the coal by machinery, the lack of this facility has not been felt. The coal is stored for the most part in the open air in the north-east part of the works, though a covered store is provided between the house containing the vertical retorts and that for those to be put up. The unloading and stacking of the coal are done by manual labour. The space is enough for a stock of 16,000 metric tons, representing a consumption of about

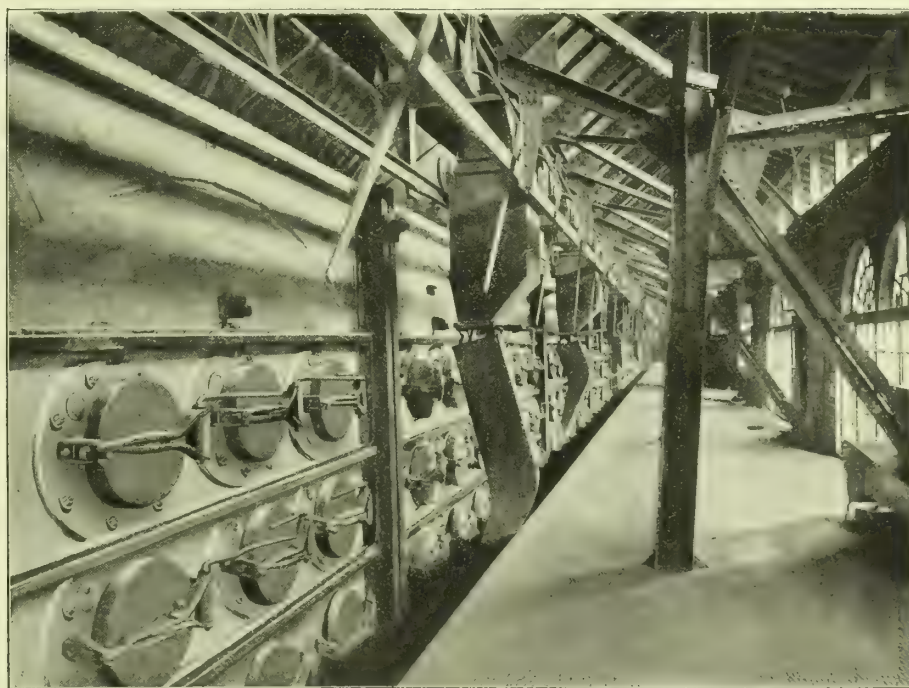


Entrance to the Works.

two works, those at Forest are the more important, and have grown rapidly of late years, as shown by the area at present covered (6 hectares 41 ares) compared with that (2 hectares 58 ares) when the works were established in 1866. In 1867, they comprised a retort-house of 16 grate furnaces, producing 24,000 cubic metres of gas per 24 hours. The first condensation of the tar and ammoniacal liquor was done in 15-inch cast-iron mains, which led direct from the retorts round the whole of the retort-house and coal-stores. The gas then passed into the washers, separators, and lime purifiers, thence through a meter of 1133 cubic metres capacity to a gasholder of 5825 cubic metres capacity, of the two-lift type, in a concrete tank. The system of mains was of small extent relatively to the present one—176 kilometres compared with 475 kilometres on May 1. As regards the output of gas in 1867 and 1909, the latter, even without Brussels and St. Gilles, is three times that of the former. The consumption has progressed to an unanticipated extent; and in view of the increasing area of supply, the make must reach a still higher figure.

Comparing the condition of the works with that in 1892, a few changes are to be noted. The retort-house has been doubled; and it now contains 32 furnaces similar to those constructed in 1866—the Morton system of sealing without lute having been adopted. Condensation is done by the passing of the gas along a slightly inclined main on the furnaces and in the condensers, erected in 1876 and 1881, of riveted wrought-iron pipes, 600 mm. diameter. The total cooling surface is 1288 square metres, or 3'28 square metres per 100 cubic metres of daily make. In 1882, two Beale exhausters were installed, worked by steam-engines directly connected thereto, and supplied with steam from a flat-bottomed horizontal boiler and a tubular boiler, each of 21 square metres heating surface. The gas was washed by washers and scrubbers on the Walker system—coke-towers, erected in 1882.

The purifiers put down about the same time were arranged in



Settings of Inclined Retorts—Charging Stage.

80 days in winter, and assuming that the coal is stacked to a height of 2'5 metres, leaving a clear space for the railway lines. On delivery at the works, the coal can be conveyed direct to the crushers and elevators for the vertical or inclined retorts. What cannot be stored in the supply hoppers above the retorts—and very often this is an appreciable quantity—is put into stock. On the other hand, when the supplies which come in are insufficient for the current make of gas, small trucks, filled with the shovel, are used in taking coal from stock. The quantities thus taken are weighed and registered by an automatic Avery weighing machine, which is operated by a 1/2-H.P. electric motor, and can deal with charges up to 600 kilos., and 30 tons per hour. The coal for the vertical retorts is placed at the top level of the coal

elevator. It is actuated by gravity, and is able to deal with the same quantity as that for the inclined retorts.

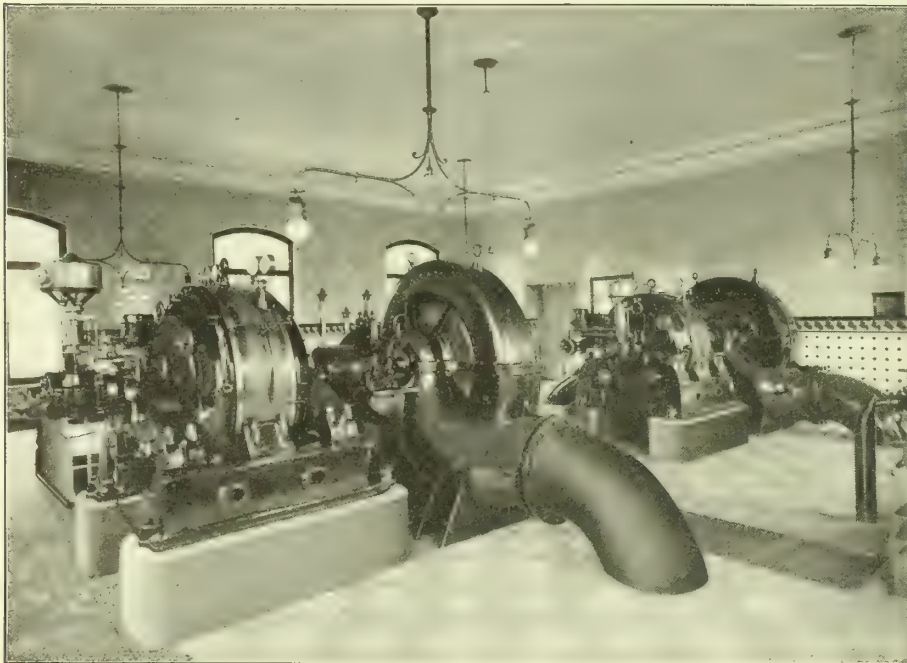
The coal employed is capable of rigid supervision (allowing of labour being on a piecework basis), which is an advantage in several respects, as coal from a variety of sources is distilled as mixtures of different compositions, which require to be somewhat carefully adjusted. The daily supply of coal does not allow of these mixtures being prepared, and therefore it is necessary almost every day to draw from stock.

INCLINED RETORTS.

Sixteen settings of inclined retorts are used, divided into two benches. The first was constructed in 1906; the second, which is exactly similar to the first, and forms a continuation of it, was put up in 1907. Both are placed in the same house. The charging floor, which is reached by a staircase, runs the length of the furnaces, and is considerably higher than the lower aris of the retorts below. This has the advantage that the retorts of all the three floors can be readily examined, and charging is more easily done, as is also the removal of the carbon. More-



Settings of Inclined Retorts—Discharging Stage.



The Compressing Plant.

over, the floor is kept clean, as it does not receive the coal which is bound to fall from the conveying vessels during charging. It falls on a gangway under the mouths of the lower retorts, and can be easily removed with the shovel. The length of the floor is well ventilated by openings. There is never the least steam or smoke. A staircase connects the charging floor with the discharging floor, access to which is obtained at any point, without disturbing the workmen, by a gangway on the outside, which is at the same level throughout the whole length of the building. A number of doors afford communication with the interior.

There are in each setting, 9 retorts each 5.5 metres in length, of the normal section and 600 by 400 mm. dimensions (maximum and minimum). The normal charge of each retort is 400 kilos. The average time of distillation is 7 hours 12 minutes, depending, however, on the quantity of coal and its nature. The mouth of the generator furnace (provided with a Morton seal) is above this level, so that the furnace can be fed directly with the coke coming in an incandescent state from the retorts.

The floor on which clinker is removed is on the ground level of the works—an advantage as regards getting rid of slag, &c. This latter operation presents no difficulties; the furnace being of stepped construction. During the process, the mass of incandescent coke is retained by a false grating, the bars of which are kept cool by circulation of water. The furnaces are worked with a very moderate amount of labour.

As has been stated, the coal after delivery and weighing is carried by a chain conveyor to the crusher, whence it is raised by a chain of buckets. The latter carry it to the upper part of the retort-house, after which it is handled by a horizontal conveyor which takes it to the storage bunker, of a capacity of 250 metric tons, running the length of the house, and erected on staging of the building. A gangway runs along the length of this bunker, and permits of the distributors, which are placed at equally distant points, being regulated. Charging is done by means of Drory apparatus. The charging hoppers for the retorts are filled from the hoppers arranged on the lower part of the coal bunker—two hoppers per furnace. The charging hoppers run upon rails fixed on the staging in front of the



The Coke-Sorting Plant, with the Inclined Retort-House on the Right.

retorts; and they can thus be readily moved from one end of the house to the other. Their capacity can be regulated; but it does not exceed that of one retort. If the conveyor breaks down, a steam-elevator can be used for raising the coal.

All the apparatus above described is operated by belts from a single steam-engine. A second engine is kept in reserve. Nevertheless, the horizontal conveyor placed above the coal bunker can be actuated directly by a steam-motor placed at the other end of the retort-house.

The coke produced falls into a conveyor of the De Brouwer type, which is on the level of the discharging stage. This conveyor is divided into two parts, each of which serves eight benches, and is fitted with its own motor—a steam-engine of 3-H.P. The two motors can thus work independently of each other. The conveyor carries its coke into another of the Merz type, which takes the charge to the plant for crushing and sorting the coke [described later]. It has been thought necessary to employ the Merz conveyor in consequence of the very considerable difference of level along the distance through which the coke is conveyed. The Merz apparatus is worked by a similar vertical steam-engine of 3-H.P. The whole of the steam plant employed for the inclined retorts is being replaced by electric motors.

The installation of inclined retorts has been completed by a mechanical sorting plant for the coke. This is composed of a separating cylinder which is provided with a bucket conveyor and formed by bars 1.5 c.m. apart, which riddle out the coarse from the fine. The former is carried on a band (40 c.m. in width) to be sorted. After passing through a small crusher, the coke is carried by a small bucket conveyor, and stacked up. Coke of good quality is produced. It sells well, and serves as a perfect fuel for the boilers.

COMPRESSING PLANT.

The area over which the gas is supplied being a very extensive one, the ordinary pressure is not sufficient, and therefore during the winter of 1908-9 exhausters worked by locomotive engines were temporarily put down; and, in spite of the essential difficulties of such an installation, they have been used without trouble. A permanent installation was, however, established in 1909; and it commenced work in October of that year. The gas is forced directly, at an increased pressure, into the distributing mains; the pressure being adjusted by one of the ordinary governors. The plant consists of two similar groups of turbo-compressors capable of supplying 24,000 cubic metres per hour when working at a speed of 3000 revolutions per minute. The pressure of gas (of density 0.5) is a metre above the normal. The compressor is a one-cell centrifugal pump as designed by Professor Rateau; the turbine motor being of the "Electra" type of

160-H.P., with an adjustable regulator. Each turbine is supplied with a Westinghouse-Leblanc condenser actuated by an electro-motor, or else by a 20-H.P. Laval turbine if electric current is not available. The consumption of power is thus very small. At full charge, the consumption of steam reaches about 0.9 kilo. per effective horse power. The installation calls for very little manual labour. One man can attend to the whole plant with ease. He first starts the turbine and its condenser with all the gas-valves closed. Then, when the working speed is attained (which is seen from the tachymeter on the turbine), the supply of gas is regulated by opening the requisite valves. The arrangement of the valves and of the gas-mains allows of the following adjustments: (1) Separate compression on one or more parts of the system; (2) separate compression from one gasholder into another; (3) operations Nos. 1 and 2 effected simultaneously without risk; (4) working of the two groups of compressors in parallel.

BYE-PRODUCTS.

As has been remarked, on its removal from the retorts the coke is taken to the crushing and sorting plant; but it may also be conveyed into bunkers holding about 150 metric tons, of which there are two—one for the inclined and the other for the vertical retorts. These bunkers are kept for several purposes, the chief of which are: (1) Complete separation of the two cokes. This is of importance, as the coke from the vertical retorts has special qualities. (2) Relief of the crushing and separating plant by provision of storage for the coke made during the night or any which exceeds the capacity of the plant. (3) Facilities for charging being done direct from the large coke-waggons, owing to the discharging table which is placed under the hopper of the bunker. Everything reaching the discharging stage passes into an excavation, from which it is carried by a vertical elevator to the crushing plant. This latter, which can be dispensed with if there is no pressing need of sorted coke, scatters the coke on a large table provided with perforated wrought-iron plates.

The coke then falls into one or other of the following categories: (1) Dust; (2) breeze; (3) No. "0"; (4) No. "1"; (5) No. "2"; (6) coarse. The sorted coke goes into separate bunkers of a capacity of from 1500 to 3000 hectolitres, provided on the sides and at the lower part with discharge hoppers by which carts can be loaded or even bags containing one hectolitre of coke delivered for retail sale. In the latter case, the coke is measured by means of a vessel gauged to contain a hectolitre. These bunkers are also provided with special openings, from which can be supplied small trucks traversing the gangways and conveying any coke in excess to the stock to which it properly belongs, or the trucks can supply coke when the demand exceeds the production.

(To be continued.)

SOME IMPRESSIONS OF A TOUR.

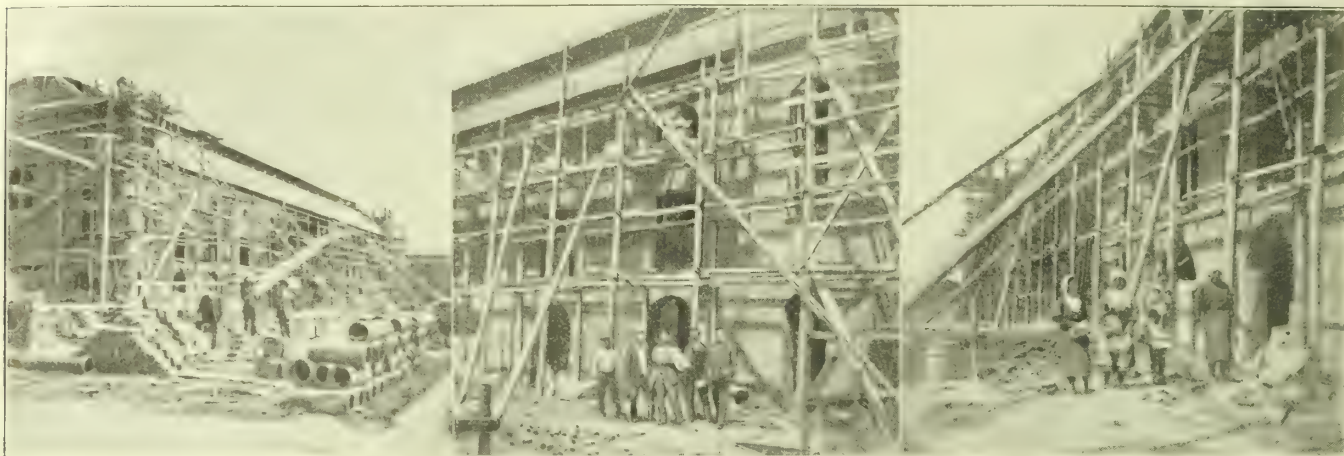
WHILE not, of course, in any way claiming to have made a record for quick travelling, which was not the object with which he set out on his journey, Mr. Charles Bland, of the Bland Light Syndicate, informed a "JOURNAL" representative who called upon him a few days since that he had just returned from a trip round the world which—including both intentional and involuntary stoppages—had been performed in a time that would certainly have astonished M. Jules Verne when he was writing his exciting book "Round the World in Eighty Days." In making the circuit of the earth, Mr. Bland was absent from England 53 days, during which time he travelled nearly 19,000 miles—19½ days being spent in railway trains, and 21 days on board ship. These figures are rather interesting, as giving some indication of what, even with short stoppages, can be accomplished by those in a hurry—and who is not?—under modern conditions of travel. That Mr. Bland, being a man of observation and a man of business, has profited personally by his tour, we have not the slightest doubt. Wide travel must be good for everybody; but for Englishmen it usually possesses the additional advantage of still further increasing their appreciation of their own country. Mr. Bland's absence, short though it was in point of time, was long enough to have this effect upon him. Just what he has seen and what he has done while away, were unfolded in the course of an interview; and to anyone who may think that to "go and do likewise" would be a good way of spending a summer vacation, the following brief outline of Mr. Bland's remarks should be of use, while to others let us hope they will prove of interest.

Starting from Charing Cross on Monday, April 25, and travelling straight through, *via* Ostend, Brussels, Berlin, and Warsaw, Moscow was duly reached; and from this point, after a halt of an hour or two, began the long journey on the Trans-Siberian Railway to Vladivostok. The numberless villages which were passed gave the impression—which no doubt was a perfectly correct one—that the peasants are very poor. At every stopping station the passengers were beset by beggars, mostly clad in filthy rags. Roads there are conspicuous by their absence. Crossing over the Ural Mountains, some magnificent views were obtained; and a fifty-minute stop at Tcheliabinsk, afforded an opportunity of visiting the town and one of the churches. In this part of the world, every effort is made to prevent the taking of photographs; and should an enthusiast find it impossible to refrain, he must either

bribe the police or bring his camera into action when their backs are turned. Omsk, the Capital of Siberia, was the next important place reached; and here Mr. Bland had to part with one of his travelling companions, who, curiously enough, was visiting that town with the object of securing a contract of the value of over a million pounds sterling, for putting down sewage works, paving streets, and erecting gas and electricity works. It seems that there is a lot of money at Omsk; and apparently it is in a very thriving condition, as the land round there is owned by wealthy Russians who were at one time exiled from their country. From Omsk, the country for a thousand miles or so was of a flat and swampy nature; but the tedium of this part of the journey was relieved by the excellence of the railway arrangements. The train was run by the Wagons-Lits Company; the rolling-stock being precisely the same as that which is familiar to travellers in Europe. Subsequently, the country gradually improved, and beautiful scenery was passed through—very similar to that which is encountered east of Winnipeg. At Lake Baikal, there was a change of trains. The lake was covered with ice; and later when Boisa, on the borders of Mongolia, was reached, it was snowing hard, and news was received that a snow block had taken place 15 miles ahead. Such an event was unheard of at that time of the year (May 5); and the railway authorities were consequently quite unprepared for it. However, 400 or 500 men were put to work; and ultimately this obstacle was removed, and the train proceeded on its way, after a delay of 36 hours.

The travellers reached Vladivostok early in the morning of May 9, only to find that, in consequence of the stoppage at Boisa, they had missed the steamer connection to Tsuruga, in Japan, and would have to wait four days for the next boat. Vladivostok, which is beautifully situated in a fine harbour, is, of course, a town under military law. Except for walking up and down the main street, there is nothing to be done there; the only amusement offered being a few cinematograph shows. Even the selling of photographs and picture postcards is prohibited. However, the time was whiled away somehow, and Vladivostok was left on May 12—the s.s. "Raizan" having a smooth passage to Tsuruga, which was reached two days later.

While in Japan, Mr. Bland visited a number of towns; though he had to curtail his stay, in consequence of the unfortunate delay which had taken place at Vladivostok. Hospitality was everywhere extended to the visitor, who, of course, inspected all the



Kyoto Gas-Works in Course of Erection.

gas-works he could, and found them apparently in a very flourishing condition, in spite of the competition of electricity. Everywhere modern machinery and appliances were to be seen; and the works are run entirely by Japanese engineers, who keep in touch with European methods by carefully studying the technical papers. They displayed the utmost keenness to learn everything possible with regard to what was going on, and what new appliances were being placed upon the market.

The three illustrations are photographs of buildings in course of erection in connection with a gas-works for Kyoto. In the "JOURNAL" for Nov. 24, 1908 (p. 558), there appeared—in connection with the series of articles "Round the World—and Some Gas-Works"—a photograph of the street-lighting arrangements at Kyoto, which was at that time carried out solely by means of Japanese lanterns; and it was stated by Mr. Maurice Graham that, though Kyoto had a population of 500,000, there were no gas-works there. It was, he added, said that a Company had had a concession for over two years for gas lighting; but unfortunately the financial depression in the country had delayed matters. The gas-works now being put up—which it is hoped will be completed by the end of the year—will doubtless soon result in an alteration of the primitive street lighting then in vogue. Electricity has for some time been installed in the town; but, in spite of this, confidence is expressed that gas will be able to fairly hold its own, as the Japanese are rapidly learning the advantages to be derived from cooking and heating by gas. Kyoto, which is a very interesting place, was originally, it may be mentioned, the Capital of Japan. It was the home of Buddhism; and there are many ancient temples to be seen there—some of them at least 1200 years old. Referring to Japan generally, Mr. Bland emphatically maintains that the country and people have been in no way over-rated. The men are keen and business-like; the women most charming; and the country lovely. The treaty ports—such as Kobe, Yokohama, and Tokio—are, of course, very much European. There are large houses and shops; and the

Japanese in these towns have generally adopted European dress. But in the inland towns, all the quaint and interesting Japanese customs still prevail. So pleased was Mr. Bland with his reception in the Island, that he wishes to make special acknowledgment of his indebtedness to the Engineers and other officials of the various gas-works visited, and to express his great appreciation of the kindness that was everywhere, and in every possible manner, extended to him.

To resume the story of the travel. "Good-bye" was said to Yokohama on May 24, when the Canadian Pacific mail steamer "Empress of India" was boarded. The sea was calm, but the weather most unpleasant. The northerly route taken was an extremely cold one. In fact, for seven days the sun was not seen; and when eventually it did show itself for a few minutes, and observations could be taken, it was found that the ship was further north than had been expected. Pleasure was manifested when the fine harbour of Vancouver was reached. Only two hours were spent there; but even this short time was sufficient to give one the impression that very great prosperity prevailed. The town was all hurry and bustle—thus indicating that there was a lot of business doing. The Canadian Pacific Railway was next joined, *en route* for Montreal. First there was to be enjoyed the beautiful scenery of the Rockies; and afterwards the fertile plains of Western Canada were crossed, where towns spring up like magic. Over a journey of 900 miles, the development of farm life could be fully studied; and though the country is, of course, quite flat, there was much interest in the "life" to be seen. Montreal was reached on June 9, and the same evening the R.M.S.S. "Virginian" (of the Allan Line) was boarded. The weather was beautiful, and the run down the St. Lawrence most enjoyable. Again the northerly route was taken through the Straits of Belle Isle; and any number of icebergs were encountered—an appropriate circumstance, in view of the fact that among the passengers was Sir Ernest Shackleton. After an otherwise uneventful voyage, Liverpool was safely reached on June 17.

THE INSPECTION OF FACTORIES.

THERE was recently issued as a Blue-Book the report for 1909 of the Chief Inspector of Factories and Workshops (Dr. Arthur Whitelegge, C.B.), which, as usual, contains references to some matters in which readers of the "JOURNAL" are interested.

Before turning to the divisional reports, which are summarized by Mr. H. M. Robinson, it may be mentioned that Dr. Whitelegge himself has something to say with regard to the efficient lighting of factories. This is a subject, it seems, which has hitherto been carefully looked after abroad. There are in Holland especially some strict rules in force. The employment of women and young persons is forbidden in works in which artificial lighting is required (in the absence of exceptional meteorological conditions) between the hours of 9 a.m. and 3 p.m. In addition to this, there is the requirement of a definite standard of illumination for certain processes—15 bougies-metres (about 1.5 candle-feet) for embroidery, working in precious stones and gold and silver, the engraving of metal and wood, the manufacture of scientific instruments, printing, mechanical knitting and quilting, sewing, draughtmanship, and the repairing of clocks and watches; and 10 bougies-metres (about 1 candle-foot) in other industries in which a strong light is especially important. In the Belgian code, there is a converse provision, which requires that the operatives shall be protected from glare. He admits that the question of standards is beset by many difficulties, at present only imperfectly investigated; and that, in the absence of a standard, a broad requirement of adequate lighting is only a half-measure. Even as regards daylight, it is pointed out, there is no constancy in the illumination of a whole room; and there are many things that have to be taken into account. Then with artificial light other considerations arise, apart from contamination of air by all except electric light and ventilated gas-burners—namely, the quality of the light and the intensity of the source from which it is radiated. It appears,

says Dr. Whitelegge, that artificial light in which the rays from the violet (actinic) end of the spectrum predominate, may on that account be less efficient, at all events for certain kinds of work, and that radiation from a small but intensely luminous source, such as an unshaded electric light, may be more trying to the sight, and hence less effective, than the same amount of light diffused from a larger surface. He adds that the subject as affecting industrial employment is not one which admits of settlement by a stroke of the pen; and close investigation of the conditions will be necessary. As a beginning, Mr. D. R. Wilson, one of the Inspectors, has been directed to inquire into the present lighting of certain classes of work-rooms, beginning with underground bakehouses in London.

Turning to the summary of sectional reports, it is found that most of the staff again comment on the greater use in factories of suction gas or electricity as a motive power; and one Inspector estimates that the electrical energy generated for this purpose has increased by 100,000 H.P. as compared with 1908. All the reports speak of the attention given to the proper ventilation of suction-gas plants. A memorandum issued from the central office, pointing out the dangers to be guarded against, and the precautions to be adopted, has been widely circulated. Several cases of poisoning were noted. Another Inspector describes a curious case caused by the discharge of the engine-exhaust into a passage in which carts stood while being loaded at the factory. Eight horses were affected by the fumes, and died. One official mentions that inquiry into the manufacture of incandescent mantles disclosed unpleasant effects on the workers from the vapour arising from the baths in which the mantles are dipped, and from excess of carbon dioxide generated in the process of seasoning. Exhaust ventilation has had beneficial results.

Flueless gas-stoves are dealt with by several of the Inspectors. Mr. A. P. Vaughan, of the South-Eastern Division, says there are still found cases where the crude means of warming by open coke-fires in buckets or by ordinary gas-jets are used, and have to be prohibited. Between the two extremes of highly satisfactory and highly unsatisfactory methods of warming, come flueless gas-

stoves and hot-water radiators with unventilated gas-burners beneath. These have been noticed in many places; and, he says, however effective they may be in securing a "reasonable temperature," they raise the question as to whether they do not interfere with the purity of the air. Mr. A. Lewis, of the South-Western Division, points out that each of the Inspectors has a word to say on the troublesome flueless stove and radiator; and the consensus of opinion expressed is against the use of them as heating agents. The experience of occupiers also tends to uphold the same view; and for this reason the use of the stoves and radiators has been voluntarily discontinued in favour of other means of heating. Mr. J. H. Walmsley, of the Midland Division, also referring to flueless gas-stoves, remarks that the attention of occupiers has been called to the necessity for preventing fumes escaping into the workrooms; and much has been done to make things satisfactory. Mr. J. A. Hine, of the North-Eastern Division, reports that Mr. Younger, of the Halifax District, had an air sample taken in a small work-room warmed by means of a flueless stove; and it showed 47·8 parts of carbonic acid per 10,000. Another sample, after the stove had been replaced by another gas-stove fitted with a flue, contained 18·2 parts only of carbonic acid, not in itself a good result, but an illustration of the extent to which the air was polluted by the flueless stove. Mr. Dunolly, of the Stockton District, remarks that the fumes generated from all gas-stoves are heavier than air at the same temperature. They rise solely by reason of their being at first hotter than the surrounding air; and as soon as they enter a long, narrow flue, they readily lose heat and form a complete stoppage to any further passage of the fumes up the flue. A short, wide flue for all gas-stoves is therefore essential. Mr. Butler, of the Huddersfield District, notes that it is very unusual to find any gas or oil stoves used for regulating temperature without flues for carrying away the exhaust. Occasionally in tailors' work-rooms a gas-stove used for the heating of irons is found to be unventilated; and as such stoves are a factor in maintaining the temperature of the room, he has required ventilation, either by inserting them in an open fireplace or providing special flues. Water-radiators with a small gas-jet are not employed at all. Whatever use they may be in ordinary sale rooms, offices, &c., he has found that they are quite inadequate for the heating of work-rooms. Mr. R. E. Graves, of the Northern Division, remarks that, in spite of all that has been written and said by Inspectors on the use of flueless gas-stoves and radiators, they continue to be increasingly employed. In large rooms not very fully populated, and provided with sufficient natural outlets, the objections are not so great; but in small rooms, where windows and doors are the only means of ventilation, such contrivances cannot but be injurious; and he invariably requires ample ventilation. Many samples have been taken to test the conditions; and in almost every case a very high percentage of carbonic acid has been found in conjunction with flueless stoves. Miss Slocock, one of the Lady Inspectors, says that gas-stoves are being utilized more and more as a means of warming; and with a good flue fitted straight into the chimney, they seem to answer well, and to have no unpleasant effects, beyond making the air of the room very dry. But fitted with flues with many right-angled turns, they are not so satisfactory; and without flues they vitiate the atmosphere. "Electric radiators for heating would appear to be the solution of the difficulty in rooms where a flue is impossible;" but she is "still informed that the cost is prohibitive."

There is reported by Mr. Bremner Davis, of the Kent District, a case with one fatal result which occurred during the year in connection with a water-gas plant recently installed in a gas works.

The wrought-iron duct leading from the blowing fans to the generator was shattered; and the man was struck by pieces of it. The case is important as indicating a danger probably existing in many similar plants; and which might be better guarded against than it generally is. The operator's evidence showed that the plant pressure had been tending to be high during the day; but while he knew there was a little, he did not consider that serious blocking of the scrubber was taking place. After the explosion, however, it was found that there had been a block there; and this necessarily meant that the pressure must have risen considerably, and possibly in quite a short interval. Unfortunately, the operator did not realize the danger of this, and was not certain that he had looked at the generator gauges just before he opened the blast-valve in the usual course. Immediately it was opened, the explosion occurred in the blast-duct.

Gas can get into this only in two ways—either by leakage past the valve faces when the valve is closed, or by overcoming and forcing back the blast-pressure when the valve is opened; and this can happen only if the pressure on the generator side is greater than that of the blast. In this instance, leakage past the closed valve can be excluded. The valves are of excellent design and construction, with double faces and a powerful wedge action for sealing them. It was proved that the faces were not corroded. Above all, however, the space between the two faces is ventilated to the open air. Even if both faces did leak—in itself excessively improbable with an uncorroded valve—the vent prevented any gas getting back against the blast-pressure into the duct. It is therefore practically certain that, when the valve was opened, a back-rush of gas took place by reason of the high pressure. This formed an explosive mixture with the air; and the red-hot generator ignited it. I happened to be almost an eye-witness, as I was close to the place at the time, and so had an unusual opportunity of first-hand information.

Since then I have visited many water-gas plants, and have found present, in many of them, some or all of the following sources of danger whose existence might lead to a similar explosion: No separate pressure-gauge on the blast-pipe side of the blast-valve, or one placed some dis-

tance from the other gauges, so that comparison between them is awkward and likely to be omitted by the operator. They should be close together on the same scale and level, so that the difference between their levels is patent to the eye. Those in charge have not realized that it is essential to safety that these two gauges in particular should be observed and compared by the operator immediately before the blast-valve is opened on every occasion. This, with properly placed gauges, occupies only a fraction of a second. The usual large relief opening was provided in the ducts in the case in point; and unfortunately the idea is widespread that explosions are thereby rendered of small moment. This was effectually disproved by the accident in question; and it is no more to be expected that thin steel duct of large diameter should be kept from fracture by relief openings, than a gun barrel would be by its opening to the barrel, were its metal proportionately thin. Practically no gun construction yet evolved will stand really high explosives; and yet there is a free opening of the barrel. The explanation, well enough known to those concerned, need not be mentioned here.

Interlocking gear in other parts of the apparatus is fitted by some makers, in order to prevent incorrect relative movement of different valves; and it acts excellently. To prevent this wrong opening of the blast-valve, however, while interlocking gear is not impossible, it would be complex, and perhaps be apt to get out of order. It could be done by a differential mechanism operated by pistons or diaphragms connected with each of the two pressures; or by an electrical make-and-break within the glass of a differential gauge with a relay and electro-magnetic or even weight or spring actuated locking mechanism.

Water-gas operators are usually intelligent and reliable men; and if they are made to realize the point, and provided with the simple appliances before named, there would be reasonably adequate protection against explosion from the cause in point.

Among the other accidents (which include more than one acetylene explosion), the following case is reported from the Swansea District. An explosion occurred at an oil-gas works where the gas is produced as the result of the destructive distillation of crude petroleum oils. The products of decomposition in these cases are all of a highly inflammable and dangerous nature. In this particular instance, a woman had taken her child to the gas-works to inhale the fumes from the oil gas as a cure for whooping cough. While they were standing near the tank in which the liquid portions of the distillate condense, there was a sudden flash, and they were enveloped in flames; the woman being immediately burnt to death, and the child dying two days after. The explosion was probably caused by the volatile liquid in the tank evaporating and the resulting vapour gradually creeping outwards to a railway track just outside. A heavy train was being spragged on the siding; and the friction between the wheels and rails caused a spark which fired the vapour. Several of the Birmingham Inspectors report explosions, some of which have occurred at enamelling stoves. Attention has been drawn to the possibility of explosion through the employment of naked gas-lights in near proximity to the doors of enamelling stoves heated by bunsen burners, which are usually arranged in rows near the floor of the stove. Accidents have also been caused by the extinction of the bunsens, possibly by a sudden draught when closing the doors, and the subsequent ignition of the accumulated gas when the doors of the stove were re-opened. An explosion occurred in the crank-chamber of a large four-cylinder vertical gas-engine, with the result that the cover of the two-to-one gear was blown off. It is impossible for gas to get into this chamber. All the bearings are lubricated by means of a system of forced lubrication, the oil being forced by means of a pump through tubes and channels to each bearing. That forced to the crank-shaft and crank-bearings escapes into the crank-chamber, whence it flows to the sump, from which it is again pumped. The crank-chamber becomes heated to a fair temperature, and the revolution of the cranks causes a large amount of splashing; so that the atmosphere of the chamber is full of oil vapour caused by spraying principally. Ordinarily, there is no possibility of the mixture of air and oil vapour becoming ignited; but in this case the hollow piston galled and heated to such an extent that oxidation of the metal resulted. This, of course, implies that a very high temperature was reached; and it is assumed that this ignited the explosive mixture. Ventilation of the crank-chamber is provided by means of two pipes—one admitting air, a second, at the other end of a chamber, allowing of its escape. From this second pipe, vapour was issuing in the case of another similar engine at the time of the visit. A like explosion is said to have happened at another factory. There are, it is stated, still grounds for complaint with regard to the unsatisfactory methods of fencing gas-engine fly-wheels. An instance is given of an accident (which resulted fatally) to a workman while engaged in taking out the piston of a gas-engine. The supply of gas was shut off at the principal valve, and the engine allowed to run itself to a stand. The man then uncoupled the connecting-rod, and, holding it in his hands, called for the crank to be turned into a new position. While this was being done, and owing to the electrical ignition device not having been disconnected, some gas lurking in the end of the cylinder was fired, which, all resistance having been removed, blew the connecting-rod with great force against him. Attention of gas-engine attendants at these works is now, by notice affixed on the engine, drawn to the dangers resulting from not disconnecting the ignition device.

Mr. Jackson, of the Liverpool District, draws attention to the fact that many accidents are due to carelessness; and he suggests as a remedy the adoption of such a scheme as is in force in a very large works in his district. Briefly the scheme is this: The works are divided into departments, and each department has its own divisional committee, elected annually, half the members of which

are workmen and half are foremen, with the head of the department as chairman. Their duties consist of (1) considering and reporting upon any suggestions that may be made to them for improvements in their department, either as to manufacture or better fencing, or safer modes of working; (2) to see the rules of the works are properly carried out, and to prevent waste or irregularities; (3) to investigate all accidents reported, and to ascertain the cause, and say if anyone is to blame; (4) to hear appeals from employees with regard to dismissal, &c. They also make a quarterly inspection of the machinery and plant used in their department, and report if fencing, &c., has been properly maintained. Their reports are considered by the managing-director and his colleagues; and their recommendations, if approved, are adopted. In regard to accidents, their finding is posted up in the department concerned; and it is found to be an excellent check on carelessness, for no worker likes to be posted. As a result of this scheme, the works are a model of fencing and efficiency in working. In 1909, only 86 reportable accidents occurred, with 436½ persons employed, or less than 2 per cent. Of these, one was fatal, none were classed as severe, and only six as moderately severe.

The danger of poisoning by carbonic oxide, which is particularly associated with the manufacture and use of suction gas, producer gas, and water and other power gases is better known and appreciated, says Mr. Vaughan. In country parts, the gas plant is usually placed in the open air outside the factory; but in towns, and in London especially, it is more often in some confined space. The question of ventilation has here become important, and in the case of newer gas plants has been satisfactorily dealt with; the engine-houses being well ventilated to the open air, and the air-intake for the engine being, in many instances, arranged from the outside, instead of from the engine-house itself. One firm have devised a simple arrangement for detecting gas leakage. The gas-cylinder is fixed, and a small cup containing water is screwed on to the valve, which is placed uppermost, so that the bubbles of any escaping gas could be seen, and an empty cylinder at the critical moment be presented. Mr. Lewis says the rapid growth in the use of producer gas for power points to the advisability of urging the makers of various plants to see, at the time of installation, that the rooms where they are fixed (often in basements) are suitably ventilated. Every endeavour is made by the Inspectors generally to impress upon those in charge of these plants the dangerous nature of the gas, the personal precautions necessary, and the importance of taking steps to prevent the diffusion of the gas into the engine-house and other parts of the works. Mr. Walmsley points out that part of the Walsall district is within the area of the Mond Gas Company's undertaking. No complaints have been received of any excess of carbon monoxide, which is limited by the Company's Act to 14 per cent., while the gas certainly possesses "a distinctive and readily perceptible smell," which is also stipulated in the same Act. Mr. Rogers, of the Birmingham District, says, with regard to carbonic oxide poisoning: The only case of any moment that came to our notice last year was that of the occupier of a small factory who was found dead on the floor of his gas-engine room. The gas-pipe from the town supply, which contained some carburetted water gas, was found disconnected, with the gas on. The post-mortem examination disclosed signs of carbonic oxide poisoning. Several cases of defective air-intake and of badly-ventilated gas-engine rooms have been dealt with. In one case it was urged that producer gas used for heating stoves should be given a distinctive and easily perceptible smell. In another factory, the waste-pipe for blowing off the gas when starting the suction-gas producer was found discharging into the air of the work-room, 14 feet above the floor. This pipe was continued to the open air. Special attention throughout the division has been given to the ventilation of engine-houses where water gas and similar gases (suction gas, Dowson gas, Mond gas, &c.) are used. In many cases the air intake to the engine-house has been removed from the inside to the outside, and additional ventilation provided. From Huddersfield there are reported two cases of carbonic oxide poisoning—one from an ordinary escape of gas, and the other in connection with a suction-gas plant. One Inspector remarks upon the carelessness and risk run by some attendants at producer-gas plants. In the Liverpool District, Mr. Jackson says that much time has been given to the ventilation of suction-gas plants; and considerable help has been received from manufacturers and their architects (as well as from the makers), who have consulted him as to what ventilation was required. They have been told that mechanical ventilation would be insisted upon, if the plant was put in a basement.

Under the heading of sanitation, Mr. G. Bellhouse, of the North Western Division, gives a record of air samples, and to them appends the following note: The returns indicate a good standard of ventilation; and it is specially interesting to note the results obtained in gassing rooms, where a high proportion of carbonic acid might be expected from the gas-jets. As a fact, however, no sample showed a proportion higher than 14.5 parts per 10,000; and one Inspector quotes a case where it was only 3.3. Another Inspector similarly reports satisfactory results being obtained from ironing rooms in laundries, which varied from 4.0 to 6.5 parts per 10,000. The worst results were obtained in tailoring and dress-making workshops; and may be attributed to either unsuitable means of heating or to the means of ventilation not being properly applied. As an example, an Inspector quotes a case where in the first instance the analysis showed a proportion of

59.9 per 10,000. The room was heated by a flueless, gas-heated radiator. This was removed, and a stove with a flue was fixed in its place. A further analysis then showed that the proportion had been reduced to 17.4. A Lady Inspector says: One of the industries in which excessive temperatures are most constantly found is that of incandescent gas-mantle making. In the burning-off and seasoning departments of those visited, where the heat is very great and the distribution of the plant makes control of it difficult, a good deal has been done to minimize this by special ventilation, but with only partial success. None of those I have visited were built for an industry of this kind; and the difficulty of unsuitable premises is naturally great where there are processes or material requiring unusual conditions.

Mr. Lewis remarks that a matter respecting which all doubt appears now to have been removed is the necessity for connecting the fume-pipes of all gas-ironing machines in laundries with an efficient fan exhausting into the open air. The Inspector for Plymouth makes mention of workrooms wherein he found large burners for heating irons without any means provided for taking away the fumes. They were generally placed in front of a fireplace, because the occupiers thought the fumes would pass up the chimney. The effect, however, was the opposite. The heat of the irons rose in front of the fireplace, and caused the air of the room to be hotter than the air in the chimney; and the fumes were therefore carried across the room. Mr. Walmsley reports improvement generally in the use of gas-irons in laundries. Mr. Nicholl, of the Lincoln District, says the manager of one laundry pointed out an improvement he had made in his ironing room. Gas-heated hand irons had been removed, and were replaced by ordinary irons heated on gas-stoves of his own invention, placed at arm's length in front of the workers—not only removing the combustion products from under the workers' heads, but making it possible to fix hoods and ducts to remove the fumes.

An Inspector in the Leeds District observes that it was noted, on visiting a small gas-works in a country town, that the smoke-stack was over a foot from the perpendicular, and seemed likely to fall; the wall behind the retorts was slipping away from the roof; a roof principal was broken and propped up by 2 feet of plank placed on end on the top of the not too strong hollow brick-work forming the flues; and the purifiers were in an unventilated outhouse, and leaked badly. The company were requested to undertake repairs promptly, which they did. New works are, it is pointed out, now in course of erection.

In the report of the Medical Inspector (Dr. T. M. Legge), the following statement by Dr. Collis on the subject of the manufacture of incandescent mantles is quoted: Four factories where incandescent gas-mantles are manufactured have been visited, to ascertain whether under the present conditions of work any injury is caused to the workers (1) by vapour arising from the baths in which the mantles are dipped; (2) excess of carbon dioxide generated in the process of seasoning or burning. The dipping-baths contain a mixture of methylated ether (industrial spirit) 60 per cent., and methylated spirit 30 per cent., in which is dissolved collodion and camphor. The vapour arising from this mixture, if breathed to any extent by the workers, causes headache, sickness, anorexia, sleepiness, and lassitude—symptoms which are experienced to a greater extent on first commencing employment. At one factory, where the workers had to enter the hot stoves, heated to about 115° Fahr., to carry in mantles for drying, and to remove the dried mantles, all seven workers complained of some of the symptoms described. These stoves have since been reconstructed, with beneficial results. Suitable hoods and exhaust ducts, minimizing the amount of vapour which escapes, can be fixed over the dipping-baths.

In the process of seasoning or burning-off, carbon dioxide is given off by the large number of bunsen burner jets employed. In one room there were about 640 jets in use for 80 workers. The products of combustion are removed by localized exhaust in only two of the factories visited. Consequently, the amount of carbon dioxide found in these rooms becomes excessive, even though there is good general ventilation effected by means of adequate exhaust fans.

Action of Air on Coal.—In a recent number of the "Comptes Rendus," M. Mahler dealt with this subject. According to an abstract of his communication contained in the "Journal of the Society of Chemical Industry," on passing a current of dried and purified air over finely powdered dried coal (different samples of French coals) at temperatures up to 105° C., water, carbon dioxide, and carbon monoxide were produced; the quantities increasing in general with the temperature, but varying according to the state of division of the coal and the velocity of the air current. For example, 150 grammes of a coal from Courrières yielded in 30 hours the following quantities of carbon dioxide and monoxide respectively at the temperatures mentioned: 25° to 30° C., 1 c.c., 2.88 c.c.; 45° C., 1.55 c.c., 3.73 c.c.; 65° C., 4.25 c.c., 5.59 c.c.; 85° C., 12 c.c., 4.97 c.c.; 105° C., 30 c.c., 6.67 c.c. When the coal was not first dried, the production of carbon monoxide was much smaller—viz., 1.13 c.c. in 30 hours at 35° C. Experiments were also made under similar conditions at higher temperatures; and it was found that above 125° C. there was a considerable increase in the amounts of water, carbon dioxide, and carbon monoxide produced, while indications were also obtained of the formation of hydrocarbons. Above 150° C., the condensed water was distinctly acid, and had an acetic odour.

EXAMINATION IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

THE City and Guilds Examinations for the third year in "Gas Supply" have now been completed, and the list of successful candidates issued. Although the results have been communicated to the local centres, the City and Guilds of London Institute has, as already mentioned in the "JOURNAL," so far withheld them from the Technical Press. This proceeding must be much regretted by all who have the true interests of the courses in "Gas Engineering" and "Gas Supply" at heart. The Technical Press, by the publicity given in its columns to the examination courses has, we venture to think, been a greater factor in bringing these examinations before the notice of the young men of the industry than the mere announcement of them in the programme of the City and Guilds of London Institute. These programmes are only supplied, as a rule, to the Secretaries of the Technical Institutes and to the Press. The Secretaries of the Institutes cannot be expected to have that special interest in one particular course which editors of journals devoted to the industry which that special course represents have; and therefore, for popularizing the examinations, the editors' influence must be considered as greater than the secretarial influence. While the latter is commendable so far as it goes, there does not appear to be any sound reason why the editors' sympathy should be alienated from the course. Each year they allowed to be published the syllabus which governs the examinations, and also extracts from the annual report of the City and Guilds of London Institute. It may at once be conceded that the publication of the pass list is an act of grace on the part of the City and Guilds officials; but it is an act of grace that conduces to mutual goodwill, and is certainly not to the disadvantage of the best interests of the examinations which concern the gas industry. The Council of the Institution is an Advisory Committee in connection with the examinations, and no doubt may be relied on to consider carefully the *pros* and *cons* of publication. Meanwhile, we quite hope that it will not be necessary for them to discuss this subject at all, but that the City and Guilds authorities will realize that the little extra trouble involved in the preparation of pass lists for technical journals is a practice that may be continued with advantage to the objects for which it was instituted.

We are able to ascertain from the report of the Council of the Institution that the number of candidates who sat this year in "Gas Supply" totalled 310. Of these, 93 were candidates in the Honours Grade—an increase of 12; and 217 were candidates in the Ordinary Grade—a decrease of 18. It would seem, therefore, that the annual number of candidates is settling down at the round figure of 300. This does not appear to be as many as might be expected, considering the enormous number of distribution employees who should have an all-round knowledge of most, if not all, of the matters enumerated in the syllabus. The City and Guilds certificate should be, as far as possible, a reliable indication of efficient training and study in this branch of gas technics; and if the character of the papers or the regulations governing the examination do not ensure this, the scheme should be modified accordingly.

At the last meeting of the Manchester District Institution of Gas Engineers, a proposal was put forward for the better training and education of gas-fitters. This matter was also dealt with at

some length by the President of the Institution of Gas Engineers (Mr. J. W. Helps) in his recent address. The desirability of such an extension of systematic training was accentuated by the discussion on the report of the Gas-Heating Research Committee. In this discussion, it was clearly held, both by the research specialist, Mr. E. W. Smith, by gas engineers, and by makers of gas-fires, that the competence of the gas-fitter was an important factor in the success or otherwise of gas-heating appliances as installed at consumers' premises. Schemes for the better education of gas-fitters, however, should not in any way be inimical to the City and Guilds examinations in "Gas Supply." If certificates of proficiency are to be awarded to gas-fitters, the City and Guilds of London Institute is the proper authority for making such awards. For a long number of years this Institution has been recognized as the leading body for the conducting of technological examinations. The better training of gas-fitters was one of the subjects put down for discussion at the combined meeting of the Commercial Sections which was held at the Institution of Mechanical Engineers on Tuesday, June 14. Owing to the length of the other business, however, consideration of the matter by the Joint Sections was deferred for twelve months. We do not see exactly what point there is in this subject that gives the Commercial Sections any special claim to consider it as distinct from the general body of members of the Institution, or their accredited representatives, to wit, the Council. It has been pointed out that the Council are an Advisory Committee in connection with the existing examinations; and if any modification in training is desired or required, the Council is the proper authority to consider the matter in all its bearings.

An examination for gas-fitters might very well be made a preliminary (though not compulsory) course to the Ordinary Grade in "Gas Supply." The gas-fitter, having secured the preliminary fitter's diploma, would probably feel encouraged to continue his studies. Having acquired the habit of systematic training and study, it would not then appear so difficult to tackle the two courses in "Gas Supply" as at present. Unless there is greater evidence of study on the part of distribution employees than is shown by the number presenting themselves for examination, the industry cannot look forward too confidently to the keener fight which will be waged for light, heat, and power custom. A larger number of competent teachers should be available; and the heads of gas undertakings in the Provinces should emulate the example of Metropolitan and Suburban heads, who realize the importance of having an educated outside staff.

In this year's examinations, the candidates in "Gas Supply" had, as formerly, the choice of 14 questions in each grade, and of these not more than eight were to be answered. The marks awarded to the questions were modified somewhat as compared with previous years; for whereas formerly the questions had respectively a value of 36 or 39 marks, this year the marking varied from 30 to 45. In the Ordinary Grade, there was one question for which 45 marks were obtainable; and this was one to rightly answer which practical experience was almost absolutely essential. A similar remark may be applied to the two questions for which 42 marks were allowed. Generally speaking, the questions which were marked lowest were such as involved the minimum amount of practical experience.

Ordinary Grade Questions.

1. (A) Describe one form of leakage indicator suitable for locating escapes from gas-mains. A gas-main, 200 yards long, supplies 50 consumers, and is connected to the distributing system at both ends; how would you ascertain the amount of leakage (if any) from same?

Ansell's Leakage Indicator.—This instrument depends for its action upon the law of diffusion of gases, which is, "that gases diffuse at a rate inversely proportional to the square roots of their densities." The instrument is circular in form, about 6 inches high by 3 inches in diameter. The means by which the principle of diffusion is applied is an elastic metal chamber, at the base of which is a porous tile, through which the diffusion takes place. When the indicator is placed in an atmosphere containing coal gas, the hydrogen of the latter diffuses through the porous tile into the elastic metal chamber quicker than the nitrogen of the air can pass out; the velocities being in the proportion of 1 to 14. A pressure is caused in the metal chamber, and the movement of the elastic metal is transmitted by suitable mechanism to an index pointer, which moves over a dial marked to show percentage of gas present. A tap and valve are provided which communicate with the metal chamber, so that the coal gas may be let out after a test has been made; the tap and valve always being left open when the instrument is out of action.

To make a test, a hole is drilled down below the level of the main, and in close proximity, by means of a crowbar. Then a ring of clay or similar material is placed round the top, so as to allow the whole of the porous tile access to any gas which may be escaping. The smallest quantity will be registered quickly; the maximum effect being obtained within two or three

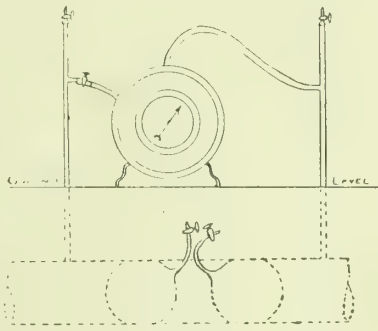


Fig. 1.

minutes. This process is repeated along the line of main until the maximum percentage of leakage is registered, and at this place excavation for repairs is made.

To test for the quantity of leakage in a main 200 yards long, supplying 50 consumers, and connected at both ends, a simple arrangement is shown in fig. 1. This consists of a test-meter

connected by flexible tubing to $\frac{1}{2}$ -inch stand-pipes. All the service cocks are closed; consumers having previously been notified of the proposed test. The main is then securely bagged off at each end, and the test-meter is attached. The meter is usually of the wet type, provided with a circular spirit level, levelling screws, &c., and indicating the consumption per hour by observations of one minute.

To make a test, the inlet tap to the meter is turned on, and the index hand of the meter moves rapidly round until the "dead" portion of the main is completely filled with gas. If the index hand afterwards moves, there is a leakage in the main according to the amount registered on the dial. A number of observations should be taken, with a short interval between each.

1. (B) Describe fully the operation of temporarily stopping the leakage from a split 8-inch main; permanent repairs being impossible for some days.

To temporarily repair a broken 8-inch main, the pipe should be thoroughly cleaned on each side of the fracture. A band of thin sheet lead is then well smeared with white or red lead and placed over the fracture, being kept in position by strong copper wire. It is also advisable, if the temporary repair has to stand a day or two, to place round the sheet lead two clips made of flat iron, each in two sections, bolted together. If sheet lead is not obtainable, strong calico or sacking should be used. This should be well smeared with red or white lead and wrapped round the gas-main two or three times; each

wrapping in turn being smeared with red or white lead. The whole is then bound together with strong cord.

In case of a cracked socket, the crack must be filled in with iron cement or red lead.

2. A five-light wet meter brought from a consumer's premises is found to be registering 25 per cent. slow. To what causes may this be ascribed? How would you proceed to put the meter into a thoroughly satisfactory condition, and certify the result of the work by testing on completion?

Causes.—1. Metal float, spindle, or plug sticking, in which case, if the water-line falls very low, the supply of gas is not shut off. It is improbable, however, that the water line would get so low as to cause a 25 per cent. slow registration unless water was leaking from the meter. 2. Meter worked above its normal capacity. 3. Breakdown of registering mechanism. 4. Drum working against a large amount of friction causing slow revolution. 5. Faulty drum—i.e., holes, &c., in case.

Repairs.—The drum should be removed, thoroughly examined, and cleaned by immersing in soda and water. Small perforations may be found in the drum; and if so, they must be soldered up. Any rust or corrosion must be removed and the interior of the meter washed out with soda and water. The metal float and valve should also be inspected and, if necessary, put into proper working condition. If the drum is not repairable, a new drum, with compensating arrangement attached, should be substituted. The registering mechanism should next be examined, to see that all the wheels are in good working order, that no teeth, &c., are missing from the wheels, and faulty wheels (if any) replaced. The parts of the meter should then be carefully put together; the joints in the outer case being made with a mixture of red and white lead, and tested for soundness and accuracy.

Testing.—Place the meter on a level bench and fill with water. Connect the inlet to the gas supply and the outlet to a line of gas-burners, which are then lighted. When all the air has been expelled from the meter and pipes, the lights are regulated until 1 cubic foot per hour is passing, and the joints tested for soundness by a mixture of soap and water. A gas pressure of not less than 3 inches should be used for this test. Gas is then passed from a graduated test holder (say) of $5\frac{1}{2}$ cubic feet or 11 cubic feet capacity at a constant pressure of $\frac{1}{2}$ -inch of water. When the small dial on the meter has reached a definite point and the holder has been adjusted to a convenient mark, gas is passed through the meter and burned at the float of lights. After passing 5 or 10 cubic feet, the readings of the holder and meter are compared, and the discrepancy (if any) noted. The percentage error can be easily calculated, and must not exceed 2 per cent. fast or 3 per cent. slow, after correcting for temperature and barometric pressure, to comply with the Sales of Gas Act.

3. State, in percentages, the composition of the following alloys and the influence which each component has upon the finished alloy: Brass, gun metal or bronze, solder. In what way are two pieces of composition (lead) pipe joined by means of a blow pipe, and what precautions have to be observed?

The composition of ordinary yellow brass is 2 parts of copper to 1 of zinc; hard brass for bearings, 8 parts of copper to 1 of zinc—i.e., in general engineering practice it varies from 2 to 8 parts of copper to 1 of zinc. If the copper is in a greater proportion than 4 to 1, the brass has a reddish appearance; while if less than 3 to 1, the brass appears to be more like zinc. Brass is tough. The quantity of zinc determines the degree of fusibility of the brass—the greater the zinc content, the more fusible the alloy. Bronze is an alloy of copper and tin, usually composed of about 9 parts of copper to 1 of tin (sometimes containing a little zinc). Hard gun metal contains 5 parts of copper to 1 of tin; soft, about 16 parts of copper to 1 of tin. The percentage of tin determines the hardness of the alloy.

Solders may be divided into "hard" and "soft" kinds, and are all composed of lead and tin.

Fine solder, 2 parts tin 1 part lead. Fuses at 340° Fahr.

Fine solder, $1\frac{1}{2}$ parts tin 1 part lead. Fuses at 334° Fahr.

Coarse solder, 1 part tin 3 parts lead. Fuses at 482° Fahr.

Plumbers' fine, 1 part tin 1 part lead. Fuses at 370° Fahr.

NOTE: The coarse solder is of the "hard" type; the others being of the "soft" kind.

More tin increases the quality of the solder,



Fig. 2.

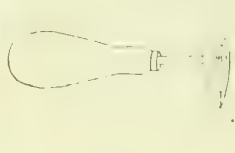


Fig. 3.



Fig. 4.

and also lowers the melting point. When a solder contains a large proportion of lead, the alloy is coarse and requires a high temperature for fusing. A good solder will emit a "crackling" noise on being bent.

To join two pieces of compo pipe together, one end is funnelled out by means of a tan pin (fig. 2), so that the other piece will just fit into it and leave a small groove to make the joint. The inside of the funnelled end is cleaned, and the top edge cut off cleanly with a shave hook (fig. 3). The other end to be inserted is then carefully cleaned by scraping to a depth of $\frac{1}{2}$ -inch; the lower end being slightly bevelled. This end is then forced into the opened one until the joint is firm enough to remain unsupported. A little powdered resin and oil is then placed in the space between the pieces of pipe to act as a flux. A spirit torch is lighted and the flame directed slightly above the joint by means of the blow-pipe. A stick of solder is held in the flame, also against the joint; the solder and flame being worked round until the union is complete. The joint is finally cleaned with tallow and cloth.

When making a joint with solder, it is essential that the surfaces of the component parts shall be perfectly cleaned by fluxes and free from metallic oxides. Such fluxes are zinc chloride, resin, or sal ammoniac, which prevent oxidation of metals when heated. The flame must not be allowed to play on any portion of the joint too long, as this would involve risk of melting the pipe. Must not get the joint too hot, or the solder may run into the pipe, and block it up. Care must be taken to work out any air-bubbles in the solder.

- 4 (A). Why is it desirable to have pressures at consumers' premises regulated? Describe, with the aid of a sketch, one form of house service governor.

It is necessary to have the pressure regulated at consumers' premises because of the variation at which gas is supplied, and because of the variation in quantity demanded at different times. Uniformity of pressure is especially desirable for inverted burners. Other reasons are the prevention of waste of gas and breaking of mantles.

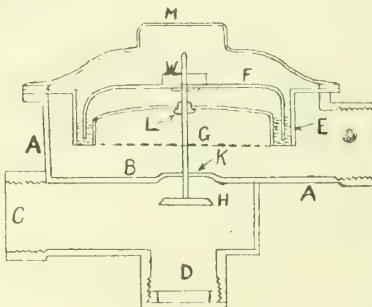


Fig. 5.

Fig. 5 is a sketch of a Peebles consumer's governor, which consists of an outer cast-iron casing A, which is divided into two chambers (inlet and outlet) by the partition B. The inlet connection can be made at either C or D, whichever seems most adaptable to the fittings. E is an annular mercury cup firmly secured to the main casting. In this cup, the bell F is free to rise and fall sensitively to the variation of demand. To the underside of the bell is attached a spindle G, which works through a brass guiding sleeve L in the top of the mercury cup. This spindle carries a flat disc valve H, which fits into the seating K, by which the gas-orifice can be increased or diminished. The spindle is made to project through the bell for the pur-

pose of attaching weights W to regulate to the necessary pressure. M is a cast-iron cover to fit on to the casing enclosing the whole.

The action of the governor is as follows: The gas enters the inlet chamber at C or D and passes between the valve H and seating K into the outlet chamber. If, however, the pressure is greater than is required, weights are taken off the bell; thus allowing the spindle G to rise and decrease the size of the inlet orifice. Different weights are tried until the desired pressure is obtained. Then the governor automatically opens and closes the valve-way, according as more or less gas is required, but always maintains it at the same pressure.

- 4 (B). How would you proceed to prove the presence of leakage in the fittings of a consumer; the leakage being too small to be readily indicated by the index of the meter?

An excellent method for proving the existence of a very minute leakage in a consumer's fittings is by the use of Milne's "Reliable" leak-testing machine.

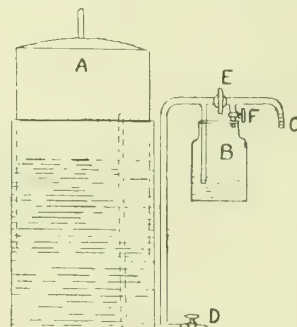


Fig. 6.

This consists of a small holder A, floating in an annular copper tank of water. B is a small glass bottle, half filled with water, to which are connected two tubes—one just slightly sealed in water, and the other unsealed and having a tap on it. These tubes are branched, one on each side of the tap E, on the main pipe leading into the bell of the holder. To operate it, connect the pipe C with india-rubber tubing to some part of the fittings. Turn off all taps on the fittings, also the meter-tap, and then open the tap D and draw up the bell. When nearly full of air, close the tap D, weight the bell, and open the tap E; thus allowing the pressure in the bell on the fittings. When the bell has become steady, close the tap E and open the tap F on the small tube, then the only connection between the fittings and the bell is through the water. Thus, if the pressure in the fittings falls, through a leakage, the pressure in the holder will then be greater, and will thus overcome the slight seal in the bottle, and bubbles of air will be seen to pass in this way. The machine is so sensitive that a leakage of 1 cubic foot in 350 hours is easily revealed.

5. A room with 2000 cubic feet of air space is lit with one inverted burner consuming 3 cubic feet of gas per hour. What quantity of air will be required for combustion, and what will be the proportion, by volume, of its chief constituents? Assuming the air of a room is changed twice per hour, what percentage will the air required by the burner bear to the total quantity passing through the room?

The quantity of air required for the combustion of 1 cubic foot of gas varies slightly with the varying composition of coal gas from 5.5 cubic feet to 5.7 cubic feet. Therefore, taking the mean as 5.6 cubic feet of air for 1 cubic foot of coal gas, the quantity required for 3 cubic feet of coal gas will be 3×5.6 —i.e., 16.8 cubic feet.

The proportion by volume of the chief constituents of the air are: Oxygen, 21 per cent.; nitrogen, 79 per cent.

If the air of the room is changed twice per hour or once in 30 minutes, then the volume $2000 \times 2 = 4000$ cubic feet, which will have passed through the room. The percentage of air required by the burner to the amount of air passing through the room is

$$\frac{100 \times 16.8}{4000} \text{ equals } 0.42 \text{ per cent.}$$

(To be Continued.)

THE GAS-TURBINE.*

It would be impossible to do anything but commend this excellent treatise on the theoretical and practical position of the gas-turbine at the present day. All that is important in connection with this fascinating subject has been grouped together to render the work both useful and instructive.

The object of this book is to compile in one volume the results of the work of English, French, German, and other organizations, so as to enable engineers, who are at present investigating the subject, to appreciate how much work has already been done, and so save unnecessary repetition—the frequent cause of much waste of time in all matters of research. One has only to consider the present position of steam-turbines in order to realize how highly desirable it is that the gas-turbine should meet with successful development to a similar extent.

In his first chapter, the author traces the evolution of the earliest forms of motors rotated by heat, from the smoke jack, actuated by fire, to the Stölze hot-air turbine, and the later turbines of De Laval and Lemale. A great deal of space, but none too much, is devoted to the reproduction of a paper on "A Scientific Investigation into the Possibilities of Gas-Turbines" read by Mr. R. M. Neilson before the Institution of Mechanical Engineers in 1904, and the highly-important discussion, contributed to by the most experienced engineers on the subject of turbines, which followed the reading of the paper. Much information is contained in a paper read by M. Sekutowicz before the Society of Civil Engineers of France, to which are devoted a couple of chapters.

So many difficulties lie in the way of a successful issue to the attempts to bring the gas-turbine from the experimental to the practical stage, that readers of Mr. Suplee's book will possibly consider that the author is somewhat unduly optimistic. Of these difficulties the question of temperature, during working, of the material of which the turbine is composed is by no means the least. When it is considered that the temperature at which the material forming the turbine must necessarily be maintained while at work far exceeds the fusing point of iron, steel, and copper, it will be seen the task before experimentalists is no light one.

The problem before the pioneers of the steam-turbine was by no means so abstruse; for in this case the temperature of the working fluid does not exceed that at which the ordinary and most suitable metals practically retain their full strength. There is, however, no need to be too pessimistic of the prospects before the gas turbine; for, as the author points out, "there are many active and energetic minds at work on the problem, and commercial results may soon be expected to follow;" though Mr. Dugald Clerk, in the discussion on Mr. Neilson's paper, said that "he did not see any immediate future for a gas-turbine, except in possibly utilizing exhaust gases from reciprocating engines, which at present were liberated under considerable pressures."

The last chapter, on the "Practical Work of Armengaud and Lemale," is most enlightening, and demonstrates to the reader that the progress in gas-turbines has been by no means illusory. It is stated that a number of 120-H.P. gas-turbines of a special type have been actually installed in submarine torpedoes completed for active service. These turbines travel at a speed of 1500 revolutions per minute; and yet the total weight is only 162 lbs. There is also described a small gas-turbine, built by Karasodine, operating with regularity and success. Developing about 2-H.P., its speed is no less than 10,000 revolutions a minute; while the diameter of the turbine is only 6 inches. As the author points out, the continuous turning effort is often most desirable; and taking into consideration the small size, the possibilities of such an apparatus become evident.

The subject is very capably treated, and the work of the author cannot but assist in the practical development of a type of engine which may well, in the future, bring much grist to the mill of the gas engineer. The book may be thoroughly recommended.

* "The Gas-Turbine." By H. H. Suplee. London: Chas. Griffin and Co., Limited; 1910. [Price 12s. 6d. net].

French Gas and Electricity Undertakings.—We have received from the offices of the "Journal de l'Éclairage au Gaz et à l'Électricité," 7, Rue Geoffroy-Marie, Paris, the directory of gas and electricity undertakings which, for about fifteen years, has been issued under the supervision of M. Maurice Germain, the Editor of the above-named publication. The edition for the present year has, of course, been revised and brought up to date. In the section relating to gas will be found a complete list of gas-works, particulars of the localities served from them, the names of the officials, &c., and a list of gas-fitters. The portion devoted to electricity furnishes a large amount of information in regard to undertakings supplying this illuminant; and there is a list of towns possessing a system of electric tramways. Each section of the book contains a chapter giving the names of the larger gas and electricity companies, with the amount of capital, the official address, the names of the directors, and the number of works owned; together with lists of suppliers of plant in connection with both of these industries. The work is now well established; and every effort has been made to ensure for the present edition the same success which has attended the issue of its predecessors. The price of the book is 4 frs. in other countries than France.

KÖNIGSBERG GAS-WORKS.

[Continued from p. 957 of last week's issue.]

THE METER AND GOVERNOR ROOM.

This room contains a wet station meter of 81,190 cubic feet per hour capacity and two district pressure regulators, with 30-inch connections, and a bye-pass with relief governor between the meter inlet and the district main. The floor on which the meter and governor stand is about 10 ft. 6 in. above the ground level. The apparatus is supported at this height on an iron structure, while the whole building rests on brick foundations and a pile framing. The connections under the floor of the governor-room are so arranged that gas can be passed if required direct from the purifiers to the governors; while there is a bye-pass for the station meter and a connection with a valve between the inlet and outlet of the gasholders. With a view to subsequent extensions, the main leading from the station meter to the inlet to the gasholders is 30 to 44 inches in diameter; the outlet main from the gasholder is 44 inches in diameter; and the main leading to the district pressure regulators is the same size.

GASHOLDERS.

The inlet and outlet mains, consisting of wrought-iron pipes 44 inches in diameter, are carried from the governor-house to the gasholders at a height of 16 feet above the ground level—measuring from the under side of the mains. They enter a valve-house situated between the two gasholder tanks, and there branch to the two holders. The branches are laid underground. The tanks of the gasholders are annular, and stand on annular foundations which rest above ground on brickwork which, under ground, is carried by granite concrete supported by a ring-shaped foundation of numerous piles, securely tied together. These piles are 52 ft. 6 in. to 56 ft. in length. The horizontal roof of the tank is partly carried by the iron tank and partly by a column. It has ribs with flexible joints. The interior of the tank is used as a store for iron and fire-clay goods. A steam-pipe runs through the annular brick foundation; and from it four branches are carried to the rim of the tank. They feed six injectors for heating the water in the tank and four injectors for heating the water in the cup of the No. 1 gasholder, which is telescopic. The steam connection between the fixed steam-pipes and the cup is by means of metallic flexible tubing, which runs over a roller carried by the rising and falling gasholder, so that the length of tube remains constant in all positions. The gasholder bells have man-holes and dip-pipes over the inlet and outlet mains, so that access can be obtained to the mains without entirely grounding the bell or emptying the gas from it. This arrangement has proved of practical value; as, after nine years' working, it became necessary to clear the outlet main of the telescopic holder of accumulated naphthalene.

LIQUOR DISTILLATION PLANT.

To the north of the condenser and washer building is a simple massive brick building, of 2153 square feet area, containing the liquor distillation plant. There are two column stills capable of dealing with 2206 and 4412 gallons respectively per diem of crude liquor. The smaller still was brought from the old works. The concentrated liquor is stored in a wrought-iron cylindrical tank, from which it is pumped by means of an air-pump into the tank waggons which are run along the north front of the building. There are also in the same building two boilers and a press for boiling and filter-pressing cyanogen sludge. The ammonia liberated in the boiling is recovered in a small condenser as concentrated liquor. The filtrate from the presses is worked up to sulphate of ammonia. The lime sludge from the stills is collected in a pit in the basement of the building, having a partition to facilitate the separation of the water, which is run off into the sludge catch-pit in the water-tower.

THE WATER-TOWER.

The water required on the works is taken from the River Pregel. A storage tank of about 700,000 gallons capacity is installed in a water-tower to the west of the liquor distillation house. Having regard to the small area of this tower and the weight of it and its contents, it was a specially difficult matter to secure a sufficiently firm foundation. A framing of piles, nearly 40 feet in length, was adopted; and the tower stands on it on an annular concrete base. The hollow space within the concrete base is used for a tank which is divided by two radial partition walls. One-half is used as a sludge catch-pit and the other as a tar-tank. The tower is carried up to a height of about 43 feet above the ground, where it is covered with a tiled roof; but out of the latter extends an iron framing, having the shape of a truncated cone, which carries the wrought-iron elevated tank for the river water. The bottom of the tank is of the Intze type of construction.

Immediately below the roof of the main portion of the tower is an annular concrete tank of a capacity of 35,300 gallons, which is for the storage of drinking water, as a reserve in case of any interruption of the drinking water supply to the works, which ordinarily is taken from the town mains. Directly underneath this is an annular tank of 353,000 gallons capacity, which is used as a tar-tank. A pipe with provision for steam-heating passes from the tar-tank to the outside of the tower, where it terminates

in a valve directly above the railway line, so that tank waggons can be filled through it. Beneath the tar-tank, at a height of 18 feet above the basement, is an intermediate floor available for stores. The basement is used for the storage of sulphate of ammonia and for the accommodation of the requisite pumps.

WATER-GAS PLANT AND BOILER-HOUSE.

In anticipation of a third retort-house being required, a third pile-framing foundation was put in; and at the east end of this the water-gas plant and relief gasholder from the old works were erected in 1903. The building is iron-framed, with cement and wire-lattice walls. An electro-motor is used for driving the fan. A station meter from the old works is used for measuring the water gas. The generators have been refitted with valves with safety interlocking gear. An improved dust separator was attached to each generator; and the scrubbing capacity was increased by the provision of a second scrubber and extending the height of the former scrubber. The uncarburetted water gas made was at first passed experimentally into the retorts, but later through the dip-pipes into the hydraulic mains of the retort-benches.

The boiler-house is attached to the liquor distillation house. It contains in the first instance two water-tube boilers of the Babcock and Wilcox type, each of 3230 square feet heating surface and 646 square feet superheating surface. The boilers produce steam of 8 atmospheres pressure with 250° to 300° superheating. They are heated with coke breeze; and the flue gases are drawn by means of Sturtevant fans into an iron chimney on the north side of the house. The fans will produce a draught of 14-10ths. Two steam-mains pass from the boilers through the washer-house to the retort-houses and water-gas plant. One steam-pipe is carried through the liquor distillation house to the water-tower, and so to the purifier-house, governor-room, and the gasholders. Another pipe goes to the baths and kitchens.

TECHNICAL DEVELOPMENT OF THE NEW GAS-WORKS.

As already described, provision was made for the erection of a third retort-house by putting in the foundations, which were, however, made use of for the time being for the water-gas plant from the old works. By the year 1905, the maximum daily output of the existing retort-house plant had been overtaken by the consumption. Experiences elsewhere, however, indicated that it would not be desirable to extend the retort-house plant, according to the old designs, with inclined retorts. In order to secure time for consideration of the new types of carbonizing plant which were being introduced, recourse was had to the plan of increasing the productive capacity of the works by the addition of water gas. Up to this time, water gas had been introduced into the hydraulic main, and thus a sufficiently uniform and satisfactory working had been obtained without artificially carburetting the water gas. Further increase of the make of water gas, however, necessitated carburetting. The altered market conditions, and the position of the new gas-works, pointed to the production of water gas carburetted with oil being most economical. All the apparatus of the old plant, with the exception of the generators and the fans, was therefore done away with, and on the space thus rendered available a water-gas generator, with carburettor and superheater for a productive capacity of 35,000 cubic feet per hour, was erected. The apparatus was arranged so that the generator could be used if desired by short-circuiting the carburettor and superheater for the production of blue water gas. A "Standard" washer-scrubber from the old gas-works was erected for scrubbing the water gas. The oil-tank was constructed within the relief gasholder.

COAL-CONVEYING PLANT.

The new coal-conveying plant came into use in 1906. Owing to its geographical position, Königsberg depends on England for its coal supply. The channel from the Baltic Sea to the River Pregel at Königsberg was deepened in 1902 to admit of large sea-going vessels coming up to Königsberg. The gas-works is, therefore, supplied direct with coal from the steamers. But the supply may be cut off for four months of the year by ice. Hence two adjacent halls, having an area of about 68,900 square feet, were erected as coal-stores. On the river foreshore, two travelling tower cranes were installed with grabs of 1 to 1½ tons capacity. The grabs and cranes are worked from an engine box on the tower by means of electric winding gear. The coal arrives in steamers of 2000 to 5000 tons capacity, having usually three or four hatches. The grabs fill themselves automatically in the holds of the boats, and are then run up and discharged into a receiver, the lumps passing over a screen to the coal-breaker, from which a load-measuring vessel is filled. This vessel fills in turn the waggons on a rope-line which runs to the coal-store. The waggons pass over an automatic weighing machine as they leave the coal unloading berth. In each of the coal halls are two electrically driven travelling cranes of about 130 feet span. The cranes travel on lines running along the sides of the halls. The two cranes are coupled to a travelling line, about 260 feet in length, which traverses the two halls, and carries an inclined plane which can be hooked by means of sliding tongues on the rope of the rope-line. On the travelling cranes there are, at short distances, shifting lugs by which the waggons of the rope-line are tipped. The waggons on the rope-line are impelled to the sheds, therefore, only by *vis viva* on the inclined railways. An elevator is provided at the south-east corner of the coal-store for raising coal from railway waggons to the rope-line if required. For removing coal from the store, there is a travelling crane, with grabs in both

balls. The filled grab conveys the coal to the middle gangway of the two halls, where it is discharged into the receiver of a rope-line conveyor, by which it is taken to the retort-houses. Provision is also made, by means of the rope-line, for conveying coal direct from the steamers to a receiver, from which it is transferred to the retort-house conveying lines.

ADDITIONAL APPARATUS.

In 1906, the purifying plant was extended by the addition of two vessels of 689 square feet area of grids. This brought the number up to six vessels, which are worked in two sets of three. The station gas-meter being no longer sufficiently large was supplemented by the installation of a dry rotary meter of a capacity of 105,000 cubic feet per hour (made by the Rotary Meter Company, of Manchester). A third exhauster of 175,000 cubic feet capacity per hour was added in 1907. In 1908, a third boiler of 3230 square feet heating surface was erected in the boiler-house; and in the same year the extension of the carbonizing plant was put in hand. After due consideration of the modern types of carbonizers, it was decided, on the ground of low depreciation charges and high productive capacity, to erect two inclined chamber settings each containing four carbonizing chambers for a charge of 6½ tons. In 1909, this installation was enlarged by the addition of four more settings of four chambers each. A view of the discharging side of these chambers was given in last week's issue, and a detailed description of them was published in the "JOURNAL," Vol. CVIII., p. 109. A comprehensive statement of the working results cannot be given here; but, speaking generally, it may be said that a considerable advance in the yield of gas has been undoubtedly obtained by the use of this plant.

In January last a third washer was erected primarily for the extraction of ammonia; but it was so arranged that it could be used if required for the extraction of cyanogen from gas which had been previously freed from ammonia. The rapid development in the output of gas showed that the provision made in the scheme for the new works for washing and purifying plant would soon be inadequate. The make of gas had nearly doubled between the years 1902 and 1909; and in the latter year a maximum daily make of 3,378,000 cubic feet was attained. The new works was intended for apparatus for a maximum daily make of about 7 million cubic feet. In order to avoid as far as might be the construction of new apparatus houses, and to work on as low a capital outlay as possible, an attempt was made to solve the following problems: (1) To make the recovery of ammonia from the crude gas independent of the temperature of the washing water and of the gas; (2) to introduce a cheap process for the production of sulphate of ammonia, as hitherto concentrated liquor only had been sold; (3) to effect the economical recovery of cyanogen; and (4) to diminish the space required for sulphur purification. Study of these questions led (in 1907) to a contract being concluded with a Zehlendorf Company, by which that Company erected on the gas-works, at their own cost and risk, a washing plant of about 4 million cubic feet capacity per diem. This plant was to test the applicability of the different processes devised by Herr Walther Feld. Trials were made of it at the end of 1908 and the beginning of 1909; and, as a consequence of the results obtained, the installation was modified and is now again at work. The course pursued is as follows: The crude gas is freed from tar as hitherto; and then sulphur and ammonia are extracted from it by means of sulphurous acid. Then it is treated with a solution of sulphate of iron or zinc, which solution is regenerated by means of sulphurous acid and air. In the regeneration, sulphur is precipitated, and is used again for the preparation of the sulphurous acid required. The procedure is therefore: Firstly, complete recovery of ammonia as sulphate, independently of the temperature of the gas and without the purchase of sulphuric acid; secondly, the limitation of the dry purification for sulphuretted hydrogen to a small portion of the sulphuretted hydrogen contained in the crude gas; and, thirdly, economy of space through the use of rotary washers with vertical axes. The gas thus freed from ammonia is then purified from cyanogen; and the rest of the sulphuretted hydrogen, which was not taken up in the ammonia washers, is passed into the dry purifiers.

The distributing system was enlarged owing to a number of suburbs being taken into the municipal area on April 1, 1905. In the summer of that year gas-mains were extended to these suburbs, and public lighting was introduced there. In 1907, a special main, of 14-inches diameter, was laid to the north-west suburb of Amalienau. At the end of the year 1908, the distributing system had a length of 83 miles of main, and there were 3935 public lamps, of which 1900 were provided with distance-lighting apparatus actuated by increased pressure from the gas-works. The extension of the distributing system in 1906 included the laying of two mains, of 26-inches diameter, beneath the River Pregel. The length under the river bed was about 360 feet.

(To be continued.)

We have received from the Council of the Scottish Junior Gas Association (Western District) the "Transactions" for the past session, as reprinted from the "JOURNAL." Seven papers were read; and there were four visits to works. The subjects dealt with were full of interest; and the Council, in their report, say that the attendance of members at all the meetings was well maintained. There is an index to the papers; and at the end of the pamphlet is a list of the office bearers and members.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

The Report and Accounts for the Year 1909-10.

The report of the Council of this Association, presented at the annual meeting at Königsberg on the 20th to the 24th ult., refers first to the celebration last year of the jubilee of the Association, and the success of the general meeting held at Frankfort-on-the-Main in connection therewith. The album issued in commemoration of the completion of fifty years' activity has already been reviewed in our columns [Vol. CVII., p. 169]. The report states that it has been very widely circulated among public authorities, colleges, and other bodies to which it was likely to be of interest, and has been received with most favourable comments.

Reference is next made to the election last year to honorary membership of the Association of Dr. Hans Bunte and Herr W. von Oechelhaeuser, to whom illuminated scrolls recording the election were presented at Carlsruhe and Dessau on Dec. 18 and Feb. 20 last respectively. The Bunsen-Pettenkofer Medallion of Honour was conferred on Mr. W. H. Lindley, of Frankfort, in recognition of his distinguished work in connection with water supply in Germany and abroad, and the great services which he has rendered to the Association, especially through the various Technical Committees on which he has served. The same distinction has been conferred also on the chiefs of two firms of makers of gas plant and apparatus—Dr. E. Blum, of the Berlin-Anhalt Engineering Company, and Dr. R. Pintsch, of the firm of that name.

In recognition of the changing conditions of the gas industry, and to counteract the favour shown by municipal authorities and others to electricity, it was decided, at a meeting held on March 14 last at Berlin, to found an Organization for Promoting the Sale of Gas. The Council decided on April 8 to support this organization by an annual contribution to it from the Association's funds of £250 (which decision was confirmed by the general meeting at Königsberg). The Council have lodged a protest with the Secretary of State for the Interior against a new German law for facilitating the distribution of high-tension electricity. Another protest has been sent to the Ministers of the Interior, of Commerce, and of Public Works against the favour shown to electric lighting for warehouses, concert-rooms, and theatres by the regulations of the Chief of Police of Berlin. In order to bring home to consumers and others the great industrial importance of the gas industry and its progress in recent years, the Association have started on the compilation of industrial statistics relating to the last three years, and many valuable conclusions have been already obtained therefrom; but the full results are not yet ready. The Council and the Technical Committees of the Association have also given much attention to the question of spreading knowledge in regard to the use of gas and its wide applicability, by means of lectures, &c.; and it is hoped that, through steps taken by the German Continental Gas Company, a greater number of properly qualified lecturers and instructors will be available shortly for this work. The Association are acting jointly with the new Organization for Promoting the Sale of Gas in endeavouring to secure ample space for exhibits relating to gas and water supply at the International Exhibition of Hygiene which is to be held in Dresden next year; and as the meeting of the Association will be held in that city, members will then have a good opportunity of seeing the results of the work done to organize the gas and water exhibits.

The report next refers to the arrangements which had been made in the spring for the visit of members of the Association to England in the second week after Whitsuntide, for a tour of inspection of the gas-works in London, Edinburgh, and Glasgow, and to the postponement, in consequence of the death of King Edward, of the visit to about the end of September, when it is hoped a large number of members will participate in the tour.

The proposal emanating from England, America, and France for the adoption of an international unit of light based on comparative measurements of the standards of light in common use in the different countries was considered by the Council. While believing that Germany has in the Hefner lamp the unit of light which has been proved to be the best available for practical photometry, the Association, acting in unison with the Union of German Electricians, have deemed it inexpedient for the time being to raise objection to the proposed international candle, provided its ratio to the Hefner unit is exactly determined. It was considered that such an international unit of light should have a rational basis, and be sharply definable and reproducible, as is the case with the Hefner unit at the present time. But so long as the units and methods employed in photometry differ as greatly as they do now, conversion of experimental results by calculation cannot be avoided; and hence the creation of an international unit does not seem to the Council to be very pressing. The Association and the Union of Electricians have in the meantime addressed a petition to the Imperial Office for the Interior, asking the assistance of the German Government and the Imperial Physical-Technical Institute in work directed towards the creation of a rational unit of light having a scientific basis. The Minister of the Interior has sanctioned the investigation of the question by the Physical-Technical Institute; and his subsequent action will depend on the results of this investigation. No substantial progress since last year has to be reported in the endeavour to create an international gas screw-thread.

The Council record their thanks to the members of the various Technical Committees of the Association for their labours. The thirtieth of the annual volumes of gas statistics compiled under the auspices of the Association relates to the year 1908, and embodies several alterations in the information furnished as compared with the earlier volumes. Questions now dealt with in the statistics include the number of settings and the number and type of the retorts or chambers in use, the production and use of water gas, and particulars of long-distance gas supplies and high-power gas lighting. The statistics now relate to 287 gas undertakings, as compared with 273 in the previous year. A considerable increase in the consumption of gas is generally shown, though it is not quite so great as in the previous year. It is intended to make a more comprehensive volume of statistics once every five years; and the first of such volumes is that which is now in the press.

The number of members of all classes of the Association has increased by twelve in the course of the year, and now amounts to 1107.

The report next refers to the eight District Gas and Water Associations which are affiliated to the German Association, and gives particulars of their membership and the meetings which they have held during the past year. Then a list is given of contributors to the fund for furthering the scientific work of the Association, and to grants made from the funds of the Schiele Foundation to students and for research work. The Benevolent fund of the Association dispensed during the year about £332 to 29 families or persons.

The report states that Mr. W. H. Lindley, of Frankfort, retires this year from the Council, and is not eligible for re-election. [Herr H. Ries, Manager of the Munich Gas-Works, was chosen by the general meeting at Königsberg to succeed him.]

The accounts show receipts for the year amounting to about £2028, and a sum brought forward of £924. The ordinary expenditure amounts to £1770; and there is an item of £914 of extraordinary expenditure towards the Instructional and Experimental Works at Carlsruhe. The book-value of these works now is about £2262.

Reports of the Technical Committees.

THE HEATING COMMITTEE.

The draft set of prescriptions and rules for the sale, regulation, and use of gas brought forward by the Committee at last year's meeting ["JOURNAL," Vol. CVI., p. 971] was, in so far as its second section—viz., "Rules for Fitting Work"—was concerned, submitted to the German District Gas Associations for their opinion and suggestions as to desirable alterations. The Committee now record their warmest thanks for the valuable hints received from these Associations.

In regard to technical questions, the proposals of the Committee could, generally speaking, be forthwith adopted. The Rhenish-Westphalian and Brandenburg Association, however, emphasized the point raised at the last meeting—viz., that under no circumstances must the supervision of fitting work be subject to the police authorities, even though the latter may only serve as a backing for the gas-works which will actually exercise the control. After much deliberation, the Committee finally came to an agreement that in all the circumstances the testing and control of gas-fitting work must be in the hands of the gas-works, and that the police authorities should be entirely excluded from the rules, in order especially to avoid collisions between them and the gas-works in cases where the latter undertake fitting work. The Committee was of opinion that fitting was to-day so important a branch of the activities of a gas undertaking that not only should all parts of the rules which gave the police any control be deleted, but that the introduction to the rules should be modified so as to express the importance of the fitting work now carried out by gas-works. In opposition to the idea that the authority of the police would be necessary to make the prescriptions effectual and to impose penalties for faulty fitting work, it was pointed out that the provision of the rules, that in cases in which the conditions were not fulfilled gas should not be supplied, was sufficient authority for refusing to make the connection with the main where the house installation was defective. Moreover, the prescriptions might be regarded as generally accepted rules in the building and decorating trade, and failure to comply with them would be an infraction of the common law and, as such, punishable by fine. In order to avoid risk of partiality in cases where the gas-works which acts as the controlling authority undertakes fitting work, provision has been made for appeal to some person who shall be independent of the gas-works. The question of provision for dealing with strikes of fitters might, the Committee thought, be allowed to stand over for a time. It was considered undesirable to put any restriction on the right of a fitter to undertake work in any district. A joint sitting of the Committee and representatives of the German Fitters' Union was held on March 12 at Frankfort; and while it was found impossible to conform to the views of the latter in all respects, it was decided to formulate them in an appendix to the report. The Committee consider that the rules, as now set out, are ready for the approval of the Association. They were approved by the general meeting at Königsberg.

The proposal of Herr Reichard, that the Committee should undertake to train lady instructors in gas cooking, has been met by the German Continental Gas Company placing their lady instructor at the disposal of other gas-works for lecturing purposes. Also the newly-formed "Organization for Promoting the Sale of Gas" [referred to in the report in last week's "JOURNAL" of the proceedings at the meeting of the German Association] has made a special point of stimulating gas cooking by lectures on the subject.

A new question, which has come before the Committee is the participation of the Association in the International Exhibition of Hygiene at Dresden in 1911. At a joint meeting of this Committee and the Water-Works Committee held at Frankfurt on March 13 last, it was decided that it was desirable that the Association should participate, and a special Sub-Committee was appointed to report on the arrangements which could be made. This Sub-Committee has recommended that a special pavilion should be secured at the Exhibition for the gas and water industries, with a view particularly to displaying their hygienic and scientific aspects. The steps taken by the General Secretary to obtain this have not yet reached any definite conclusion, and the financial support required cannot therefore yet be fixed.

The resignation by Herr L. Körting, one of the Honorary Members of the German Association, and until recently Manager of the Hanover works of the Imperial Continental Gas Association, of his seat on the Committee, has been accepted with much regret, and the retirement of Herr Galley from the Committee is also announced. The report is signed by Dr. E. Schilling, of Munich, as Chairman of the Committee.

The set of prescriptions and rules for the sale and use of gas, which have been referred to in the foregoing report, are printed as an Appendix to it. They cover 40 pages, and are divided into a preface and four sections, of which the first relates to the regulation of the relations between gas-works and consumers, the second to prescriptions for fitting-up houses and rules for gas-fitting, and the third constitutes a simple statement for the information of consumers on the properties and use of gas. The fourth section is supplementary to the second, and merely gives explanations and additions proposed after the latter had been drafted. It is unnecessary to refer in detail in the "JOURNAL" to the set of rules and prescriptions.

GAS-METER COMMITTEE.

This Committee report that they have not put any fresh work in hand, and that the investigations already started have been hampered through the many other claims on the time of their members individually. Consequently, the work of the Committee has not progressed so rapidly as might be wished. The artificially prepared membranes for dry meters, which had previously been made in small pieces for preliminary examination, have now been produced in larger sizes, and found to be as good as the small pieces formerly made. Experimental meters for 5 and 20 lights made up with these membranes are ready for distribution to the gas-works which have undertaken to submit them to supervised durability trials. The Committee have decided that these should be conducted as far as possible on a uniform basis.

The question of a reduction of the fees charged for stamping gas-meters has been further considered, and the President has agreed to present a petition to the Bundesrat urging the necessity of a reduction in the fees at present prescribed by resolution of that body. The Committee have continued their work aiming at the unification of the external dimensions of the gas-meters made by different firms. There seems little difficulty in arriving at uniformity in regard to wet meters; but the dry meters vary greatly, and the Committee are still in communication with the representatives of the firms of makers in regard to an agreement as to the dimensions. The question of meter unions and threads has also been considered; and the Committee recommend the adoption of the sizes approved for gas and water pipes by the Joint Standards Committee of the Association and of the Association of German Engineers in 1903.

The Committee had been asked to make trials of the "Rota" apparatus for measuring gas made by the Rota works at Aix-la-Chapelle. Several examples of it were supplied for an extended trial; and observations taken by two members of the Committee showed that while it was not applicable to the exact measurement of quantities of gas, it was useful for a number of other purposes, such as the rapid measurement of the gas consumption of lamps and apparatus, and for regulating gas-nipples, testing of meters *in situ*, determining the amount of gas passing through a pipe, and measuring the air for the revivification of oxide in the purifiers, and of gases generally for mixing.

The Committee record their thanks to the Imperial Standards Department for the interest which it has taken in the work of the Committee. The report is signed by Herr C. Kohn, of Frankfurt-on-the-Main, who is the Chairman.

WATER-WORKS COMMITTEE.

The report of the Committee on the working of Water-Works states that they held two meetings. Reference is made to the publication of the twentieth issue of the "Water Statistics," compiled under the direction of the Committee. This contains reports from 381 undertakings, compared with 345 in the previous year's issue. It is the practice to include full particulars of the machinery and equipment of different works in every fifth year's volume, and the present issue contains this complete in-

formation. In other years only new plant is referred to. It was decided to include in the next volume information on many points not hitherto dealt with; and additional questions were accordingly drawn up for issue to the authorities concerned. A large number of answers have already been received. One question was as to whether any tests were made of the calorific power of the fuel used on the works; and 56 undertakings replied that they made such tests, while 298 replied that they did not. Another question was as to whether the manager had had any opportunity of seeing a water-diviner at work; and, if so, with what result. Only 24 answers were in the affirmative. The question of water-divination was discussed at one meeting; and the information obtained showed that the "art" was again in the ascendant. The Committee were unanimously of the opinion that the collection and sifting of particulars of cases of the use of the divining-rod and the publication of the results of this investigation would be the best means of correcting erroneous views thereon. Reference is made in the report to the joint meeting with the Heating Committee, called to consider the question of the participation of the Association in the International Exhibition of Hygiene at Dresden next year. The result of this meeting has been referred to in the report of the Heating Committee [*vide supra*]. The Committee deplore the loss by death during the year of Herr E. Kunath, one of the oldest members. The report is signed by Herr Reese (Dortmund), Chairman of the Committee.

ELECTROLYSIS COMMITTEE.

The report of this Committee for the year 1909-10 states that no independent work has been carried out, as for the time being the activity of the Committee is merged in the Electrolysis Committee appointed jointly by the Association with the Association of German Electricians and the Association of German Tramway and Light Railway Undertakings. The Joint Committee have already carried out investigations at Düsseldorf, on which a circumstantial report has been prepared. A Sub-Committee have been appointed to sift the immense mass of information collected by the Committee, and to draw up a set of prescriptions for general acceptance. Great difficulty, however, has been experienced in this matter, because the interests of the two principal parties in the Committee are opposed. Much time has been spent in collating the results of investigations carried out at Brunswick, Nuremberg, Cassel, Warsaw, Beuthen, and Düsseldorf. In fact, one engineer—viz., Herr Besig—has been almost exclusively engaged on this work up to the end of the year. The issue of the complete report has not therefore yet become possible. The prescriptions suggested by the Sub-Committee were, however, discussed in a plenary sitting of the Committee held at Carlsruhe on April 30 last, with the gratifying result that they were unanimously adopted, with but trifling alterations, and there is every prospect of their ultimate ratification by the three component Associations of the Joint Committee.

The "Prescriptions for the Protection of Gas and Water Pipes from Injurious Effects of Currents of Electric Lines using Continuous Current and the Rails as Conductors" are given in an appendix to the report. They are in six sections, of which the first refers to the range of applicability of the prescriptions, and excludes therefrom lines of which the rails are insulated by being laid on a wooden bed or the like, and lines which are at least 200 metres (656 feet) from the nearest point of the system of mains. The second section states that the rails used for conducting the current must be laid and maintained, as far as possible, as reliable and perfect conductors. The resistance at the joints must not be more than 20 per cent. higher than the resistance of the rail where there is no joint. All conductors for carrying current which are connected with the rails are to be insulated from earth. The third section refers to the tension in the rails, and states that in urban localities where the lines ramify the tension between any two points must not exceed $2\frac{1}{2}$ volts, while on outlying stretches the fall of tension must not exceed 1 volt per kilometre. A higher tension may be allowed on lines which are only used for one or two hours a day. The fourth section relates to the resistance between the rails used for conducting current to earth, which resistance must be as high as possible and, if necessary, owing to special conditions of soil or otherwise, must be increased by effective insulation. The rails and conductors connected with them must not be connected with gas or water pipes or other metal bodies embedded in the earth. The distance between rails and hydrants, syphon-pots, or other objects lying near the surface and attached to the pipes by metallic connection must be at least 40 inches. Insulated conductors must be used for motors, lights, &c., fed from the tramway conductor except in certain specified exceptional circumstances.

The fifth section states that while the preceding prescriptions are intended to avoid the possibility of pipes being destroyed, it is recognized that the electrolytic destruction of pipes depends quantitatively on the density of the current passing from them. Where the current due to tramway currents has an average density exceeding 0.75 milliampere per square centimetre, the pipe or main is to be considered unreservedly as endangered by the tramway; and further protective measures must be taken. Exception is made for goods lines working only for a short period of the day. The sixth and last section gives the provisions which should be made for supervising installations, such as the carrying of test wires from junctions in the line to some central point, so that the potential at junctions may be readily tested.

The report points out that these prescriptions tally generally

with the regulations which the Association have considered necessary, though their outward form is different; and more latitude is given to the tramway constructors as to the choice of means by which the desired end may be attained. A few measures have, however, merely been recommended instead of being definitely prescribed. The prescriptions aim, on the one hand, at providing all the protection which is imperatively required, while not exceeding what is practicable in present conditions. To what extent they fulfil all requirements will be revealed by future experience only; and as a result of the latter, changes may have to be made. The Committee of the Association propose, as soon as the work of the Joint Committee is finished and their final report issued, to resume independent inquiries into the question of the electrolysis of gas and water mains by vagrant currents. The report is signed by Mr. W. H. Lindley, of Frankfort-on-the-Main, on behalf of himself and his colleagues.

THE INSTRUCTION COMMITTEE.

The training schools for gas fitters, &c., referred to in previous reports, have continued their work regularly during the year 1909-10; and the Committee propose next year to reconsider the schemes of instruction and the results obtained at these schools. The Committee have been busy with the organization of instruction in gas cookery, and have decided to submit the following propositions to the Council of the Association: (1) That courses of training for ladies in cooking by gas be established in suitable centres in Germany, such as Berlin, Leipsic, Dresden, Carlsruhe, Wiesbaden, &c., if local conditions and the gas-works managers favour the scheme. (2) That it be ascertained through members of the Association what cookery schools exist in different places, and that gas apparatus be put at the disposal of these schools free of cost, and instruction be given there on cooking by gas. (3) That the ladies trained to give instruction be informed of the facilities offered by the gas-works for the supply, by hiring or otherwise, of gas cooking apparatus, and that they be requested to include this information in their course of instruction. (4) That in lectures and courses of instruction it be strongly recommended that explanation be given of the regulation of gas-burners, and the mode of dealing with any obstructions which may occur. (5) That in default of courses on gas cooking, which should be repeated frequently wherever possible, it is strongly recommended that suitable articles thereon should be inserted in the newspapers. (6) That it is desirable to ascertain and consider whether prepayment meters might not be introduced in many places solely for heating and cooking purposes. (7) That it is desirable to give attention to the supply of specially cheap gas cooking and heating apparatus for the middle and lower classes. That the supply of the very inferior apparatus often put in by fitting firms must be checked by every possible means. (8) That where gas and electricity are both available, reliable comparative trials of cooking with gas and electrical apparatus should be carried out, and the results placed at the disposal of the new organization for promoting the sale of gas.

The Committee further suggest that the latter organization should collect literature, both native and foreign, on heating and cooking by gas, with a view to compiling therefrom a comprehensive pamphlet suitable for publication. Finally, books on, and recipes for, gas cooking should be published. The foregoing hints should be taken by gas engineers as intended for adaptation according to local conditions; and the Committee invite suggestions for their modification and extension. The report is signed by the Chairman of the Committee, Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, who, however, was unfortunately prevented by indisposition from presenting it himself at the meeting of the Association.

OTHER COMMITTEES.

An abstract translation of the report of the Committee for the Instructional and Experimental Gas-Works of the Association was given in the "JOURNAL" last week (p. 961), and some notes were also given at the same time on the contents of the report of the Committee on Photometry, which report has not yet been issued in full. The reports for the past year of all the Technical Committees of the Association have therefore now been dealt with in the "JOURNAL;" the fulness of the treatment given them varying, not according to their respective lengths, but according to the extent to which their contents seem likely to be of interest to English gas engineers.

Prices realized at an art sale at Christie's recently showed that the late Sir Frederick Mappin was fortunate in other spheres of life than as a gas administrator. During the sale of his pictures, a canvas by Constable, "Stoke-by-Nayland, Suffolk," sold for 8800 guineas—an auctioneer's record for a Constable. In 1879 this very picture was sold for 740 guineas.

In connection with the road-tarring experiments of which the results have been recorded from time to time in the "JOURNAL," the name of Mr. Rees Jeffreys has been frequently mentioned, in his capacity as Secretary of the Roads Improvement Association. We learn that he has now been appointed Secretary of the newly-formed Road Board. The selection is a very good one, for, though quite a young man, Mr. Rees Jeffreys is an authority on systems of highway administration; and we believe it was mainly through his efforts that a Departmental Committee of the Local Government Board was appointed to inquire into the subject as far as regards England and Wales.

THE USE OF GAS FOR INDUSTRIAL PURPOSES.

By Dr. E. SCHILLING, of Munich.

[Abstract Translation of a Paper read at the Meeting of the German Association.]

The general assumption that the use of gas for heating purposes is a modern innovation is erroneous. So long ago as 1858 it was announced in the Technical Press that the Cathedral at Berlin had been heated by gas for about two years past, and also that there were eight gas-stoves in the Church of St. Katherine, at Hamburg. The principle of the burner, known as the Elsner, used in these stoves was the combustion of gas above a wire gauze, beneath which it had been mixed with air. These Elsner burners were used for a variety of heating purposes; and the author remembers quite well one being used at his home in his boyhood for boiling the tea kettle. It was also reported at the same time that a patent (dated January, 1857) had been granted for the heating of irons for laundry work by means of gas; and in 1859, a soldering apparatus for continuous soldering by means of gas was described. This included the use of a blast worked by a foot bellows.

In 1859, also, a Görlitz firm advertised gas cooking and heating apparatus; while a Berlin firm were supplying gas-stoves for heating churches, gas-fires, gas-grills, and baking-ovens, as well as boiling burners for kitchens and chemical laboratories. In an advertisement of Elsner, of Berlin, in July, 1859, it was pointed out that there was scarcely a branch of domestic work, of industry, and of business for which a gas cooking or heating apparatus could not be recommended. Thus it is evident that the use of gas for industrial purposes is considerably older than is usually assumed, and that it has not been brought about through a falling off in the use of gas for lighting due to the spread of electricity. The Paris Exhibition of 1867 contained the first gas-engine of Otto-Langen type, thereby indicating that gas was already applicable at that date in industry in the most varied directions. Besides cooking apparatus, there were also exhibited there singeing apparatus for use in wool-works, dye-works, and bleaching-works. Jewellers also were using gas. Plant for chemical and metallurgical purposes and laboratory ovens were also shown.

Attention is at the present time turned again to industry by the development of an enormous number of new applications for gas; and it is important that the gas engineer should be acquainted with them in order to meet the threatened competition of electricity for heating purposes in industry. A short time ago, the author was visiting a works in which gas was used for the hardening and tempering of watch springs; and he was informed that only the day before a representative of a large electricity firm had been setting out in a most convincing manner the advantages of the electrical hardening of steel. This reminded the author afresh of the necessity that manufacturers should have explained to them by representatives of the gas industry also the advantages of heating by gas. Numerous instances demonstrate how much can be done in this direction if the gas industry actively pushes the application of its staple product. A representative of the gas industry can be helpful not only in bringing to the notice of consumers the most suitable apparatus and burners, but also he can gain their confidence by teaching them how to use gas economically. By this means their satisfaction will be assured.

The competitors with which gas has to reckon as a heating agent are steam, water gas, producer gas, solid fuels (among which is its own bye-product, coke), and, finally, electricity. While all these competitors, with the exception of electricity, present advantages, in the smaller absolute cost of the heating agent, electric energy is the dearest of all, and it must be again and again brought to the notice of the public that 1000 cubic feet of gas, costing 2s. 10d. to 4s. 6d., contain 561,800 B.Th.U.; whereas 1 unit of electricity, costing 1½d. to 2½d., can, in the most favourable case, develop only 342 B.Th.U. Consequently, electricity can merely come into play as a heating agent in quite exceptional cases. If gas engineers were called upon to leave lighting to electricity, they might with far greater justice call upon electricians to leave heating entirely to gas. All the advantages that are claimed by electricians, such as convenience, easy regulation of temperature, adaptability, &c., are to be attained in at least as high a degree, if not higher, with gas; and the apparatus required for the latter is for the most part simpler and cheaper. No injury, therefore, need be feared for gas from the competition of electricity, if gas engineers assist industrial consumers who have to reckon their working charges most carefully, to apply gas in a rational and an economical manner. The advantages of gas should be explained to them just as the advantages of electricity are explained by electrical concerns.

More serious rivals for gas are the cheaper heating agents, particularly steam. The sale of gas will, however, extend more in competition with the latter the greater is the success in utilizing rationally the calorific power of the gas and the greater the extent to which the properties of gas-flames dependent on their nature, varying temperature, and shape are rendered available. In order to present a review of the extent to which gas has at the present day obtained a footing in industry and business, the author has appended to his paper a list of the apparatus used for heating with gas, the purposes for which it is used, and the names of the most important Continental makers of such apparatus. The list only contains the results of the author's own knowledge

and inquiries; and he hopes that it may be extended by others. Nevertheless, the list, incomplete though it may be, indicates the directions in which gas has been applied with success and in which an increase in the use of gas is to be obtained.

There is wide scope for the use of gas in annealing and smelting by means of muffle-furnaces heated by a blast. Gas here competes especially with the cheaper descriptions of gas, such as water gas, producer gas, and also with furnaces heated with coke. The chief advantage of gas firing consists in the extraordinarily simple regulation of the heat and the convenience with which it can be supervised. Soot and smoke are also avoided. The use of water gas and producer gas is only possible where the amount of work to be done admits of a special gas plant being employed. The rapid development of machine tools makes it necessary to use in all works well hardened, sharp steel tools; and in all such cases tempering or case-hardening furnaces heated by gas are applicable. The tools are raised to incandescence in a muffle or other furnace and are heated to a temperature varying from 550° to 1200° C., dependent on the quality of the steel.

The second important operation is the cooling or tempering of the steel, which takes place in the absence of air in baths of saline solution, oil, or molten white metal. Various types of gas-furnaces are used according to the procedure required. There are also crucible furnaces for melting metals of all kinds, such as gold, silver, copper, brass, &c., in graphite crucibles; and these gas-furnaces are extensively used both in laboratories and in the refining and working of metals, and in the manufacture of alloys. Somewhat similar furnaces are also used in the porcelain, enamel, and glass industries, for the continuous and rapid burning-in of designs on glass, porcelain, &c. The heating gases in these cases envelop, in the first instance, the lower or high temperature muffle-furnace, then pass on to the upper or preparatory furnace, and, lastly, to the drying chamber; so that they are completely utilized. One firm of apparatus makers supplies for modern tool manufacture a special form of salt bath crucible oven, which is used where rapid cutting tools of tungsten steel are employed, the temperature for tempering which is from 1100° to 1300° C.

There is wide and varied application for gas for soldering and brazing, with apparatus ranging from the simple soldering bit heated by the Bunsen flame, to the blast brazing tables which are used in the cycle industry. The modern forms of appliances present great economy over the old soldering irons heated with the Bunsen flame, and for work of considerable size the use of the blast appears to be desirable. The blast allows the heat to be applied exactly at the desired point, and is therefore in many cases very advantageous. The electrical power available in most works can be used in the simplest manner for providing the blast. It is worth observing that the electrical apparatus works are most important consumers of gas for these purposes. The melting of metals for printing machines is also an extensive business.

Recently, autogenous welding, which, in essence, is nothing more than a smelting process, has come into extensive employment. The apparatus formerly used for the purpose with hydrogen and acetylene has been adapted by one firm for use with coal gas. The calorific power of the gas is first increased by carburizing it with benzoline vapour. The temperature of the welding cone of the carburized coal-gas-oxygen flame is about 2000° C., and the flame, like the hydrogen flame, serves to effect weldings of metal up to a thickness of 2½ to 3 inches. The cost is lower than that of hydrogen, apart from the fact that coal gas is available nearly everywhere, and it is unnecessary to provide for the storage of compressed gas in steel cylinders. A pamphlet on autogenous welding with coal gas and oxygen has been issued by the firm of Jacob Knappich, of Augsburg.

It has already been indicated that gas is especially applicable where high temperatures are required. The number of works in which gas is used for heating to moderate temperatures is legion. One of the oldest uses is for singeing apparatus in the textile industry. For working on the large scale, producer gas appears to be cheaper, and also to have the advantage that the flame is more suitable for singeing than a coal-gas flame. This question has been discussed in recent technical literature; but attention should be given to it by gas engineers in order to ensure that coal gas is not driven out of a field of application in which it has answered well for many years, and in which further inquiry may show it is still the most suitable agent. Gas is also extensively applied in the box making and hat industries. A large industrial use of gas is for heating irons; and though coke or electricity, and with large ironing machines, steam also, are applicable, gas possesses the advantage of being serviceable for either the smallest smoothing iron or large ironing machines. Special types of ovens are also extensively used for heating a number of irons, up to twenty, for use in the millinery business. They are distinguished by the low consumption of gas and high efficiency obtained. In these applications, special attention has been paid to improving hygienic conditions in work-rooms. In laundries, hospitals, &c., there is frequently used, in addition to the steam-heated ironing machine, a gas-ironer, consisting of a hollow steel roller heated from within with gas under an air-blast.

There is scarcely a branch of modern industry in which gas-heated apparatus for drying does not find a place. Though steam may hold the premier position in this connection, gas has extensive and increasing use. The possibility which it presents of drying at a lower or higher temperature as required, and of regulating the temperature readily and exactly, are advantages which ensure it a great future in this direction. When used in conjunc-

tion with thermostats, gas becomes available for maintaining any desired temperature constant for any length of time. An instance of this application of gas is the heating of incubators. Recently also gas has come into extensive use for the curing of the so-called "smoked" meat. The use of gas in the jam and similar industries is well known.

The use of gas also for boiling and roasting and baking in hotels, restaurants, and eating-houses, is too well known to need emphasis. The hygienic advantages of gas as a fuel, especially in sanatoria and hospitals, are so great that in modern installations gas is taking the place of steam. For example, in Davos, where the avoidance of smoke and soot is imperative, gas is almost exclusively used. Finally, the employment of gas for heating water, which originally only applied to water-heaters in bath-rooms, has at the present time extended so that gas is regarded as an indispensable auxiliary for the supply of hot water to whole buildings and works. Its advantages, compared with solid fuel, have become recognized for central heating plant; and it may be anticipated that, just as for cooking the coal-range is being forced into the background, so for heating solid fuel will constantly be more and more ousted by gas.

It will be realized from this brief review of the extensive field in which gas is applicable in industry and business that it is practically impossible to enumerate all its applications, let alone to describe them in detail. Such was not the author's purpose. He wished rather to draw the attention of gas engineers to the wide possibilities of increasing the output of gas for heating purposes, and believes that this paper, with its appendix, may serve to incite others to extend these possibilities. The times are now past in which gas-works can afford to ignore the development of this branch of trade. They are compelled, like any tradesman, to work up their business; and the author hopes that his paper may come as a small aid to them in this direction.

The appendix to the paper is an extensive list of the different types of gas apparatus for industrial and business purposes, with the classes of works or manufactures in which they are used, and the names of the firms in Germany who supply them. Since, so far as we can judge from glancing through the list, the types of apparatus enumerated are, with many others, made also in this country, it does not seem to be necessary to refer further in the "JOURNAL" to this appendix.

Canadian Gas Association.

According to the accounts which have reached us of the third annual meeting of this Association, which was held at Hamilton (Ont.) from the 9th to the 11th ult., under the presidency of Mr. J. S. Norris, of Montreal, it was altogether very successful. The following papers were submitted: "Some Methods of Measuring Light," by Mr. W. C. Philpott, the Chemist to the Toronto Consumers' Gas Company; "New Business Methods," by Mr. B. G. McNabb, of Montreal; "Gas-Engine Development, Construction, and Application," by Mr. R. A. Fraser, of Toronto; and "Recent Gas Installations in Hamilton," by Mr. E. A. Howe. Messrs. Hewitt and Keillor submitted a report by the Committee on the Illuminating Power and Calorific Value of Gases Made in Canada; and Mr. Norman Macbeth, the Manager of the Illuminating Engineering Laboratories of the Welsbach Company of Gloucester (N.J.), delivered a lecture on "The Importance of Illuminating Engineering to Gas Companies." In connection with the meeting, the first Canadian Gas Exhibition was held from the 6th to the 11th ult. The social functions incidental to the gathering appear to have been of a very pleasant character. The new President is Mr. Arthur Hewitt, of Toronto. We hope to notice the proceedings at greater length in subsequent issues.

The Calcutta Appointment.—Readers will probably remember that the Calcutta Corporation a short time ago invited, in our advertisement columns, applications for the position of Gas Lighting Superintendent. We learn that the appointment has been conferred upon Mr. H. V. Eastwell, who was for some years with Messrs. Pontifex and Co. He has had the personal supervision of the fixing of large installations of incandescent gas lighting in London and the Provinces, and considerable experience in the maintenance and general supervision of public lamps on this system. The salary is Rs. 500 per month, rising to Rs. 750 per month by equal annual increments.

Road-Tarring in Illinois.—A tar macadam road, 30 feet wide and 400 feet long, was put down as an experiment at Kankakee (Ill.), to discover whether this form of highway construction would reduce the dust nuisance caused by the wearing away of the top dressing of the shale macadam streets which are used to a great extent in that section. The dust from the limestone was washed into the sewers, and formed a sediment which was removable with great difficulty. The street re-surfaced had been paved with stone macadam three years before. Ordinary coal tar, direct from the local gas-works, was used, after being allowed to settle for about a month in a large well, heated by a steam coil. It was applied to the road from 10-gallon hand sprinklers—the only method available. Upon the hot tar was spread a top covering of crushed limestone, which was compacted by a 20-ton roller. After a period of three days, the street was opened to traffic.

STEEL GASHOLDER TANKS MADE WITH BULGING SIDES.

[A Paper read before the Société Technique du Gaz.]

By M. EDOUARD BONNET.

One of the most interesting papers read at the annual meeting of the Société Technique du Gaz described the design and form of a new gasholder tank in steel, patented and made by the Maschinenfabrik Augsburg Nürnberg, and erected at the municipal gas-works Simmering, Vienna. The distinguishing feature of this tank is that, instead of the usual vertical side plates of varying thicknesses, its sides are curved or bulged, or (to use a more expressive word) bellied-out; and the plates composing it are of the same thickness throughout. It is claimed that this gives a more flexible and, technically, superior structure. The shape of the curve resembles somewhat the old Roman form of tanks and the ancient pots for wine, oil, or other liquids. The gasholder working in this tank is a telescopic one of four lifts, containing 150,000 cubic metres, or about 5,300,000 cubic feet. The writer of the paper—with the title "A Note on Metal Gas-holder Tanks with Curved Sides"—was M. Bonnet.

Reduction in the price of gas, and increased make, have necessarily led gas companies to use larger and more economical apparatus. While considerable progress has been made in retort furnaces, in purification, and in the treatment of bye-products, &c., the question of gasholders has long remained stationary. In France, up to recent years, Paris only had gasholders of 30,000 cubic metres (about 1,060,000 cubic feet); Lyons, Marseilles, and Bordeaux had none exceeding 20,000 cubic metres (706,000 cubic feet). In England and America, however, there are gasholders of 345,000 cubic metres (say, 12 million cubic feet) and 425,000 cubic metres (or 15 million cubic feet). In Germany, towns of less importance than ours ordinarily have holders of 50,000 cubic metres (1,766,000 cubic feet), 100,000 cubic metres, and more.

This increase of volume has the great advantage of reducing the price of storing gas, per cubic metre, from 30 to 10 frs. and even less, as the gasholder becomes larger. But if the volume of gasholders and the number of lifts are increased, the mode of construction of the tank, which is the most delicate part, has not been improved. The tank of a gasholder of 150,000 cubic metres (5,300,000 cubic feet) is, in fact, made in the same way as that for gasholders of 10,000 cubic metres (353,000 cubic feet); and this type is neither logical from the point of view of the distribution of the tank metal, the function of the sheeting and its strength, nor economical as a structure.

A tank in sheet steel consists (fig. 1) of a bottom, A A', a vertical cylinder, B B', an angle-iron, C, joining the two, a circular gangway, D D', and gussets, B D D', supporting the standards. The gussets are riveted to the tank, and transmit to it the force of the wind, which acts on the lifts and guiding frame. The drawbacks to this arrangement are as follows:

(1). The metal used for the bottom is absolutely useless from the point of view of resistance. This bottom only ensures the tightness of the cylindrical part of the tank with the foundation. If this tightness could be secured otherwise, the whole of the metal of the bottom could be done away with. There is, therefore, here a considerable

amount of metal, which often represents a quarter of the total weight of the tank, and which has no really useful place in the construction.

(2). The vertical cylindrical part resists the pressure of the water, which gives rise to circular tangential strains. Its thickness is calculated on the French formula: $E = \frac{HD}{2 \times K \times R}$.

where K is the relation of the resistance of the riveting to the full plate. This thickness is, then, proportional to the diameter and to the height of the tank; and, when diameters of 60 and 80 metres (197 feet and 262 feet) are reached, if safe limits in the working of the metal are desired, it is necessary to have plates up to 50 and 60 mm. in thickness (1.969 and 2.362 inches). The weight of tanks is then too much; the work of hydraulic riveting, the coincidence of the rivet holes which it is necessary to drill, the placing together of the plates, are all difficult; and lastly the price is high. If the thickness of the plates was independent of the diameter, as in the system to be explained, there would be considerable improvement and great saving effected.

(3). The angle-iron joining the bottom to the vertical part is inevitably very thick. While the interior pressure increases the diameter of the tank, the bottom of the lower ring of plates, strengthened by the angle-iron and held by the bottom plates, cannot take part in the general tension of the circumference, and causes partial strains which are dangerous and lead to bursts.

(4). The gangway, like the bottom, consists of ironwork which does nothing. Its only effect is to ensure the circular form of the tank and it adds nothing to its strength.

(5). The force of the wind is carried on to the tank by the gusset plates supporting the standards.

Such a tank, which already bears uniformly distributed forces by the pressure of the water, has thus added to it considerable strains (varying in position and intensity), which it is almost impossible to ascertain. All these drawbacks—almost nothing in small gasholders—become serious in larger ones. The fact of having metal in certain parts which does nothing, and which in others exerts itself badly and uneconomically, leads to an increase of weight and of price which one ought to try to reduce.

To obviate these disadvantages, the Maschinenfabrik Augsburg Nürnberg (designated the "M.A.N." Company) have endeavoured, by a better apportioning of the metal, to design a tank which will have greater strength and be more economical both as regards the tank and its framework. The principle of the "M.A.N." tank is to replace the vertical rectilinear side of the tank by a flexible curved side, sustaining equal strains at all its points.

Let us suppose a perfectly flexible and resisting envelope—a sack, for example. If it is hung in a rigid circle, as when being filled, and if it is filled with water allowed to rest partly on the ground, it will take such a shape that it will have, at any point of the envelope, outward strains from the side, which are equal all over. This phenomenon is analogous to that of a heavy wire—perfectly flexible, and merely stretched between two points of support. This envelope will only have to resist the forces of tension in the meridian planes. Its form, and the strains which it will carry, will only vary with the total height of the water. The diameter of the vessel will not have any influence either on the strains which support the envelope, or, consequently, on its thickness. As regards the circular tension on the side, it is negligible on account of the tension following the curve.

DISTRIBUTION OF STRAINS.

Fig. 2 gives the outline of the system. The two ends of the curve at A and C must be kept fixed; and the strains at these two points are directed according to the tangents to the curve. At C, the strain is horizontal; and it is balanced by the tension in the bottom.

This tension is identical with that of the curved side. The thickness and the fixing together will, therefore, be the same in the side as in the bottom, the metal of which is now utilized rationally. The curved side is connected to the bottom, of which it is the tangential extension, by direct riveting. The bottom angle-iron (the drawbacks to which have just been explained) is done away with. At A, the strain follows the tangent A F to the curve. This will be counteracted by the horizontal circular girder A A', and by the vertical uprights D A B, the resultant of which is directed along A F. These uprights D A B, connected together by Saint Andrew crosses, rest on the ground across the bottom through the medium of the supports K. The curvature of the plates, the greatest dimension of which is on the meridian, is made so that the line of the middle of the vertical section of the plate coincides with the supporting curve

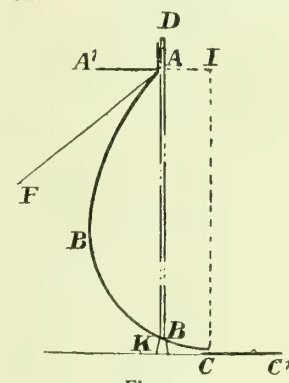


Fig. 2.

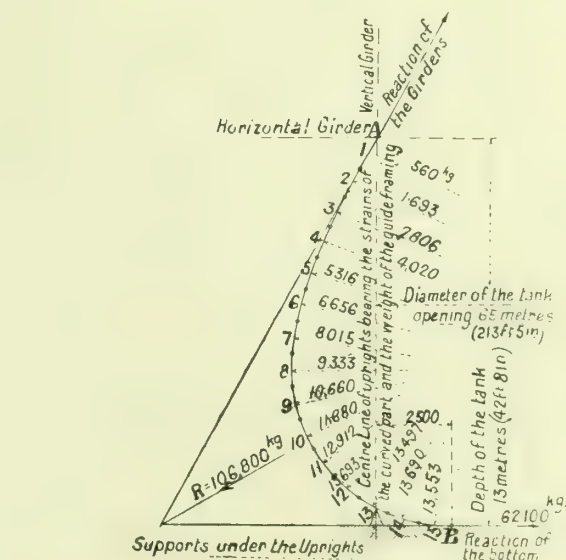


Fig. 3.—Diagram of Curve.

resulting from the pressure of the water. The pressure of the cylindrical column of water, which rests directly on the bottom, and is limited by the line I C, is received by the bottom itself and

transmitted to the foundation. The volume of water, enclosed in the annular space limited by the line I C, and by the side of the tank A B¹ B, gives rise to a total pressure directed towards the outside and the bottom, the vertical component of which finds a support on the point K, which transmits the pressure direct to the foundation.

It is interesting to observe that the general form of this curve is that which the Ancients, and especially the Romans, gave to the large-sized tanks in which they kept their liquids. The large pottery jars, containing several hectolitres of wine or of oil, were of a shape very analogous to that of the "M.A.N." tank.

OUTLINE OF THE CURVE.

The curve of the side can be easily followed from the diagram, fig. 3. Let us suppose the problem solved and that A B is the curve desired, and is such that it supports equal strains at all its points. Let us take a set, one metre wide on the circumference of the opening, and divide the curve into fifteen equal divisions. At the centre of gravity of these divisions, let us apply the water pressures. The table herewith gives the value of these pressures at different points.

Table of Water Pressures at Different Points of the Curve.

Number of Points.	Opening out of the Plate.	Length of Plate.	Surface.	Distance of Points from Top of Tank.	Pressures.
			Sq. M.		Kilos.
1	1'020	1'100	1'122	0'500	560
2	1'040	"	1'144	1'480	1'693
3	1'050	"	1'155	2'430	2'806
4	1'075	"	1'1825	3'400	4'020
5	1'090	"	1'200	4'430	5'316
6	1'100	"	1'21	5'500	6'655
7	1'110	"	1'22	6'570	8'015
8	1'110	"	1'22	7'650	9'333
9	1'110	"	1'22	8'740	10'660
10	1'105	"	1'215	9'780	11'880
11	1'095	"	1'20	10'760	12'912
12	1'075	"	1'0825	11'580	13'693
13	1'030	"	1'10	12'270	13'497
14	0'980	"	1'078	12'700	13'690
15	0'950	"	1'045	12'970	13'553

By carrying out the strains following the one with the other, parallel to their direction, the polygon of strains (fig. 4) is formed, the closing line of which gives in full and in direction the resultant RR¹ of the pressures. [The author then proceeds to show how the polygon is made up.] In practice, in order to lay out the

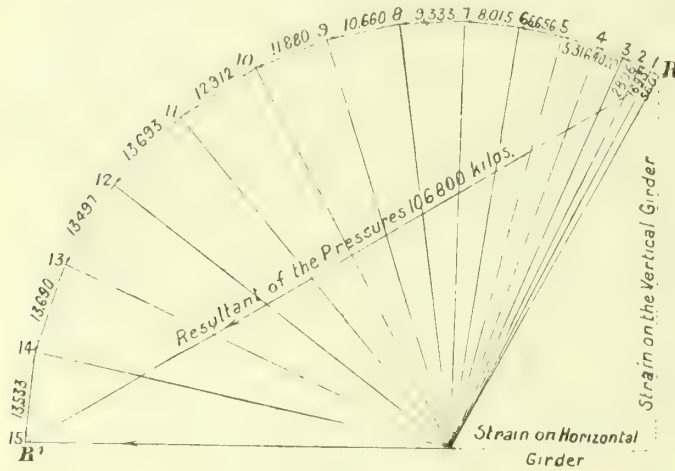


Fig. 4.—Polygon of Strains.
1 mm. represents 500 kilos.

curve (the points at which it must end being given), any curve whatever is traced out and one applies to it the water pressures in each division. Then the polygon of strains corresponding to these divisions is traced; and this polygon should be within a circle, if the curve is exact. If not, one begins again, and by repeated attempts arrives at the curve desired. Ascertaining the tensions and the form of the curve can also be obtained analytically.

A tank like this weighs about two-thirds of what a tank with a rectilinear side would weigh, the function of the metal being the same. Where the thickness of the rectilinear side would vary from 6 to 35 mm. (0'236 to 1'378 in.), a uniform thickness of 5 mm. (0'197 in.) is sufficient for the "M.A.N." tank. This thickness is increased up to 7 or 8 mm. (0'276 or 0'315 in.) from the construction standpoint.

FILLING THE TANK.

During the filling, the circumference of the tank does not present a surface under equal strains, as the form of the side has been arrived at by supposing the tank to be full. To prevent its deformation during this filling, latticed girders are constructed, confined by the vertical uprights, and curved according to the curvature of the side to which they are riveted (see fig. 5). These

girders will have their use only at the moment of filling, and do not take any part in the resistance of the tank when once full. They could be done away with after the filling. The rivets fastening them to the side do not serve any purpose when the tank is full. The force of the wind not being carried on to the side of the tank, the corresponding drawback noticed in cylindrical tanks is overcome.

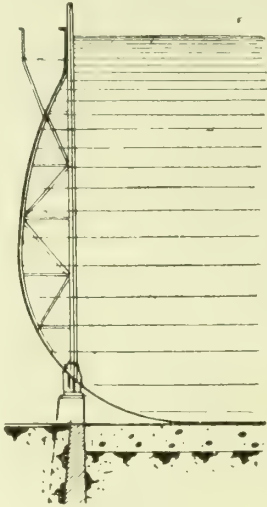


Fig. 5.

FOUNDATIONS.

As the rigid plates of the "M.A.N." tank, which take all the weight of the metal work and the pressure of the wind, rest on the masonry supports which surround the tank, the strength of these supports is only of importance in the one essential of the foundation. Even the bottom only supports the weight of water; and calculation has shown that an important depression in this part of the foundations would require only a slight increase in the work done by the plates.

The foundation consists then of two parts:

- (1). An annular wall formed in concrete, the wall going down to solid ground. On the top of this wall are placed the rest stones K (fig. 2) corresponding to the uprights intended to support the standards. At these points, the annular concrete wall is strengthened by buttresses.
- (2). The central surface, after taking up the bed of soft earth, is simply recovered with layers of gravel and sand, watered and rammed, over which a bed of cement from 20 to 30 mm. thick is laid, so as to ensure the binding of the gravel and to smooth the surface. Above this, a layer of asphalt, 30 mm. thick, is spread, in which the rivet heads sink down so as to be certain of contact with the foundation.

In case of the sinking of one of the supports, K, of the framework of the tank, the connection of the different parts is enough to avoid deformations or tangential strains. The form and the position of these supports round the tank render the adjusting of it easy in case the ground slips, without involving the difficulties which the raising of a cylindrical tank presents, resting wholly and directly on the foundations. The foundation of the "M.A.N." tank is thus appreciably cheaper than would be the foundation of a straight tank.

ANNULAR TANKS.

When the ground is very bad, and foundations have to be made on piles, annular tanks are introduced. These tanks have the serious inconvenience of having their inside ring under compression; and consequently they are easily distorted. To avoid this inconvenience, either very strong inside plating to stiffen the inside ring is used, or stays braced by bulky framework or reinforced concrete are adopted. But the mass of metal used causes the net cost to be almost as high as if the whole of the foundation had been piled all over the surface.

The "M.A.N." tank lends itself very well to the annular form, and can be easily understood from fig. 6. Both the exterior and the interior sides are in tension and under the same conditions. There is no longer any side under compression. The part A, A, representing the bottom is in equilibrium. The parts A, C, B, D, have their two sides the same. This arrangement is only given as a record; but it shows an excellent solution of the annular tank. It should, however, be added that it has not yet been made.

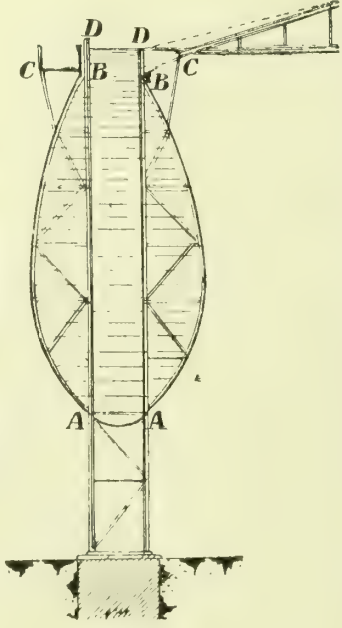


Fig. 6.

Other interesting improvements have been proposed by the "M.A.N." Company in the guiding, in details of construction, in the framework supporting the crown, and in the warming of the hydraulic cups. It is only possible to name them here; the author being desirous of calling attention chiefly to the tank with curved side, which marks important progress.

The "M.A.N." Company have under construction the

following gasholders with curved sides :—

One of 250,000 cubic metres at Brigittenau, Vienna;	
" 40,000 " " Mayence;	
" 120,600 " " Nuremberg;	
" 25,000 " " Augsburg.	

One gasholder of this type, of 150,000 cubic metres capacity, is now regularly used at the gas-works of Simmering, Vienna. The Municipal Commission to whom was entrusted the acceptance of this gasholder has, during and after the filling of it, taken observations and precise measurements which are of considerable interest.

The measurements of elongation taken at the largest circumference of the curved tank—that is, at point B in fig. 7 (taking into account the influence of the temperature)—showed that the circumference, which was 217.59 metres, was elongated 78 mm. (3.071 inches). The static calculation had anticipated 76 mm.

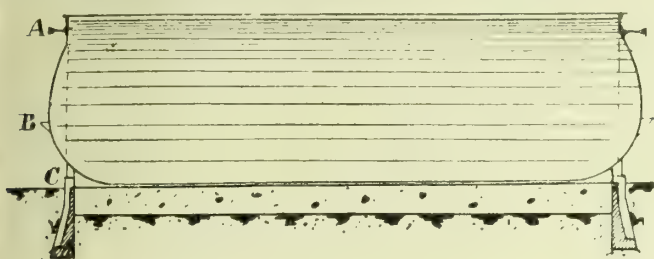


Fig. 7.

The measurement taken at the point A, at the top of the ring of the tank, gave an elongation of 100 mm. (3.94 inches). The static calculation had given 99 mm. As regards the horizontal position of the tank, it was ascertained that the top of the tank had given way at the maximum 5 mm. (0.197 in.); the conditions imposed had allowed 65 mm. (2.559 in.). The sinking at the point C was 15 mm. (0.591 in.). The elastic elongations of the curved tank, as measured, were, therefore, nearly in absolute agreement with them as they had been calculated. This remarkable agreement is due to the fact that the form adopted for the work is such that all the strains which arise are ascertained statically, without it being necessary to bring in hypotheses of distortion, as one is obliged to in most metal structures.

On account of the excellent result of the filling of the tank, a new gasholder of five lifts with a curved tank, of 250,000 cubic metres, has been ordered for the works at Brigittenau.

This new type of tank appears, therefore, to be of considerable interest where gasholders above 20,000 cubic metres (706,300 cubic feet) are contemplated, but especially for those of the largest size, both from the point of view of sound construction and in regard to economical installation.

THE PARIS RETORT-DISCHARGING MACHINES.

By M. ANTOINE FOILLARD.

[Abstract of a Paper read before the Société Technique du Gaz.]

One of the visits made by members of the Société Technique du Gaz during their annual meeting was to the Landy works of the Paris Gas Company, where were seen many important electrical appliances for the handling of coal and coke. Among these were the Sautter-Harlé electrically driven coke-discharging machines, which, it will be remembered, were adopted by the old Compagnie Parisienne du Gaz. There are thirteen machines on this system now in use, and four in course of construction. It was fitting, therefore, that there should be a paper dealing with these machines; and M. Foillard contributed a short one to the proceedings, under the title of "A Supplementary Note on the Electrical Dischargers of the Société du Gaz of Paris." His paper showed that experience had led to the simplifying and strengthening of the dischargers; and the main point dealt with was the adoption of a discharging machine having two rams instead of one, which allows greater freedom in the working, and permits one ram or pusher to be at rest and to cool down while the other is at work.

He said: My object to-day is not to describe the principle of these machines, which I put before the meeting of 1906; but rather to give some details that may be of interest. These dischargers are of two different models, one with a single pusher, and the other with two pushers, placed side by side, which can be used alternately, passing from one to the other by means of gearing, put into or out of work by a lever under the control of the driver of the machine.

Fig. 1 shows the two end plates of the rams and the coupling gearing, which can only be put into operation by one or other of the two sets of gearing driving the pushers. The advantage of this arrangement is to give the machine greater power in case of its being called upon to do an unusual amount of work, either regularly or through accident. There is always one pusher cooling itself while the other is at work.

In a general way, both the single and the double pushers which the Société du Gaz of Paris have at work, have been much simplified and strengthened. Experience has shown us that in these installations, it is before all things necessary to have strong material, free from all complication; and automatic combinations, that we formerly had, were found to have greater drawbacks than advantages.

The author then refers to the three types of racks working the pusher-plate that have been tried on the Paris machines. The

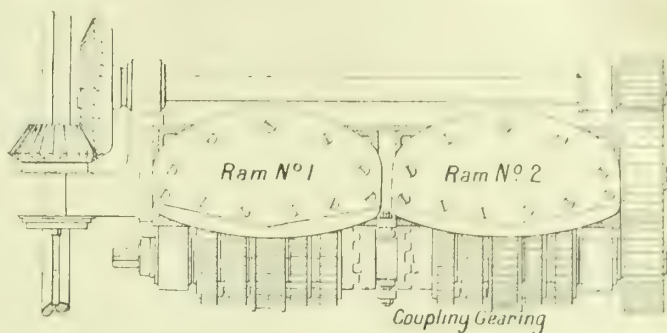


Fig. 1.—Front View of the Two Rams.

first was a small one of simple flat iron, 30 mm. wide by 75 mm. deep (1¼ in. by 3 in.). It soon got hot, and required repairing. The second type was a built-up one, consisting of a flat bar across two angle-irons, separated and closed by an inverted T-piece. The groove in the middle was used to receive the water for keeping the pusher cool. This artificial cooling was not found to be successful; and the necessity for having a water-tank on the machine (which tank often failed to get filled) also proved inconvenient. So the third, and last, form has been adopted which has given every satisfaction. It is a massive bar of forged steel of double T section, and of great rigidity, both horizontally and vertically. It is 90 mm. wide by 100 mm. deep by 32 mm. thick (about 3½ in. by 4 in. by 1¼ in.).

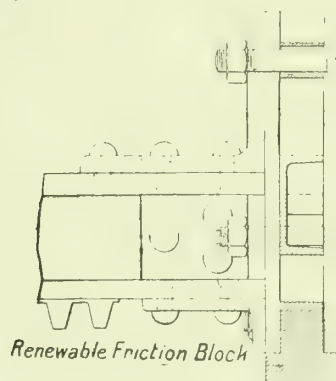


Fig. 2.—Side View of the Pusher-Plates.

Fig. 2 shows a side view of the pusher-plates. It consists of two plates, each 12 mm. (½ in.) thick, braced by tubes, through which the bolts pass, and strengthened by a channel iron. At the bottom part are two blocks or friction plates which can be easily renewed when worn out. In the original machines, the ram end consisted of a single plate. It quickly got distorted, becoming V-shaped and making a wedge in the mass of coke.

The author proceeds to give some figures relating to the normal working of the machines with a single ram; the retorts being 6 metres long (19 ft. 8 in.) and charged with about 600 kilos. of coal (nearly 12 cwt.), which is carbonized in eight hours. The results given have been obtained while the machines have been undergoing the ordinary methodical upkeep, which the Société du Gaz organize so well. The average time for the discharge of one retort, including all accessory movements, is 55 seconds; or in 60 minutes each machine could discharge 65 retorts. The speeds per second for the different movements are as follows:—

Pusher	{ Discharging	360mm. (say, 14 inches)
	{ Return	460 " " 18 " "
Travel of the machine.	{ Upwards	600 " " 24 " "
	{ Downwards	220 " " 8½ " "
Vertical movement {	Upwards	230 " " 9 " "
	Downwards	230 " " 9 " "

The consumption of electricity, at 240 volts, in normal working is as follows:—

Pusher	{ Discharging	1800 watts
	{ Return	1080 " "
Travel of the machine.	{ Upwards	1200 " "
	{ Downwards	720 " "

From diagrams taken, it appears that the expense of energy in normal working per retort discharged is only about 17 to 20 watt-hours. Reckoning 25 watts (to take into account wrong movements and anything unforeseen), the result is arrived at that forty retorts containing 17 (metric) tons of coke, and having produced about 7200 cubic metres (254,280 cubic feet), are discharged with an outlay of energy of 1 kilowatt-hour.

Gas from Peat.—A French patent has been taken out by the Peat Gas and Coal Company for a process of manufacturing gas from peat. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the wet peat is treated in a disintegrator so as to destroy its porosity, and at the same time it is sprinkled with petroleum or other hydrocarbon. The pasty mass is then heated in a retort until it is converted into coke. Air is admitted to the retort during the coking, and the heated air, mixed with gas from the retort, is carburetted by passing through tar obtained from the peat. The gas is then cooled and the bye-products are condensed.

COMBINED DE BROUWER RETORT CHARGER-DISCHARGER.

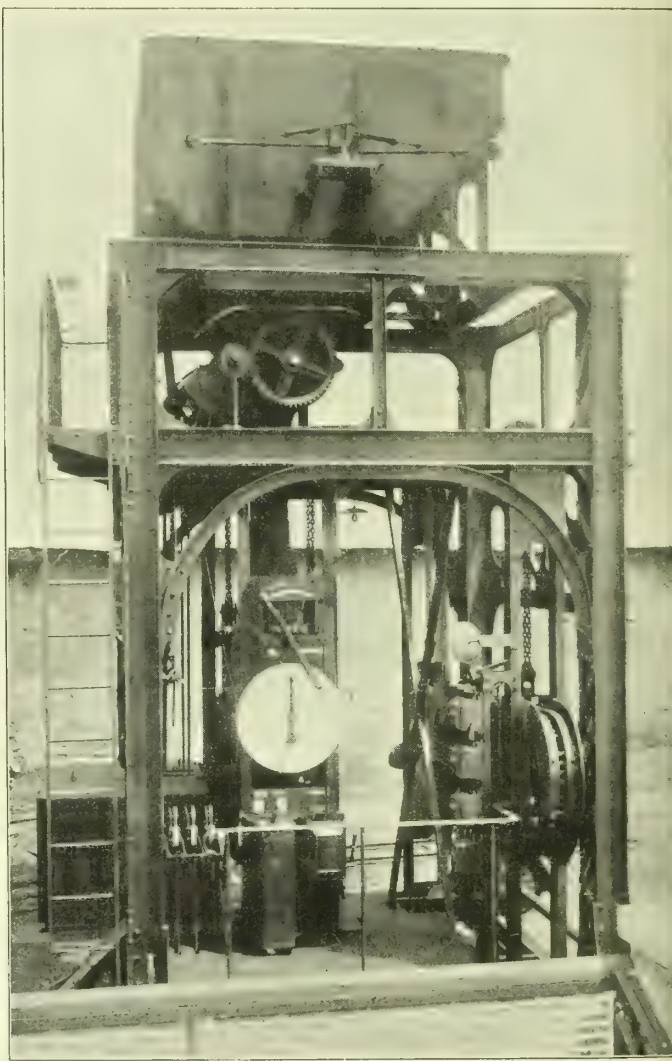
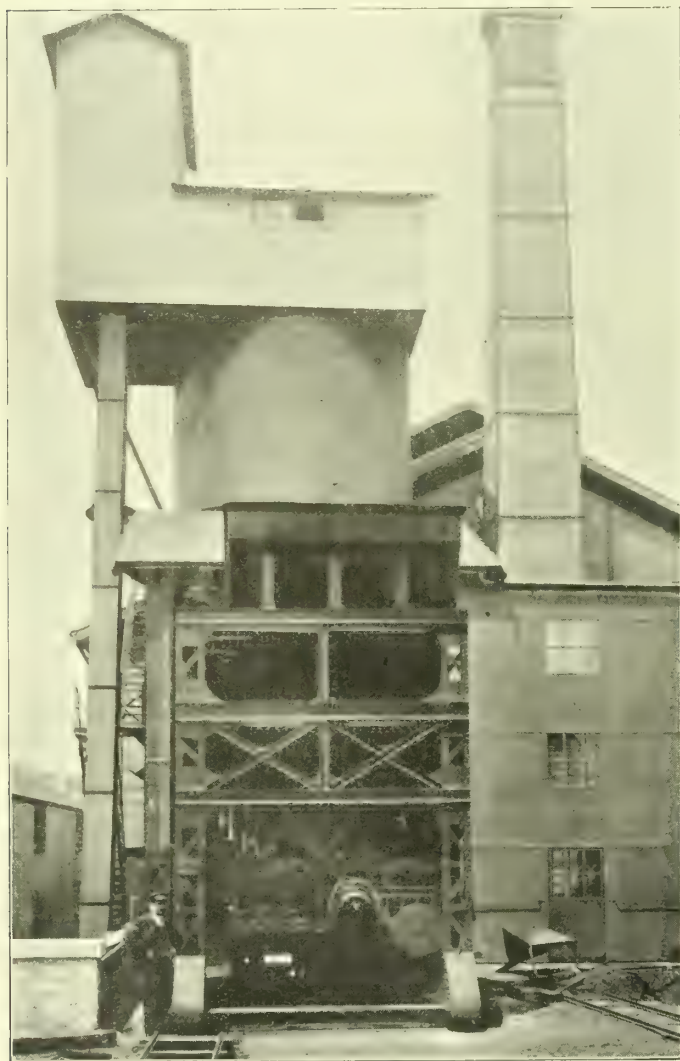
By M. R. DE LA BOULAYE.

[A Paper read before the Société Technique du Gaz.]

Both the Paris design and the De Brouwer type of retort charging and discharging machines came in for some notice in the proceedings at the annual meeting of the French Gas Society. The object of the paper dealing with the latter type was not to describe the separate charging and discharging machines on the De Brouwer system, which are so well known and appreciated, but to bring to notice a combined machine, made by the Compagnie Anonyme Continentale, and at work at the Angers Gas-Works. The author of the paper, M. R. de la Boulaye, points out the improvements that have been made—such as having an independent motor for the pusher, instead of driving it from the travelling motor; and an indicator for showing the actual amount of coal projected into any given retort. He compares the separate machines with a combined one, and also a suspended charger with one travelling on the floor; and he comes to the conclusion

that the latter requires more upkeep than the former, but that in the majority of cases the balance of advantages rests with the travelling charger. For gas-works of average size, he considers the combined machine is the neater and more practical.

At Angers, the charger and the pusher are side by side on a carriage-frame running on four wheels, two of which are driving ones. Over the top is a storage tank, of about 6 cubic metres (212 cubic feet) capacity, for the feeding of the charging machine. There are three motors—one for the charger, another for the pusher, the third for the general driving. The electric current is taken by a trolley from an overhead wire. The current goes by way of a commutator in two directions—either to the discharging motor, or to the general one, which (by means of three sets of gearing) drives the travelling, the lifting and lowering apparatus, and the Archimedian screw supplying the charger. All levers are close at hand for the driver of the machine, who has also in sight



The Combined De Brouwer Retort Charging-Discharging Machine at the Angers Gas-Works.

the speedometer, recording the rate of revolutions of the charger, and a divided dial, with moving pointer, showing the weight of coal thrown into the retort.

IMPROVEMENTS AND DRAWBACKS.

Some improvements have been introduced in this machine. In former machines, the pusher was driven by the travelling motor by means of a vertical shaft. Now it is driven directly; and some mechanism, which was necessarily delicate, has been done away with. Further, the control of the discharge was more complicated, as it necessitated the handling of two levers. The number of motors is, moreover, not increased, as the Archimedian screw, now worked from the general motor, before required a special motor.

Another improvement is that in front of the driver is a dial, with marked divisions and a needle worked from the spiral screw, indicating the number of its turns. After each retort charge, the indicator returns to zero. A mark shows the number of divisions over which the needle ought to pass so as to get the desired charge of coal. Each division gives 6.5 to 7 kilos. (say, 14 to 15 lbs.) of coal. To verify the weight obtained, a charge is

made in an experimental retort; and the coal is then withdrawn and weighed. The regularity of the layer of coal is also thus ascertained. This arrangement has undoubted advantages. It allows of variations in the weight of the charge being made even during the charging. Further, by showing at every moment what is the point reached in the charge, it ensures the regular reduction of the speed, and, consequently, the evenness of the layer of coal. But exact control of the weight of coal carbonized cannot be counted upon. Its condition, notwithstanding the spiral screw, has considerable influence on the amount of the charge. Dry, dusty coal will give more weight than when it is in lumps; wet coal will give an opposite result. With very wet coal, it hardly slides on the screw, with the result that a retort will be half full for the same number of divisions which, at another time, will give a retort crammed full. Without going to such an extreme, there are considerable variations. Thus, the same coal has given with 65 divisions, 419 kilos., and with 62 divisions 415 kilos., or only 4 kilos. (8.8 lbs.) less, instead of a difference of 23 kilos. (44 lbs.), which there ought theoretically to have been. The error can easily reach, on an average, one ton in fifty; and as it occurs sometimes one way and sometimes the other, it may be taken in

practice to be much more. However, it is the only serious drawback experienced with this machine, and, indeed, it is less than with the preceding machines. In all other ways, every satisfaction has up to now been given.

COMBINED AND SEPARATE MACHINES COMPARED.

It remains to be seen if it is better to adopt separate charging and discharging machines, or whether the combined machine offers equal facilities in working. The combined machine is naturally bigger and heavier than each separate machine. Its four points of support cover a surface of 3.20 metres by 3 metres, or 9.60 square metres (103 square feet); and its total height, including the slope of the coal, is 6.60 metres (21 ft. 8 in.). But though the dimensions of a single pushing machine are less than these, those of both machines would be as large.

The weight in full work of the combined machine is from 20 to 22 tons; while the weight of a single machine is about 15 tons. All that is required is to make the travelling floor stronger.

Again, it may be objected that if an accident occurs, either to the motor or to other mechanical parts of a combined machine, the whole is brought to a standstill. To guard against this, the best thing to do is to have a machine in reserve. It is in this way that we have up to now avoided not only stoppages, but also delays in the times of making the charge. Should, however, the purchase of a second machine appear too costly, with a number of change-parts in reserve, any breakdowns whatever could very quickly be remedied.

The cleaning and upkeep of the machines, which we have been able to do regularly and fully, on account of having a reserve machine, have not brought to light any apparent wear after seven months' working, notwithstanding the large bulk in motion. We do not see, therefore, how it can be argued that the weight, dimensions, and difficulties of maintenance of the combined machine are reasons for preferring separate machines.

Neither can it be said that it is more difficult to work, for our experience has proved that both the discharging and charging are very simply and very quickly done. As soon as the retort-lids are opened, horizontal tiers are discharged. While the coke is being taken away by the conveyor, the retort lids and ascension pipes are cleaned. Then the retorts are charged, the coal-tank refilled, and the machine placed for the following charge. All this requires 20 to 25 minutes to discharge 3000 kilos. of coke and to charge 3900 kilos. of coal.

All the special supervision, consequent upon the combination of the two machines in one, can be carried out during necessary stoppages; and, in our opinion, two separate machines cannot work more quickly than one combined machine. Where a large number of retorts are placed in the same line, and the charging is done immediately after each discharge, then there is an advantage in having separate machines; and the duration of carbonization in each retort is thus prolonged. This also necessitates a larger staff. If needs be, it could be adopted with a combined machine. But the cleaning of the retort-lids would have to be done first of all; and the manipulation of the machine would become very complicated. The longer time taken would thus destroy any advantage.

COMPARISON OF TRAVELLING AND HANGING CHARGERS.

The combined machine, like the floor travelling charging machine with coal reservoir, has a disadvantage in comparison with the suspended charger. It cannot charge more than nine or ten retorts without returning to the main storage tank to be filled up with coal. This means loss of time. We must, therefore, compare installations having hanging chargers and storage tanks above the retort-bench, with those having travelling chargers and themselves carrying the coal.

The first arrangement necessitates an elevator, a conveyor, and coal-bunkers with supporting girders. The second always requires an elevator, but does without the conveyor and bunkers; the elevator feeding directly a general storage tank of large capacity. The last requires a strong framework to support it; but it is independent of the retort-house, which remains undisturbed, except during the time of charging.

The capital cost of these two types is practically the same; the cost of the coal-bunkers and conveyor making up for the greater cost of the travelling charger and erecting the general storage tank. The travelling charger requires more upkeep than the suspended one; but in the long run, the coal-bunkers are eaten by the oxidizing action of the coal; and the conveyor wants keeping up every minute. Generally, the bunkers are 20 metres square, or of 16 tons—the amount required for a bed in 24 hours. It is, therefore, necessary to feed them every day whatever be the number of beds in work. Some installations even have no tank above the bench; and the coal supply has to be carried on day and night, with many men, wearing out the apparatus and making repairs and upkeep difficult.

With a reservoir of 80 to 90 tons, only supplying three beds of nine retorts, as is the case at Angers, the coal is raised in the winter only five days in the week—the sixth being kept for cleaning and maintenance. Now, in the summer, it is necessary only to work three or four days per week. Besides reducing the staff, this avoids useless wear of the machinery and facilitates repairs. There is less outlay for steam, and alleviation of the mechanic's work at the electricity station at night and on Sundays.

Plants of the two types have not been long enough at work yet to afford practical information on the comparative costs of upkeep

over a certain period; but it seems that in many cases the advantage lies with the travelling charger and general reservoir. Plants at very large works and those at works of average size should be distinguished. For the former, several machines have to be employed, with many general reservoirs requiring a lot of room. The size of these plants enables the full power of the elevators, breakers, &c., to be used; and the intermittent feeding of reservoirs does not present the same problem.

For a medium-sized works, however, the combined machine seems the most fitting and most practical solution of mechanical charging and discharging. The manipulation is as easy and as quick as with the separate machines; the price of the combined machine is less; the storage tanks above the bench are not required; and the coal-projector allows intermittent feeding, and consequently a better use of material. Moreover, the saving which results from the adoption of the combined machine is so much that in all works it is well to provide reserve machines, which emphasizes the difference in the cost of the two kinds of installations. In such a case, the combined machine has all the conveniences of the separate machines.

MIXING GAS AND AIR FOR HEATING PURPOSES.

By M. VANDERPOL, of Lyons.

[A Paper read before the Société Technique du Gaz.]

The author began by pointing out that it is generally acknowledged that in burning a given gas with the object of producing the maximum temperature, it is necessary to use the minimum quantity of air; the proportion, in the case of coal gas, ranging from five to six times the volume of the gas. In order to take in, and mix with the gas, the air necessary for complete combustion, the method adopted is either that of suction by a chimney, or of pressure of either the gas or the air. As regards the taking-up of the air by the gas, the latter is one-seventh the volume of the mixture which it is required to produce; and as its density is about half that of the air, a given mass of gas is required to take up air to the amount of (say) thirteen times this mass. It will thus be understood that when using gas at the ordinary pressure this may not be an easy matter in practice; and the mixtures so made, even with the aid of the draught produced by a chimney, are not at all perfect. In order to produce a more certain and energetic draught of air, and a more perfect mixture of the latter with the gas, it has been the practice to use the gas at an increased pressure of from 1 to 2 metres of water. For two reasons, such high pressure is disadvantageous. In the first place, there is greater risk of leakage; and, secondly, the orifice from which the gas issues has to be of very small diameter.

Attempts have been made to bring the air and the gas together by means of the former, with results which have been good, though inferior to those obtained with compressed gas. This system, however, has the drawback of requiring a duplication of the mains supplying the burners—one set for gas, and another for the compressed air. Furthermore, in order to secure constant proportions of the two gases, both must be maintained at precisely the same pressure at the burner—a condition which is not easy to fulfil, if the consumption on the main is at the same time undergoing variations.

The third solution of the problem to which attention has of late been turned consists in previously mixing the air and gas in suitable proportions. This system has some advantages. First of all, a more intimate mixture of the air and gas is obtained; and next, if the whole quantity of air necessary for combustion is not introduced into the mixture, the pressure of gas required to take up the remainder is very small. Take, for example, the case of a mixture of one volume of gas with two volumes of air, or a mass represented by the figure 5. This is the quantity of "gas" available to take up the residual 8 parts of air, as compared with 1 part of pure gas required to take up (say) 12 parts of air.

Again, any loss of pressure will not alter the proportion of air to gas. From this, it would seem that as regards regular and perfect combustion this system of mixing the air and gas in the proportions to ensure complete combustion should give the best results. Such a mixture, however, could never be employed on account of its explosive properties, except under certain special conditions. The gas is used in admixture with three times its volume of air; and even with this proportion certain precautions are necessary. It is better to limit oneself to twice the volume as the maximum proportion in which the air is to be employed. The less the proportion of air, the higher the pressure at which the mixture is required to be used; but even with the air in the proportion necessary in practice—namely, $1\frac{1}{2}$ times that of the gas—the pressures are not great.

The chief advantages of thus working with previously mixed air and gas under constant pressure are as follows: (1) In heating by gas on the large scale, absolutely constant calorific power is obtained. (2) The maximum temperature is produced in consequence of the freedom from excess of air. There is no cooling of the flame, and an excellent combustion results from the intimate mixture of air and gas. It is for this reason that the system affords such excellent results in incandescent lighting—giving one carcel-hour with 6 litres (0.21 cubic foot) of gas, or even less.

The author then proceeded to describe two forms of apparatus

in which the method of the prior admixture of air and gas is adopted. The first, invented by MM. Bouvier and Collon, is shown in fig. 1*. It consists of two pumps placed one above the other; the upper pump supplying the air, having three times the section of the lower one, which is used for the gas. In order to reduce the effect of the strokes of the piston at the outlet of the pump, the air and gas are taken separately into reservoirs, after traversing which they pass into an attachment fitted with hydraulic seals so as to prevent any possible striking-back of the flame, and mix at the entrance to the mains leading to the burners. A regulator is used to arrest the passage of air or gas to the reservoirs when the consumption reaches or falls below the normal supply of the pumps. This apparatus, named the "Calor," has met with useful application in the heating of laundry irons; it having been found to afford considerable saving of labour to the laundress in comparison with the charcoal closed stoves usually employed.†

The second apparatus, shown in figs. 2 and 3, is that devised by the Société Industrielle des Compteurs. Like the one just described, it adjusts the proportions of the gases, mixes them, and subjects them to pressure. Its principle, however, is entirely different. An iron tank is divided into two parts by a partition in the middle. In each of these sections, or in two separate tanks, is a drum resembling that of a gas-meter. Each drum can

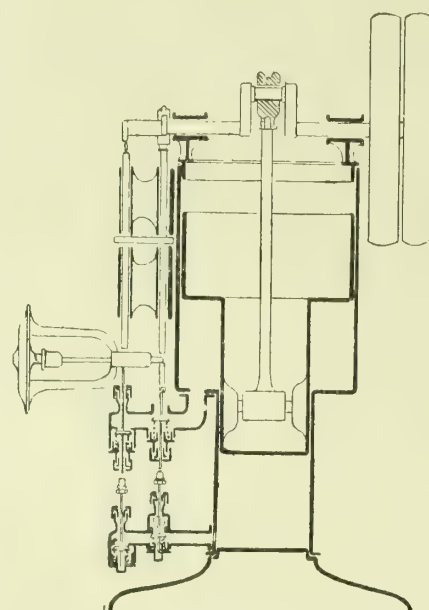


Fig. 1.—The Bouvier-Collon Gas and Air Mixer.

* The apparatus has been patented in England, and has been described in the "JOURNAL." (See Vol. XXVIII., p. 593, and Vol. CI., p. 300.)

† This application of the "Calor" was on view in the vestibule of the hall of the meeting-place.—ED. J.G.L.

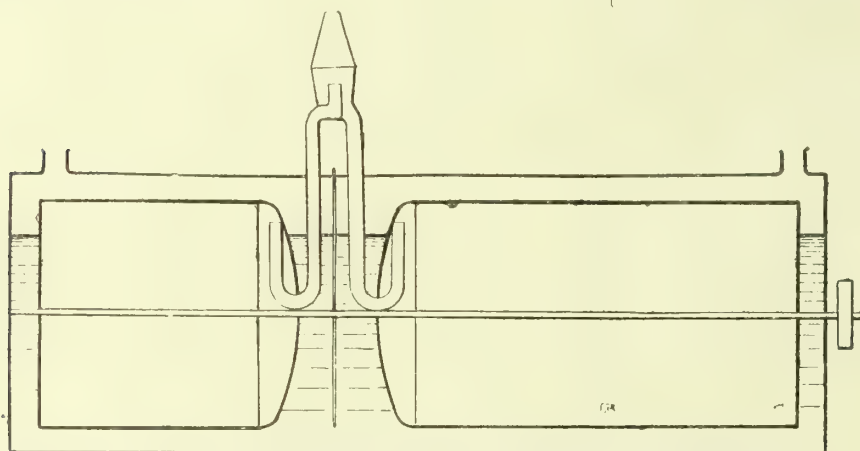


Fig. 2.—The General Arrangement of a Second Form of Gas and Air Mixer.

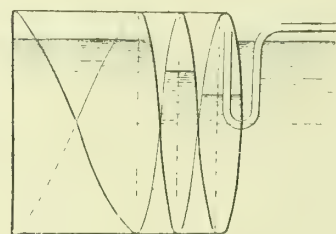


Fig. 3.—Section of the Drum.

be rotated on its axis by any convenient motive power—*i.e.*, an electric motor, a hot-air engine, or else a system of pulleys and a windlass, as in the case just described. The construction of the drums is as follows: The cylindrical capacity of the drum is divided into two by a division which is formed of two helicoidal surfaces soldered together. The surfaces are of different pitch—that of the second being smaller than that of the first. The drum is closed by a cap, and the compressed gas or air passes out by a syphon. Compression of the air or gas proceeds continuously; the level of the water between the two divisions falling according to the pressure attained by the air or the gas—that is, in proportion to the rotation. Further, the space in the drum which contains the compressed air or gas is limited by the fixed surfaces on the one hand and by the helicoidal surface on the other; so

that its flow is constant, and does not give rise to variation in the pressure so long as the consumption continues. If this varies, a regulator placed at the outlet of the mixture reduces or increases the rotation to meet the requirements in the pipes—the composition of the mixture remaining unaltered. The power required for the apparatus is very slight. It can also be actuated by a weight; but, in order to avoid the numerous pulleys which have usually to be employed, a special device has been constructed, consisting of two pulleys provided with grooves, which agree with the diameters corresponding in turn to the speeds of displacement of the cord. The apparatus not only takes up very little room, but where there are only two axes to rotate they can be mounted on ball-bearings, with the result that the friction does not amount to more than 5 per cent. of the power transmitted.

REGISTER OF PATENTS.

Incandescence Bodies for Gas Lighting.

BÖHM, C. R., of Berlin.

No. 10,400; May 1, 1909.

Many attempts have been made, the patentee remarks, to utilize artificial silk for the manufacture of incandescence bodies for gas lighting—for instance, by adding the usual luminiferous salts to a collodion solution before it is formed into filaments. Another method consists in impregnating with luminiferous salts a fabric woven from artificial silk, after which the fabric is allowed to dry, then drawn through an alkaline bath (of ammonia) for converting the nitrate into hydroxides, and subsequently replacing the bath by a bath of hydrogen peroxide. However, as hydrogen peroxide converts only the thorium salt into a form insoluble in water, while leaving the cerium nitrate unchanged, this defect is remedied by the addition of organic acids or their salts. It was attempted also to produce the desired effect by simply impregnating the fabric woven from artificial silk, using first a colloidal thorium solution and then a solution of basic thorium salts. The "object of such treatment appears readily from the fact that the excess of nitric acid contained in every normal thorium nitrate has a destructive effect on the substance of the artificial silk."

The present invention starts from a recognition of this fact, and serves to simplify the manufacture of incandescence bodies from artificial silk.

Experiments have shown, it is pointed out, that the substance of the artificial silk is not only left uninjured, but is affected favourably, if

instead of compounds of the luminiferous salts with inorganic acids compounds of the same with organic acids are used. Organic acids are all weak acids, and will not therefore destroy the artificial silk if employed in excess, as is the case, for instance, with nitric acid. Even insoluble compounds of thorium with organic acids may be employed for the impregnation of incandescence mantles of artificial silk, inasmuch as they are in most cases dissolved by a minute addition of an inorganic acid. In this case the inorganic acid always occurs in a chemically combined condition, and never as a free acid, as the stronger acid always drives out the weaker. This is important, because, as already mentioned, care must be taken in the manufacture of this class of incandescence bodies to avoid free inorganic acids—especially nitric acid.

There are a considerable number of solvents for sparingly soluble organic compounds of luminiferous earths. In the majority of cases they will not be used, however, because there exist also soluble salts of the said earths, which may be used with advantage for the impregnation of incandescence bodies from artificial silk. The woven fabrics, impregnated with organic acid salts of luminiferous earths, or with a mixture of organic and inorganic acid salts of luminiferous earths, are fixed, preferably, by subjecting them to an alkali bath or treating them with alkaline vapours, such as ammonia vapour.

If organic compounds are used for impregnating the incandescence bodies made of artificial silk, the slight addition of cerium may be left out of consideration and used in the form of a nitrate, as hitherto.

As the compounds of thorium and of the other rare earths with organic acids will rapidly hydrolyze, this property may be utilized advantageously for the fixation or solidification of the impregnated fabric by means of peroxide of hydrogen. This reaction will, however, take a much more rapid course, if the artificial silk fabric is slightly impregnated with organic salts, instead of adding them to the hydrogen per-

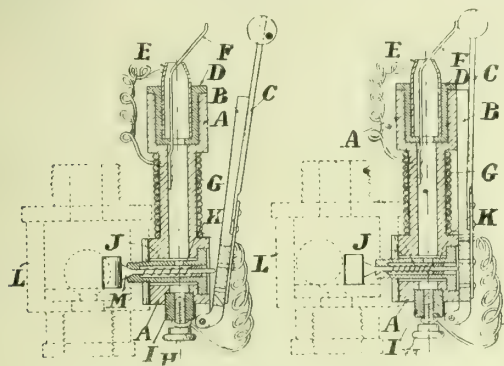
oxide. In selecting the particular salt, account must be taken of the fact that some organic compounds prevent the precipitation by means of hydrogen peroxide or ammonia.

Controlling the Supply of Gas and Igniting Same.

GIORGI, A., of Florence, Italy.

No. 12,470; May 26, 1909.

This invention relates to means for controlling the supply of gas to gas-burners, and also for igniting same, of the kind wherein an electro-magnet is provided with a double armature, one part of which actuates the gas-valve, while the other part actuates a contact so as to set up sparking which ignites the gas.



Giorgi's Gas Controller and Igniter.

A is the hollow core of the magnet, and B C the double armature—B being the fork-shaped part pivoted to the lower end of the hollow magnet core, while C represents the hammer portion, which is mounted on a spring secured to the lower end of the fork-shaped part. E is a socket or nozzle fitted at the upper end of the magnet core; being insulated from the core by the sleeve D. F is a spring rod of a non-oxidizable metal, extending through the nozzle E, and secured at its lower end to the inner surface of the core of the hollow magnet, while its upper end (which projects beyond the upper end of the nozzle E) is normally in contact with the edge or lip of the latter. G is the winding of the magnet; the upper end of the winding being connected to the nozzle E, while the lower end is connected to the binding screw H. The lower part of the core A is formed with a transverse passage J, fitted with a bush K in communication with the interior of the casing L (shown in broken lines) of the valve which controls the supply of gas, to the service-pipe of which it is fitted—the bush having mounted within it a rod M normally held in the inoperative position by a spring, and projecting at its outer end through the magnet A and into contact with the lower end of the part B of the armature.

Assuming that the gas is cut off and that it is desired to ignite a burner, the circuit containing the electro-magnet is closed by a controlling switch (not shown), whereupon current flows from the battery (also not shown) to the clamp H, thence, through the winding G, to the nozzle E, and through the spring rod F to the hollow core A, and thence to earth. The double armature B C is thereby attracted towards the electro-magnet; this movement of the double armature actuating the rod M so as to open the gas-valve and cause the gas to pass to the burner, and also, through the hollow core A, to the nozzle E. The part C of the magnet is attracted simultaneously with the part B; and its upper end strikes the end of the spring rod F, thereby pushing it out of contact with the nozzle E and breaking the circuit so that the elastic armature C recoils, and permits the circuit to be again completed. This operation continues as long as the controlling switch is on—thereby causing the armature C to vibrate and create a rapid succession of "makes" and "breaks," and, consequently, a succession of sparks between the spring rod F and the nozzle E. This sparking ignites the gas issuing from the socket E, and this serves to ignite the gas issuing from the main burner.

Gas-Purifiers.

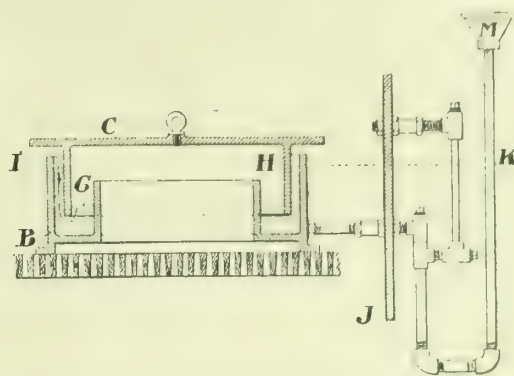
MAY, T., of Richmond, Surrey.

No. 16,871; July 20, 1909.

This invention relates to purifiers in which horizontal grids are placed one above another (at some little distance apart) supporting purifying material; the gas introduced under the lowest grid rising through the interstices of successive grids and through the purifying material. It has been customary, the patentee points out, to provide automatic or other valves or bye-pass arrangements by means of which, when the pressure of gas below any grid becomes excessive in consequence of the resistance of the purifying material, a portion of it can be led into the space above the grid without passing through the purifying material in the usual way. The present invention is designed to provide a simple and effective automatic bye-pass characterized by the employment of a water seal, through which the gas can blow from the portion of the purifier below the grid when a certain pressure is reached or exceeded.

The apparatus comprises, firstly, a bell or cover provided with legs or supports, and with means whereby it can be lifted; and, secondly, an annular trough or flanged ring adapted to contain water, into which the edges of the cover dip—the legs of the cover resting upon the bottom of the trough. The trough holds sufficient water to resist a pressure equivalent to (say) 4 inches of water, in which case the rim of the cover will be immersed to a depth of 2 inches; the inner wall of the trough therefore rising at least 2 inches plus the depth of the legs of the cover. The outer wall of the trough may rise above the cover, so as to prevent the purifying material falling into the water, or the cover may overhang the outer wall. The depending flange of the bell is

near the outer wall of the trough, so as to leave the greatest practicable area of water between the cover and the inner wall of the trough. The water is not found to evaporate to any appreciable extent; but, if necessary, the trough may be connected to means for refilling—such as a seal and tundish.



May's Gas-Purifier Bye-Pass.

Over the purifier grid shown is placed an annular trough B, containing water. The bell C has a number of downward extensions resting upon the bottom of the trough, two of which legs are indicated in dotted lines. The gas in the compartment below the grid has free access through it and through the open centre of the trough to the surface of the water at G, which surface is depressed by the pressure of the gas; the level of the water contained between the outer wall of the trough and the flange H of the cover being thereby raised. The pressure still increasing, the gas forces its way through the water seal and escapes, as indicated by the arrow I, into the compartment of the purifier next above the grid. The wall J of the purifier may be pierced to admit water from a pipe K, having a bend or seal to prevent leakage of gas, and a funnel or tundish M at the top, into which water can be poured. The upper opening of the pipe K should normally be plugged or otherwise closed, so as to prevent evaporation.

Gas-Fires.

YATES, H. J. (John Wright and Co.), of Aston, near Birmingham.

No. 17,920; Aug. 3, 1909.

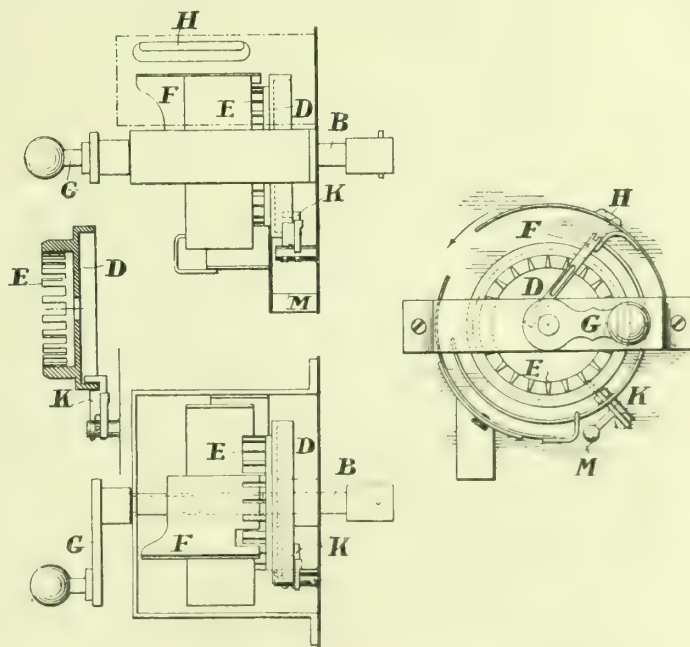
This gas-fire is of the "basket" type; and the invention comprises the employment (in conjunction with a frame or grate containing the refractory fuel and fire-brick back or lining, and adapted to be placed compactly within, and supported upon, the fire-bars of an ordinary coal-fire grate) of an adjustable cover-piece or fender capable of being extended or contracted vertically for enclosing the space beneath the gas-fire frame or grate and, if desired, of providing support to it.

Coin-Freed Meters.

GIBSON, T. S. F., and PALMER, W. V., of Old Kent Road, S.E.

No. 19,184; Aug. 20, 1909.

This invention has reference to coin-freed gas and other fluid meters, wherein, by turning a handle or by drawing down a lever after the insertion of a coin, the mechanism is actuated through the coin acting as a gag or bridge piece between the free handle and the mechanism attached to the meter.



Gibson and Palmer's Coin-Freed Gas-Meters.

The illustration shows just so much of a gas-meter as will suffice for present purposes (the meter proper being of the usual construction). It gives front, plan, and end views of the coin-freed mechanism; also the operating disc or wheel in section.

The mechanism is contained in a box fixed to the end of the meter

casing. B is the usual meter shaft extending into the box; and on it is keyed the flanged disc D, which has on its face dentals E. The shaft also forms a spindle upon which turns the sleeve C, to which are attached the coin-carrier F and the handle G. H is a slot in the top of the box as far as may be to the left from the end of the meter casing, and out of reach of the disc D. A coin inserted in the slot falls into the coin-carrier; and if it is of the proper size, it bridges the space between the carrier and the dentals of the disc and locks the two together, so that the disc can be rotated to operate the shaft of the meter by means of the handle. Stops are provided for limiting the movements of the coin-carrier in a rotary direction—one stop being, as usual, adjustable.

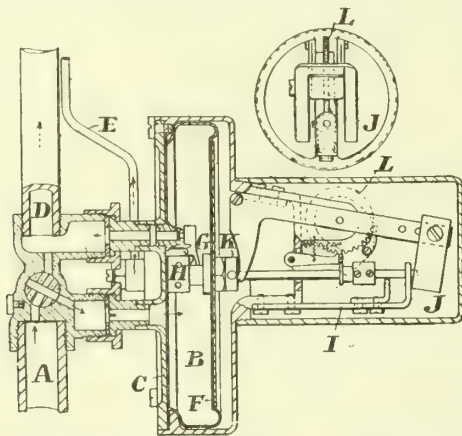
So far the mechanism does not differ from the operating mechanism usually employed in prepayment meters. It will be observed, however, that the form of the disc D is different—without the usual ratchet and pawl arrangement, which prevents "pumping" the apparatus to obtain fraudulently an extra supply of gas. To prevent the movement of the disc and the parts connected with it in a backward direction, there is a gripping plate or arm K, carried by a slotted post fixed to the end of the meter. The plate is formed with a forked end, which is passed into the slot of the post; being held in position by a pin and plate. The free end of the plate is notched to form jaws, which embrace the flange of the disc D. The plate is provided with means—such as the counter-weight M—to hold the plate normally in a position so as not to interfere with the rotation of the disc in the direction of the arrow. The plate, however, is so placed and adjusted that its jaws will immediately grip and bind the flange of the disc if the rotation of the disc in a backward direction is attempted. The binding action of the plate is instantaneous; and when free, it is perfectly silent, and puts no friction whatever on the disc when rotating forwards.

This absence of friction is claimed to be advantageous, inasmuch as the shaft B and disc D can rotate if the meter should continue to register beyond the predetermined extent owing to the non-closing of the valve or other defect in the mechanism. This rotation is usually prevented by the pressure of the ratchet mechanism spring, with the result that the gearing is in danger of being stripped by the continued action of the meter mechanism due to a leaky valve.

Operating Gas-Lamp Valves from a Distance.

M'NAB, N. S., of Caulfield, Victoria, and LINK, J. S., of Melbourne. No. 21,437; Sept. 20, 1909. Date claimed under International Convention, Sept. 25, 1908.

This mechanism for operating valves from a distance (and particularly intended for use in lighting and extinguishing gas-lamps) works electrically or by a temporary increase of fluid pressure or fluid pulsations. In its application to gas-lamps, the mechanism is adapted to extinguish or light simultaneously a series of lamps, or a cluster of burners, or to extinguish series of lamps or series of burners of a cluster before others of the series.



M'Nab and Link's Lamp Lighter and Extinguisher.

The gas is supplied to a pipe A provided with an ordinary or three-way cock, which admits the gas when opened into a chamber B through an opening in the valve plate C of the chamber. The plate has two outlet ports—one leading to the burner by way of the tube D, and the other by the tube E to the pilot light. The valves controlling the ports are connected by a gas-tight sensitive diaphragm F, and bellows or some like device in the chamber B cause pulsations of varying pressures of the gas introduced into the chamber. In the simplest form of construction for extinguishing or lighting all the burners at the same time, one valve is mounted on a pivoted lever G and kept normally closed by a spring, while the other is formed on a rod attached to, and operated by, the diaphragm. The other valve is closed by the direct action of the rod; and the one end of the latter and the valve are guided by a sleeve H, perforated to admit gas to one outlet valve, while the other end of the rod slides on the end of an arm I.

The diaphragm is under constant pressure by means of a weight J, which is slidably and adjustably secured to the end of a hinged lever, having an arm bearing against a block K secured to a rod outside the chamber B and within the casing of the mechanism. The rod is provided with an adjustable trip collar near its outer end, and has either a single or double flange, according to the effect desired, while the arm itself is provided with a stop to limit the outward movement of the collar and the rod.

Adjacent to the trip collar is a spring pawl pivoted on a rigid frame and adapted to engage with a ratchet toothed wheel L provided with notches of different depths and loosely mounted on a spindle. The ratchet-wheel is adapted to be partially rotated in one direction only by means of a pawl lever operated by the forward movement of the flanged trip collar. The pawl lever comprises a curved arm loosely mounted

on the spindle and provided with a tension spring and a stop; while upon the arm is pivoted a spring pawl adapted to engage the teeth or notches of the ratchet-wheel. The notches between the teeth of the ratchet-wheel vary according to whether the mechanism is adapted to operate a single lamp or groups of lamps—such as street-lamps at different times, or a series of those provided with a cluster of burners.

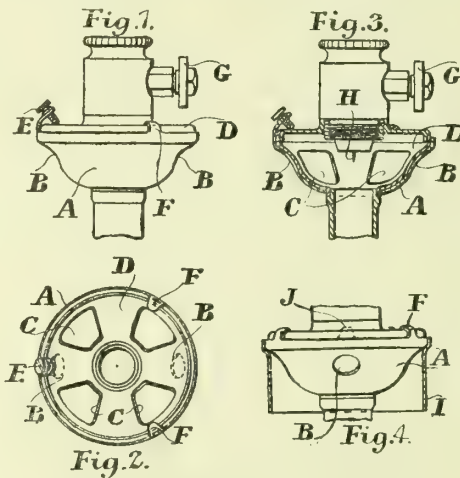
The ratchet-wheel shown is adapted to operate a series of lamps each having a single burner, and all of which lamps are to be extinguished at the same time. Thus one series of notches are deeper than the alternating ones, and might be termed respectively the "releasing" and "retaining" notches. Thus when the pawl is in engagement with a shallow or retaining notch of the ratchet-wheel, it projects sufficiently to engage the flange of the trip collar on the rod, and prevents the backward movement of the diaphragm controlling the inlet valves; but when the pawl engages a deep or releasing notch it is out of the path of the flange, and so permits the weighted lever to operate and force the diaphragm back.

Assuming the valve on the lever G to be adapted to close the burner-port and the valve on the rod of the pilot-port, and assuming the burner is extinguished but the pilot alight, the pressure of gas being normal, the pawl will be in engagement with a shallow notch, and will retain the rod and diaphragm by projecting in the path of the flange of the trip collar—thus preventing the weight operating on the diaphragm. By now momentarily increasing the pressure, the flange will first move outwardly and operate against the arm of the pawl lever, thus rotating the ratchet-wheel L to the extent of one tooth; so that the pawl springs into a deep or releasing notch and allows the flange (which immediately returns) to pass, and the weight to operate on the rod and depress the diaphragm F. The effect of this is that the shoulder on the rod depresses the pivoted valve lever G against the pressure of its spring and opens the burner-valve, and approximately at the same time the pilot-light valve is closed. The burner is extinguished by another pulsation or momentary increase of gas pressure whereby the flange of the trip collar again moves outwardly and operates the pawl lever; thus turning the ratchet-wheel so that the pawl again engages a shallow notch and prevents the return of the diaphragm. The pilot-light valve is thus retained opened, while the burner-valve is closed by the spring of the pivoted lever to which it is attached.

Inverted Incandescent Gas-Burners.

BLAND, C. W., of Little Trinity Lane, E.C. No. 24,095; Oct. 20, 1909.

This invention relates to the air inlet chambers of inverted burners (both low and high pressure), and is specially designed for use in mills and other places where there is a quantity of dust or fluff in the air. The air-chamber is of the type in which the air enters from below, and, being closed on the top (preferably flat), has a saucer-like under case or portion which is of double form, and with which a shield outside the air-chamber may be used. The under side is provided with air inlet holes in both its inner and outer cases; one case being capable of movement upon the other, so as to cause the holes to more or less register with each other. The holes in both the inner and outer cases may be of any desired number; but it is preferred to use two only in the inner case, and to arrange them diametrically opposite to each other.



Bland's Dust-Proof Inverted Burner.

Fig. 1 shows the burner; fig. 2 is a plan with the top plate removed; and fig. 3 is a sectional view of fig. 1. Fig. 4 shows the application of a shield.

The under saucer-shaped case A has air-holes B (shown closed), which can be caused to more or less coincide with the apertures C in the inner case D. The case has lugs F, which are bent round the edge of the top flat part of the case, and one of the lugs is furnished with a set screw E. The shield consists of a plain ring of sheet metal I with a clip J. The finger piece G of the gas-regulating valve controls the needle part H in the usual manner.

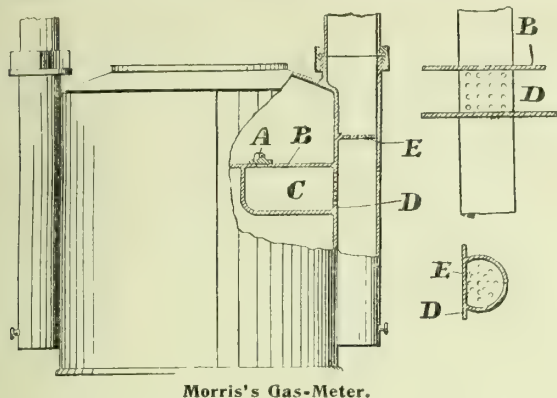
It will be obvious that falling particles of dust cannot be easily drawn through the holes B, because they are under the cover D; and when the shield I is used, the dust would have to follow a circuitous direction to reach the holes.

Gas-Meters.

MORRIS, H. J., of New Britain, Conn., U.S.A. No. 25,867; Nov. 9, 1909.

The primary object of this invention is "the provision of a gas-meter in which there is no possibility of a malicious person gaining access to

the recording or registering mechanism within the meter for the purpose of permitting a flow of gas without being registered." In the meter outlet-pipe, baffle plates are disposed to prevent tampering with the meter.



Morris's Gas-Meter.

The registering mechanism of the meter (not shown) is adapted to control a valve A, forming a closure for a valve-port, contained in a horizontal partition B, within the meter. This port leads to a by-pass chamber C within the meter and in communication with the outlet pipe through a number of openings formed in the vertical wall D of the meter. These openings are of a size to prevent the insertion of a hook instrument or even a bent wire, although allowing the passage of gas from the meter to the outlet pipe. Above the openings, and within the outlet pipe, is a "horizontal foraminous baffle-plate" E, the apertures in which are of a size to prevent the passing of a wire or other instrument through it to the valve A, to open it and allow a flow of gas from the meter without being registered.

Removing Tar from Hot Gases.

OTTO AND CO., G. M. B. H., of Dahlhausen a/Ruhr, Germany.

No. 26,124; Nov. 11, 1909. Date claimed under International Convention, Dec. 22, 1908.

In their complete specification, the patentees say: It has been recognized that the most economical method of recovering ammonia from gases (coking-ovens, gas-retorts, or the like) consists in obtaining ammonium sulphate direct by passing the gases through sulphuric acid strong enough to determine the separation of the ammonium sulphate as crystals as soon as it is formed. For the success of the method, it is essential that the tar should be removed from the gases as completely as possible before the gases pass through the sulphuric acid, and that the temperature of the gases and the sulphuric acid should be high enough to prevent condensation of the aqueous vapour in the gases, and thereby the dilution of the sulphuric acid. The best mode of removing the tar has been shown to consist in scrubbing the gases with tar or ammoniacal liquor containing tar, or with ammoniacal liquor alone, since this speedily becomes tarry; and the best mode of applying the tar or tarry liquor is by spraying apparatus, preferably an injector, as described in patent No. 12,809 of 1908. It has been pointed out that the temperature of gases of this kind from which tar is to be separated by a tar spray should exceed 40° C.; and it has been stated that the higher the temperature above this limit the better, when the recovery of ammonia is in question—the best temperature being between 100° and 200° C.

Now, according to the present invention, for the successful working of the scrubbing agent, the latter should have a temperature not exceeding 80° C., and not substantially below 80° C. It follows that the temperature should be maintained as near 80° C. as may be without exceeding this degree. If this temperature be adopted, the gas remains sufficiently hot for direct precipitation of all the ammonia it contains.

There are various modes, it is pointed out, of ensuring that the temperature shall not exceed the limit named. Thus, care may be taken that the temperature of the gases at the time they are scrubbed with the tar is such that the temperature of the latter cannot exceed 80° C., although in this case there is some danger that the content of steam in the gases may lead to incomplete precipitation of the ammonia as sulphate. Another mode is to supply the scrubbing agent in such proportion that the temperature cannot exceed the limit.

Gasholder.

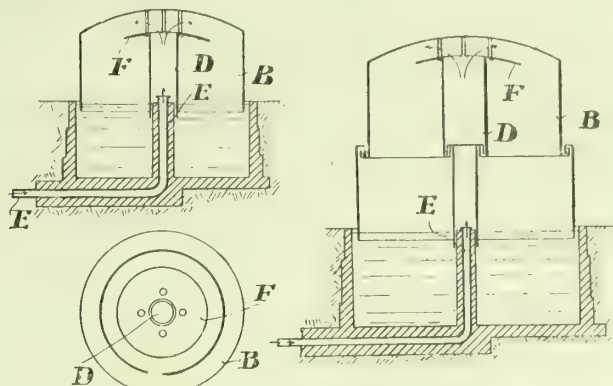
OFENBAU G.M.B.H., of Munich.

No. 27,278; Nov. 23, 1909. Date claimed under International Convention, Dec. 7, 1908.

This invention relates to a device for filling gasholders in the manufacture of illuminating and water gas; the object being to obtain a gas of as far as possible uniform constitution by its being introduced at or near the top of the holder. A telescopically displaceable feed pipe, open at the top and connected at the bottom with the gas-supply pipe, is suspended from the top of the bell of the holder, so that the gas introduced must flow along the top of the bell in any position of the latter.

The patentees here remark in their specification: Now, if a specifically heavier gas be periodically or temporarily introduced into the gasholder, it will, after escaping from the feed-pipe opening at the top of the holder, be thoroughly mixed with the gas already contained in it by falling downwards, whereby a uniform composition of the stored gas is afforded. This thorough mixing of the gas may be further facilitated by the gas on its exit from the feed-pipe into the holder being distributed laterally over a large part of the section of the holder by means of a shield surrounding the upper mouth of the feed-pipe. They

point out that they are aware that it has previously been proposed in small gasholders for use in connection with compressed-gas consuming plants to have a tube connected with the dome of the bell and slidable over the central gas-supply pipe; the lower end of the tube being formed to act as a valve to regulate the admission of gas, and the upper end having outlet apertures into the bell. In this arrangement, as the tube serves to carry the valve for controlling the admission of gas it has only a very limited movement, and the arrangement is quite inapplicable for the purposes of the present invention to the large gasholders at gas-works.



Mixing Gases in Storage Holders.

To the dome of the single-lift gasholder bell B, a downwardly extending pipe D is attached, preferably in the middle, by stay bolts or other suitable means. The top of the pipe is a little below the dome, and the bottom projects below the mouth of the gas inlet pipe E, over which the pipe D slides. The pipe D rises and falls with the bell of the holder, sliding up and down over the inlet pipe; so that the inflowing gas must always rise to the top of the bell. If the gas introduced by the feed-pipe D at the top is heavier than that already contained in the holder, it will, of course, sink downwards, and "thereby become intimately mixed with the gas already accumulated." In order that the gas thus introduced may not be able to flow down the sides of the pipe D, a shield-like disc F is provided (at the upper end of the pipe), over which the gas flows; so that it must mix intimately with the gas in the holder. For a telescopic holder with two or more lifts and so-forth, the gas-supply pipe is made suitably telescopic, as shown.

APPLICATIONS FOR LETTERS PATENT.

- 14,242.—KIRKBY, R., "Valves for gas-furnaces." June 13.
- 14,273.—BEHRINGER, E. A., "Gas-main stoppers." June 13.
- 14,304.—SOCIÉTÉ FRANÇAISE DE MATÉRIEL AGRICOLE ET INDUSTRIEL À VIERZON, "Gas-generators." June 14.
- 14,405.—KOPPERS, H., "Gas-furnaces." June 14.
- 14,426.—ELLIN, A. H., and ATKINSON, D., "Hot-plate." June 15.
- 14,458.—RUSCOE, A. O., "Inserting valves in gas-mains under pressure." June 15.
- 14,478.—HARTMANN, W., "Explosion-engines." June 15.
- 14,480.—SMALLWOOD, J., "Switches for controlling gas-burners." June 15.
- 14,492.—JULIUS PINTSCH AKT.-GES., "Ignition-device for inverted incandescent gas-lamps." June 15.
- 14,599.—KNAPP, H., "Acetylene generator." June 16.
- 14,629.—BATTY, J., and COATES, F., "Gas-ring." June 17.
- 14,681.—ROBSON, G., "Automatically operating gas-burners." June 17.
- 14,686.—ENDERSON, S. J., "Pumps and blowers." June 17.
- 14,701.—BENNIS, E., and BIBBY, J., "Valves." June 18.
- 14,737.—SOUTHEY, A. W., "Generating gas." June 18.
- 14,757.—KNAPP, H., "Purifying acetylene gas." June 18.
- 14,768.—STAINER-HUTCHINS, T. W., "Gas-producer generators." June 20.
- 14,809.—TUCKER, T., "Meter money-boxes." June 20.
- 14,825.—RAWLINGS, J., "Globe holder." June 20.
- 14,828.—LAMPLOUGH, F., "Exhauster and blower." June 20.
- 14,839.—BRADLEY, G., "Pipes." June 20.
- 14,897.—DOR-DELAITRE, E., "Retort making." June 21.
- 14,902.—JOSEPH, J. E., "Pipe-joints." June 21.
- 14,950.—JULIUS PINTSCH AKT.-GES., "Incandescent gas-lamps." June 21.
- 15,036.—BROUGHAM, F. J., "Manufacture of ammonium sulphate." A communication from Solvay et Cie. June 22.
- 15,081.—HELPS, G., "Gas lamps and burners." June 23.
- 15,196.—AINLEY, L., "Anti-vibrator." June 25.
- 15,255.—BROWN, A. A., "Mantle boxes." June 25.
- 15,290.—CLOUDSLEY, J. L., "Two-stroke internal-combustion engines." June 25.

At the twentieth annual meeting of Head, Wrightson, and Co., Limited, Sir Thomas Wrightson, who presided, said the result of the past year's working was somewhat more favourable than that of 1908-9, when they had to dip into the reserve fund. This year, after paying interest on debentures and preference shares, the amount carried forward was £2563, or over £2000 more than they carried forward last year. Having regard to the short period that their South African branch had been established, the turnover had been considerable; and a satisfactory footing had been obtained in this important market. Taking the balance-sheet as a whole, it was an improvement upon 1909, though the Directors considered the improvement was insufficient to allow them to declare a dividend on the ordinary shares. Whether the fierce competition which was crushing market prices below actual costs was to be mitigated during the current year remained to be seen.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coalite Company and Their Process.

SIR,—I have observed in your last issue a letter in regard to the "Coalite Process," in which it is suggested that the claim to the Coalite patent has been knocked on the head by an opposition brought by the Coalite Company against a pending application in the Patent Office.

As it may possibly be a matter of interest, might I point out that this could hardly be correct; for under section 11 of the Patents and Designs Act, 1907, the opposition would be made on the ground that the invention claimed had been patented in this country on an application of prior date.

I have looked up the claims on the application that is apparently referred to, and they read as follows:—

1. In a process for obtaining a smokeless free burning fuel by coking at a low temperature, subjecting the charges of coal contained in externally heated retorts to the action of watery vapour or steam introduced into the retorts during the whole of the coking process for the purpose described.

2. In the process forming the subject-matter of the foregoing claim, the addition to the coal to be treated of tar or other hydrocarbon, as and for the purposes set forth.

3. In the process forming the subject-matter of the foregoing claims, the addition to the coal of salts of alkalis, such as sodium or potassium nitrate, chloride, or hydrate, as and for the purposes described.

Unless the Coalite Company actually and expressly claimed the use of steam throughout such a process, and the use of tar, or salts of alkalis in such a process, or point to patents covering this identical subject-matter, they could not prevent the grant of a patent on the application. But if the process claimed were used in the Coalite process, by anyone other than the Coalite Company, this is a matter of infringement that could only be dealt with in the Law Courts, where alone such a decision could be given, if at all.

Further, in such opposition proceedings, the question whether the claim on the application involved good subject-matter for a patent could not be contested; but the grant would be allowed whether the claim were good or bad, and so long as there were no prior patents in which the subject-matter had been actually and expressly claimed.

Hornsey Rise, N., June 30, 1910.

GEORGE HAM, B.Sc. (Lond.).

High-Pressure Gas Systems.

SIR,—Will any brother gas manager kindly state through your columns whether he has found that lead joints are satisfactory for high-pressure mains? Also, considering the present and future traffic likely to be experienced on our highways, will this method of jointing withstand the vibration unless laid at abnormal depths?

Hoping some managers will be good enough to give their experience.

June 27, 1910.

PROVINCIAL GAS MANAGER.

Utilization of Waste Gases.

The Lord Chairman of Committees (Lord Onslow) had before him last Tuesday the Bill of the Little Hulton Urban District Council, which authorizes the transfer of so much of the gas undertaking of the Salford Corporation as is within the Council's area, and empowers the Council to supply gas in their district. It may be remembered that it is proposed to utilize for the first time the waste gases from coke-ovens for the purpose of a public supply of gas. Under an agreement scheduled to the Bill, Lord Ellesmere contracts to supply the Council annually with not less than 8 million cubic feet of gas from his coke-ovens, the gas from which is at present running to waste. The agreement, which is for 35 years, may be determined after this period by either party giving five years' notice; and in this event, the Council are to have the option of purchasing Lord Ellesmere's gas plant. [The proceedings on the Bill in the Lower House were reported in the last volume of the "JOURNAL," pp. 53, 126.] His Lordship passed the Bill; and it was ordered to be reported. This stage was subsequently passed.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale, by order of Directors, a new issue of capital of the Chigwell, Loughton, and Woodford Gas Company. It consisted of £2000 of consolidated ordinary stock and £1000 of 4 per cent. perpetual debenture stock. The former ranked for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; but the dividend on similar stock for the four years ended Dec. 31 last has been at the rate of 5½ per cent. per annum. It was all sold at £125 to £126 per £100; the debenture stock fetching £102 to £102½ per £100. On the same occasion, Messrs. Richards sold a few £5 "B" shares in the Pinner Gas Company, Limited, ranking for a standard dividend of 7 per cent., subject to the sliding-scale, but carrying £8 8s. per cent., at £9 to £9 5s. each. New 7 per cent. stock (1881) of the Brenford Gas Company, carrying 9½ per cent. dividend, fetched £188 to £192 10s. per £100. The final lots offered consisted of 3½ per cent. "B" stock of the Ilford Gas Company, carrying a dividend at the rate of 5½ per cent. per annum; and it was sold at £116 to £116 10s. per £100. At the Royal Hotel, Norwich, last Tuesday, Messrs. Spelman sold, under instructions from executors, ten fully-paid original shares of £10 each in the Fakenham Gas Company, Limited, for £7 15s. apiece.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Middlesbrough Corporation Bill, Pontypridd and Rhondda Joint Water Board Bill, Shirebrook and District Gas Bill.

Bills read a second time and committed: Bradford Corporation Bill, Bristol Gas Bill, Middlesbrough Corporation Bill, Pontypridd and Rhondda Water Board Bill, Slough Water Bill.

Bills reported, with amendments: Brighton and Hove Gas Bill, Bristol Gas Bill, East Grinstead Gas and Water Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Gas Orders Confirmation Bill (No. 2), Exmouth Urban District Water Bill, Little Hulton Urban District Council Bill, Worksop Urban District Council Bill.

The Bradford Corporation Bill, Gas Orders Confirmation Bills (Nos. 1 and 3), Water Orders Confirmation Bill, Middlesbrough Corporation Bill, Mountain Ash Water Bill, Pontypridd and Rhondda Joint Water Board Bill, and Rhondda Urban District Council Bill, have been referred to a Select Committee, consisting of Viscount Hutchinson (Chairman), Lord Sempill, Lord Middleton, Lord Ellenborough, and Lord Wynford; to commence sitting to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Great Grimsby Gas Bill, Havant Gas Bill.

Bills reported: Cambridge University and Town Water Bill [Lords], Garnant Gas Bill [Lords], Kingswood Water Bill [preamble not proved], South Lincolnshire Water Bill [Lords], Water Provisional Order (Sutton) Confirmation Bill.

Bills read the third time and passed: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill [Lords], Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Shirebrook and District Gas Bill, Southend Water Bill [Lords], Thorne and District Water Bill [Lords], and the Water Provisional Order Bill.

The petitions of the Wealdstone Urban District Council and the Wolverhampton Corporation against the Gas Companies (Standard Burner) Bills have been withdrawn.

Last Wednesday, Sir J. D. Rees asked the President of the Local Government Board whether the Government proposed to introduce legislation this session restricting the borrowing powers of local bodies. Mr. Burns having replied in the negative, Mr. Bowles asked the right honourable gentleman if he was aware that the aggregate debt of the local authorities of the United Kingdom very nearly equalled the funded National Debt. Mr. Burns said he was aware of the fact; but he added that there were assets to which he would direct the attention of the honourable member.

On Friday, Mr. Fell asked Mr. Burns if he had received any complaints with regard to the quality of the water supplied during the past year by the Metropolitan Water Board to consumers in the borough of Wimbledon—that such water contains an excessive amount of chalk or lime; and if he would have such water specially tested and reported upon. Mr. Burns replied that no complaints had reached him. He was aware, however, that the water now supplied to certain parts of Wimbledon was obtained from wells, and that it was harder than the river water which was previously distributed. In view of the regular analyses of the water by Dr. Houston for the Metropolitan Water Board, it did not appear necessary that any further ones should be made.

LOCAL AUTHORITIES AND PROVISIONAL ORDERS.

Consents Dispensed with by the Board of Trade.

Three reports have lately been presented to the House of Commons by the Board of Trade, pursuant to section 4 of the Gas and Water Works Facilities Act, 1870, setting forth their reasons for dispensing with the consents of local authorities in the cases of certain applications for Provisional Orders in the present session.

Rowley Regis and Blackheath Gas Order.

The Board of Trade report that they have made the Rowley Regis and Blackheath Gas Provisional Order, and have dispensed with the consent of the Cakemore Parish Council, who are the Local Authority within the extended limits of supply to be authorized by the Order, and also with the consent of the Halesowen Rural District Council, who are a road authority within the extended limits.

The application for the Order was made by the Rowley Regis and Blackheath Gas Company, who sought power to supply gas in the township of Cakemore, in the county of Worcester, and to raise additional capital not exceeding £12,500 by shares or stock, with borrowing powers not exceeding one-third of the authorized capital of the Company. The promoters having failed to obtain the consent of the Local Authority and of one of the two road authorities concerned, the Board decided to hold a local inquiry into the application for the Order and the objections which had been lodged thereto; and they appointed Mr. Raymond Asquith as Commissioner for the purpose. The Parish Council were not represented at the inquiry; but it appeared that their consent had been refused on the ground that the granting of the Order would invest the promoters with a monopoly of the gas supply in Cakemore. It was stated that portions of the parish are supplied with gas, but not under statutory powers, by the Halesowen

Gas Company and the Oldbury Urban District Council; but neither of these bodies objected to the granting of the Order.

It appeared from a petition praying that the Order might be granted, and signed by upwards of 200 householders, ratepayers, and gas consumers of Cakemore, that the promoters had supplied gas in the parish for over thirty years, and that the Parish Council had entered into a contract with them for the supply of gas to public lamps.

The Halesowen Rural District Council urged two objections to the Order: (1) That the Council hoped shortly to become an Urban District Council, and might then desire themselves to supply gas in Cakemore. (2) That, as the Rowley Regis Urban District Council have power, under the Rowley Regis and Blackheath Gas Act, 1886, to purchase the undertaking of the promoters, the Council might acquire power to supply gas in Cakemore, and that this fact might be used to further a proposal to detach the parish from the Halesowen rural district and attach it to the Rowley Regis urban district.

With regard to these objections, it appeared that already two applications for urban powers made by the Halesowen Rural District Council have been refused by the Worcester County Council; that six out of the nine parishes in the district objected to the application; and that the township of Cakemore has applied to be included in the adjoining urban district of Oldbury.

The Commissioner reported that, in his opinion, having regard to the whole of the evidence, and especially to the fact that no inhabitant of Cakemore has a right at present to require a supply of gas from any existing company or authority, the Order should be granted. The Board of Trade accordingly decided to dispense with the consents of the two authorities concerned, and to grant the Order.

Sutton District Water Order.

The Board of Trade have to report that they have made the Sutton District Water Provisional Order, and have dispensed with the consents of the Kingswood Parish Council, the Reigate Rural District Council, and the Surrey County Council.

The application for the Order was made by the Sutton District Water Company for power to supply water in the parish of Kingswood in the county of Surrey, to maintain and continue existing water-works, and to construct new works. The promoters having failed to obtain the consent of the local and road authorities concerned, and objections having been lodged by the Kingswood Water Company, Limited, an inquiry into the application for the Order and the objections which had been lodged thereto was held on behalf of the Board of Trade. The Kingswood Water Company were represented, and opposed the application on the ground that they are themselves promoting a Bill in Parliament for the purpose of obtaining statutory power to construct water-works and supply water in the parish of Kingswood. An application by the Company for a Provisional Order to authorize them to construct works and supply water in the parish of Kingswood was refused by the Board of Trade in the session of 1909.

It appeared that the promoters are supplying water in the northern part of the parish, and that the Kingswood Water Company are serving the southern portion. Neither the promoters nor the Company, however, have statutory powers to supply in the parish. The Kingswood Parish Council were not represented at the inquiry, and appear to have adopted a neutral attitude as regards the two schemes. The Reigate Rural District Council were represented by one of their members, who gave evidence that the Council were opposed to the granting of the Order. The Surrey County Council did not express any opinion as to the merits of the schemes, but desired the insertion in the Order of a clause for their protection, to which the promoters did not agree. It appeared from the evidence that the promoters of the Order were in a position to give an adequate supply of water to the whole of the parish of Kingswood.

In view of all the circumstances of the case, the Board of Trade decided to grant the Order, and to dispense with the consent of the authorities concerned.

Swansea Gas Order.

The Board of Trade have to report that they have made the Swansea Gas Provisional Order, and have dispensed with the consent of the Llansamlet Parish Council, the Clase Rural Parish Council, the Penderry Parish Council, and the Cockett Rural Parish Council, who are Local Authorities in the extended limits of supply authorized by the Order, and of the Swansea Rural District Council and the Glamorgan County Council, who are road authorities in the extended limits.

The application for the Order was made by the Swansea Gas Company, who sought power to extend their limits for the supply of gas. The promoters having failed to obtain the consent of the local and road authorities concerned, an inquiry was held on behalf of the Board of Trade into the application for the Order and the objections which had been lodged thereto.

It was stated that the Local Authorities had refused their consent to the application except on the condition that the price of gas in the added area of supply should be the same as that charged in the existing area. It appeared, however, that a considerable part of the added area is sparsely populated, and, being a much undermined colliery district, it was anticipated that there would be considerable leakage from the mains. In their existing area outside the limits of the borough, the promoters are already entitled to charge, and in some parts thereof do in fact charge, a higher price than within the borough. In these circumstances, the Board of Trade decided to allow a maximum price in the added area higher by 4d. per 1000 cubic feet than the price charged for gas within the borough of Swansea.

The Swansea Rural District Council also asked for the insertion of a clause requiring the promoters to lay certain specified mains; but the Board of Trade did not consider it desirable to insert it. The Glamorgan County Council, who were not represented at the inquiry, were understood to desire the insertion of a clause for their protection; but, following the usual practice of the Department, the Board decided not to insert the clause in the absence of agreement between the parties—protection being already afforded to road authorities under the Gas-Works Clauses Acts, which are incorporated with the Order.

Having regard to all the circumstances of the case, the Board of Trade were of opinion that the Order should be granted, and the consent of the authorities concerned dispensed with.

GLASGOW GAS CONSOLIDATION BILL.

House of Lords Committee.—Monday, June 27.

(Before the DUKE OF BEDFORD, Chairman, the Marquis of BRISTOL, Lord BASING, Lord DIGBY, and the Earl of WESTMORELAND.)

This Bill, which provides for the consolidation of the Glasgow Gas Acts from 1869 to 1909; for the reduction of the illuminating power of the gas supplied by the Corporation to 14 candles; and for other purposes, came up for consideration to-day.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. H. BEVERIDGE appeared for the promoters. The petitioners against the Bill were: Baillieston Gaslight Company, represented by Mr. BLENNERHASSETT, K.C.; Thomas Clement and Andrew Clement, by Mr. CRAIG HENDERSON; Mr. Wm. C. S. Stuart, by Mr. CRAIG HENDERSON; Mr. Alexander Crum MacLae and the Trustees of the deceased John Miller, by Mr. CRAIG HENDERSON; the Lanark County Council, by Lord ROBERT CECIL, K.C., Mr. J. WILSON, K.C., and Mr. J. E. KING; the Town Councils of Govan, Parick, Rutherglen, and Pollokshaws, by the Hon. J. D. FITZGERALD, K.C., Mr. FREEMAN, K.C., and Mr. W. B. CLODE; the Caledonian, Glasgow and South Western, and North British Railway Companies, by Mr. FORBES LANKESTER, K.C., and Mr. CRAIG HENDERSON; the Glasgow House Owners Association and others, by Mr. VESEY KNOX, K.C., and Mr. W. SZLUMPER; manufacturers, engineers, and others within the gas supply area of the Glasgow Corporation, by Mr. LEWIS COWARD, K.C., and the Hon. E. CHARTERIS. There were petitions with regard to which Counsel was reserved from the County Council of Renfrew, and the Dumbarton, Milngavie, and Clydebank Town Councils.

Mr. BALFOUR BROWNE, in opening the case for the Bill, said that the Acts they were seeking to consolidate were some 19 or 20 in number; and certain amendments were to be made, most of which were unopposed. Going back to the year 1869, the Corporation had long felt that the supply of gas should be in their hands; and in that year, the two gas undertakings in the Glasgow district were transferred to them. Since then, the supply had been in the hands of the Corporation. As a condition of the purchase, Glasgow was bound to supply the whole area with gas, and to every person within 50 feet of the mains who wished to have a supply. They were under this obligation to-day. Under the Purchase Act, they had to pay annuities of £27,000 to one Company, and £7762 to the other; and the Corporation also took over the mortgage debt of the two Companies, which amounted to £192,000. The Corporation had to be liable for the whole risks of the undertaking; and they became liable to a guarantee rate of 6d. in the pound if the revenues from the gas undertaking were insufficient. This guarantee rate fell upon the City of Glasgow, and not upon the area of supply. New works were erected, and still the demand went on increasing. At the present time, the capital expenditure of the works was £3,841,282, exclusive, of course, of the annuities of £34,762. By their Act of 1869, the price to be charged was 4s. 7d. per 1000 cubic feet; and the quality of the gas was 25 candles. In 1882, the candle power was reduced to 20 candles, and later to 16 candles, at which it stood to-day. In 1869, the amount of gas manufactured was 1206 million cubic feet; it was now 6820 millions. The price of gas had been gradually reduced until it was now 2s. per 1000 cubic feet. They had the right to apply the surplus of their gas profits to the general purposes of the Corporation, which was not at all an uncommon thing. Birmingham were making out of their gas undertaking £71,000 a year, which was applied to the reduction of the charges on the ratepayers. But Glasgow had carried very little indeed to the relief of the rates. During the whole period the Corporation had had the works, only £21,000 had been transferred to the general fund. In 1871, the Partick, Hillhead, and Maryhill Gas Company were started, and supplied one part of the area given to Glasgow in 1869. The Corporation resented the unfair competition of the Company, which was not a statutory concern; and when they came to Parliament for powers in 1873, their Bill was rejected on opposition by Glasgow. In 1890, the Company again sought parliamentary powers—meanwhile having purchased another Company for a sum of £11,000. This Bill was also rejected on the opposition of the Corporation of Glasgow. In 1891, Glasgow promoted a Bill to include within its municipal area Maryhill and some other districts. In the same year the Maryhill Company again promoted a Bill for statutory powers; but Glasgow agreed to purchase their undertaking for £202,500. The Corporation also purchased the Milngavie Company and other gas companies. To-day, their district covered 98 square miles. From east to west it extended 15½ miles, and from north to south 11½ miles. There were new provisions in the present Bill, to give certain discounts, to reduce the quality of the gas to 14 candles, the fittings were not to be subjected to distress, and to give the use of anti-fluctuators. With regard to these matters, however, he did not think there was any opposition. They were proposing to define their limits of supply, and divide the limits into two districts—the City supply and the supplementary supply. It was proposed at first that Milngavie should not be in the City supply; but in the Lower House it was decided that it should be, and no point now arose upon this. With regard to clause 2, which incorporated the General Acts, the opposition was mainly, if not entirely, confined to the county of Lanark, who said the General Law was not sufficient, and asked for special clauses to be put upon the Corporation. But he would point out that there was no case in which the general law had been varied, except by agreement. Clause 6 defined the City supply district, and the only part, so far as he knew, where it was not absolutely limited was in the parish of Cadder. There was a Company who had not got mains in either Mearns or Carmunnock who opposed them in the other House with a view to compelling the Corporation to buy their whole undertaking. The Corporation refused to purchase; but desired then and now to continue the supply they were giving in the two parishes. The House of Commons Committee, however, decided that the Corporation should not go on supplying there unless they purchased the Busby Gas Company; and therefore these parishes were left out. However, there were people petitioning against the Bill and saying that they wanted a supply of gas from Glasgow. But he must fully acquiesce in the decision of the House of Commons; and it was for the present Committee to say

whether Glasgow was to go on supplying these districts or not. Before the Bill went into the other House, the Corporation entered into negotiations with the Baillieston Gas Company, in the parish of Old Monkland, and agreed that, if they were put in the supplementary supply area, where the Corporation could charge a higher price than in the City area, they would purchase their works for £10,000. It was decided, however, by the Committee that they were to be in the City supply area; and the bargain was therefore off. He was quite content either that it should be where it was before, in the supplementary area, or to have it struck out altogether. It did not matter to the Corporation which took place. Clause 26 had reference to the price of gas. In the House of Commons, as they brought up the Bill before the Committee, the price to be charged by the Corporation was not to exceed the maximum of 4s. 7d. They might charge a differential rate as between gas supplied and used for private lighting purposes and that employed for other purposes; and in the case of gas supplied for such other purposes, the rate to be charged was not to exceed that charged for private lighting, but might be such as should be agreed upon. In the supplementary supply district, the Corporation might charge rates higher than those charged within the City area. These rates might vary in different parts of the supplementary supply area, but should not at any time exceed the maximum. As the clause was introduced into the Lower House, it gave the Corporation power to vary the price to consumers under different circumstances—they were only to charge the same under like circumstances. But the House of Commons Committee, after hearing a number of witnesses, came to the conclusion that a flat-rate should be charged, and the price was not to exceed the maximum of 4s. 7d. They must treat every consumer for trade purposes exactly the same, even although the circumstances might be entirely different. The Committee seemed to think that if the Corporation were to trade, they were not to trade for any profit, and that they were not to differentiate between one customer and another. He must acquiesce in the clause; but he found that several of the opponents of the Bill were now there to insist that this was not a fair clause, and he would take no part whatever in the discussion. He brought up the clause as it left the Lower House. He thought the Bill as it now stood was a better one for the Corporation than the existing legislation; and if the Committee passed it as it left the House of Commons, he would be content. At the present time, in consequence of section 9 of the Glasgow Corporation Act, 1882, which it was proposed to repeal (read in connection with the Glasgow Corporation Act of 1859), there was a flat-rate to all consumers of gas supplied by the Corporation; there was the same rate for public lamps; and there was no differentiation of gas for industrial purposes. As the Bill stood, there was a flat-rate within the City district for gas supplied by the Corporation; a flat-rate for public lamps, which need not be the same as the flat-rate for the gas supplied by meter; a lower rate for gas supplied for trade purposes, and a different rate according to the purpose for which the supply was required; and higher rates in the supplementary supply district than those charged in the City supply district. This was as the Bill left the House of Commons; and he was perfectly willing to acquiesce in it. He thought the Corporation would be in a better position if the manufacturers and others succeeded in modifying the clause so as to enable the Corporation to reduce the price of their gas to large consumers. The only other clause in the Bill to which any objection was taken was clause 50. It was urged that the lamps along the canal towing-path should be put on the same basis as public lamps. This the Corporation absolutely refused to do, because they were private lamps belonging to the Railway Company. The clause provided that the Corporation were to apply all moneys from time to time received by them under the powers of this Act.

(1) In payment of the expenses of, and incidental to, the raising, levying, and recovering the rents, charges, and revenues, and the borrowing of moneys for the purposes of this Act; (2), in payment of the expenses of managing and maintaining the gas undertaking; (3), in payment of the annuities and interest on money borrowed for the purposes of this Act; (4), in carrying the several powers and provisions of this Act into execution, including any improvement and extension of the gas-works and mains; (5), in providing the sum necessary to meet depreciation at not exceeding the following rates—on gas-works, at 1½ per cent. per annum; on pipes, at 2 per cent. per annum; on meters, at 6 per cent. per annum; on stoves, at 10 per cent. per annum; and on premium, at 2½ per cent., which rates were to be calculated on the book values of the respective assets on May 31, 1906, together with the net additions to such assets subsequent to that date, and any balance remaining should be carried forward to the revenue account of the gas undertaking for the next succeeding year, and should, whenever there should be an amount sufficient for the purpose, be applied to the reduction of the gas charges equally throughout the limits of supply.

The effects of this section was to prevent them making any profit whatever out of their gas undertaking. They were the owners of it, and had taken all the risks in regard to it; but the Committee of Parliament had said, notwithstanding this, that they were to conduct it, in the words of the Socialist, "not for profit, but merely for use." He must take the Bill if their Lordships passed it; but there were a large number of opponents there who said that this was entirely wrong. If the Corporation were to make a dead loss on their undertaking, as was quite possible, who was to pay? Not the people in the outlying districts, but the citizens of Glasgow. They stood the whole racket. There was a guarantee rate of 6d. in the pound which fell on them; and the whole idea when the concern passed into the hands of the Corporation was that, if they made a profit, it might be done by carrying a certain amount of the profit to the relief of the rates, or it might be done by a differential rate. If they had the power to charge the people outside Glasgow a differential rate, then there might be no reason for carrying any surplus profits to the relief of the rates. But they had not; they were within the City supply district. In forty years the Corporation of Glasgow had only carried £21,000 to the relief of the rates; but the Committee of the House of Commons had said that all the money was to be applied in the reduction of the price of gas. He must take the Bill, considering that it would be an advantage to the inhabitants of Glasgow; but there was a large number of people who said they were ratepayers in Glasgow, and if they could not get the profit in Glasgow then the Corporation might come down on them. There was a number of petitions against alterations, and others wanted the Bill as it left the House of Commons. The Glasgow House

Owners Association did not object to the Bill when it was before the House of Commons. He thought the measure was open to serious criticism at the hands of the people of Mearns and Carmunnock, and people in the Company's area with regard to finance; but he must leave it to the Committee to say whether they were right or wrong.

Evidence was first given by,

Mr. M. W. Montgomery, Chairman of the Glasgow Gas Committee. He said the consumers numbered 260,000, the quantity of gas made annually 6000 million cubic feet, and the price charged 2s. per 1000 cubic feet for lighting and domestic purposes. There had been a less charge for gas for motive power. In the supplementary supply area, the price was 1s. per 1000 cubic feet extra. The area of supply was 98 square miles, and included several counties. The length of mains was over 1000 miles.

Tuesday, June 28.

When the hearing was resumed this morning, a question of procedure arose.

Mr. J. D. FITZGERALD, who represented various boroughs who were petitioning against alterations, said these were boroughs on whose petition the Bill was altered in the other House. He objected to the *locus* of Mr. Vesey Knox, who appeared for the Glasgow House Owners Association and others.

Mr. VESSEY KNOX said that if Counsel for the Bill objected to his *locus*, he was willing to deal with it.

Mr. FITZGERALD contended that the Glasgow ratepayers, as represented by Mr. Vesey Knox, were not entitled to be heard at all. If they had presented a petition against the original Bill, they would not have been entitled to be heard, because they would have been petitioning against their own Corporation. They now came before the Committee in the guise of opponents, to ask that the Bill, as originally brought into the other House, should be passed.

Lord ROBERT CECIL supported Mr. Fitzgerald in his contention.

The CHAIRMAN at this point called upon the promoters' Counsel to resume examination of

Mr. Montgomery, who said that, in relation to clause 26, dealing with the price of gas, the price was governed by certain sections in their existing Acts, among which was section 9 of their Gas Act of 1882. The result of the operation of this section was that there was to-day, firstly, a flat-rate to all consumers of gas supplied by meter; secondly, a lower flat-rate for gas supplied for trade purposes; a flat-rate, again, for public lamps; and there was at present a differentiation between gas for industrial purposes. The Corporation were allowed to supply non-illumination gas for other purposes. It was essential for trade uses to sell gas at a price lower than that at which it was supplied for lighting. As brought into the House of Commons, the Bill contained proposals which were set out in the petition now presented by Mr. Vesey Knox; and the Glasgow Corporation were desirous of obtaining, if they could, legislation upon these lines. But in the course of the hearing in the other House, the clause was altered to the form in which it now stood in the Bill. Under the clause there was a flat-rate for public lamps, and higher rates in the supplementary supply district to those charged in the City area. Nowadays, gas for industrial purposes had to compete with electric current; and it was becoming the common practice to enable gas companies to supply at a lower rate for certain purposes. In his view, it was fair and just that the Corporation should be entitled to charge an additional sum in respect of the outside area. The charges for distribution would be greater. In the supplementary district they were not liable to any rate or charge in case of deficiency; and they took no risk. The Railway Companies were asking that they should have the same charges in respect of the lighting of lamps along the canal as were given to local authorities; but these were the private property of the Companies, and he could not agree to their suggestion. The canal was within the City area.

Mr. LANKESTER, who appeared for the Railway Companies, said he would not press the point.

Mr. BLENNERHASSETT, on behalf of the Baillieston Gas Company, at this point asked the Committee to deal with clause 6 of the Bill, regarding the limits of supply.

This course being accepted by the Committee,

Mr. Montgomery also gave evidence upon this point. He said the Corporation had powers to supply in the Baillieston Gas Company's district; but they had not exercised these powers. Since 1862, the Baillieston Company had given a supply, and the Corporation had not intervened. But when this Bill was promoted, the Baillieston Company approached the Corporation; and an agreement was entered into that if the Baillieston Company's district was put in the supplementary area, the Corporation would purchase the undertaking for £10,000. The Committee of the Lower House, however, held that the district should be in the City supply area; and the agreement thus came to an end. As matters now stood, the Corporation were willing to exclude the district and not give a supply of gas. The Coatbridge Company also had powers to supply this particular district, but had never exercised them. It would be detrimental to the interests of the district if competition were allowed, and prevented the Baillieston Company from putting their undertaking in a satisfactory position.

Mr. CRAIG HENDERSON then examined witness on behalf of the proprietors of various estates in Mearns and Carmunnock. He said there was a small estate in the parish of Mearns within 2 miles of the Busby Gas-Works; but it would be unprofitable for that Company to give a supply. The Corporation gave a supply to the estate; the charge being 1s. per 1000 cubic feet above that in the Glasgow city area. In Carmunnock, there were two estates which were supplied by the Corporation under their powers of "places adjacent thereto." The Baillieston Company were prepared to supply on condition that they obtained something like what they asked for in the House of Commons.

In reply to Mr. BEVERIDGE, for the promoters, witness said the position of the Baillieston Company was in no way altered by the Bill, and there was no reason why they should be put in a different position to that which they had held for some fifty years. The Glasgow Corporation were quite prepared to supply certain parts of the parishes of Mearns and Carmunnock if required, to the extent of 130 acres in the former parish and 500 acres in the latter.

Mr. Alex. Wilson, Gas Engineer and Manager to the Glasgow Corporation, said their area of supply was not increased by this clause; and he denied that the limits were vague. The only really undefined area was in the parish of Cadder and in Baldernock.

In reply to Lord ROBERT CECIL, who appeared for the Lanark County Council, witness said the Corporation desired to define the supplementary area. They had power to charge a 50 per cent. higher rate in the supplementary area; and it might be more expensive for them to deal with areas such as Carmunnock. They were content to deliver gas on the boundary at 2s. per 1000 cubic feet; but it was thought that the supply of the suggested 500 acres in Carmunnock might not be a profitable business.

Mr. JOHN WILSON, for the Busby Gas Company, remarked that, in consequence of what Mr. Balfour Browne had said in opening the Bill, that the Corporation of Glasgow were desirous of continuing the supply to the people on the Nether-ton Estate and the estates in the parish of Carmunnock, the Busby Company recognized the reasonableness of allowing the continuance of that supply, and they thought this would have ended the matter. But it had since been indicated, to his surprise, that the Corporation were inclined to go back upon it, and desired not only to continue the supply, but to take up 500 acres in the parish of Carmunnock.

Mr. BEVERIDGE said the Corporation agreed to supply in Carmunnock on one side of an imaginary line which had been suggested, and in the parish of Mearns a triangular piece in which was contained the Nether-ton Estate.

Mr. Sneddon, the Chairman of the Baillieston Gas Company, then gave evidence on clause 6. He said that in 1857 the Glasgow Gas Company were authorized to supply Baillieston; and when, in 1862, a demand arose for a supply of gas, the Baillieston Company was formed, because the demand was not then sufficiently remunerative for the Glasgow Gaslight Company to give a supply. The original capital of the Baillieston Company was £1200; and it had now been increased to £4549. The price charged for gas was 3s. 1½d. When the tramway system was extended to Baillieston, the Glasgow Corporation extended their mains in order to serve the new buildings that sprang up. When the Corporation came for their Bill, his Company thought it a good opportunity to assert their position for fair treatment. If the Company were saved from the competition of the Corporation, they were content to go on in the ordinary way. But the Corporation retained the power to supply the Baillieston district; and with the fear of the competition hanging over their heads, they would be unwilling to undertake the necessary expenditure of putting the plant into a satisfactory condition. He did not see what right the Lanarkshire County Council had to interfere in the matter.

Replying to Mr. BEVERIDGE, witness said his Company had not obtained statutory powers. The area in question had been within the area of the Glasgow Corporation since 1869. He agreed that the Corporation had never endeavoured to compete with them.

Mr. BLENNERHASSETT, in addressing the Committee on the clause, agreed that in the legal position of the Baillieston Company there was no change. All they asked was that in the district they supplied the Corporation should not be allowed to supply. If the Corporation wished to purchase the Company's undertaking, they would be happy to meet them.

Mr. Alex. Wilson said that the Baillieston Company were content to supply as a non-statutory Company in a portion of the area of the Glasgow Corporation. But Glasgow did not see that it was to their interest to go into the district; and the Company might continue to supply in the future as in the past. He asked that the decision of the Committee of the Lower House should not be altered.

Mr. CRAIG HENDERSON said the Corporation had power to supply gas in the various burghs and "places adjacent thereto;" and it now appeared that they gave a supply to Nether-ton because they were hoping to gradually extend their mains further afield. But it would be unheard of to say that, because a gas authority went into one area to use that as a stepping-stone to get into further areas, and finding itself balked by Parliament, it was thereupon to be entitled to say it was going back and would not supply the area at all. In the fight as to what should be supplied, the position of actual consumers in these areas was overlooked altogether, and they were left out. He asked that the Corporation, having applied for more than they were entitled to in the other House, and having been refused, should be compelled to continue their supply to the Nether-ton Estate. The Busby Company were prepared to say that a line might be drawn in the parish of Carmunnock, and it would relieve the question as to what was to be the price of gas in that area by putting it in the City supply district.

Mr. JOHN WILSON concurred entirely with this request.

Mr. BEVERIDGE announced later that, with regard to the opposition of the County Council, certain words had been agreed with the promoters. With regard to Baillieston, the Corporation would accept whatever the Committee saw fit to decide.

The CHAIRMAN announced that the Committee's decision on the clause would be given later on.

Clause 26 was then considered.

Mr. Montgomery, having given his evidence in chief on the clause, was examined by Mr. LEWIS COWARD, on behalf of the manufacturers, engineers, and other consumers of gas. Witness quite agreed that the petitioners represented a consumption of 250,500,000 cubic feet of gas, and the total valuation of the premises they occupied was about £160,000 a year. When the Bill was introduced into the Lower House, it contained a clause allowing the Corporation to charge a differential rate to large consumers. It was a good principle to encourage differential rates to large consumers. He could not see why the Bill should be an exception. The burghs of Govan and Partick had their own electricity undertakings, and gave large discounts to power and lighting consumers.

By Mr. LANKESTER: The Railway Companies ranked very high among the large gas consumers. He did not think that any injury would be done to the small consumers by this proposal. He thought it would benefit all consumers, as it enabled them to lower the price all round. There was no intention to allow discounts to large consumers in Glasgow that would not be allowed to large consumers in other districts.

When Mr. SZLUMPER rose to question witness on behalf of the Glasgow House Owners Association and others,

Lord ROBERT CECIL remarked that they ought not to be heard.

Mr. SZLUMPER contended that it was not for Lord Robert Cecil, as a petitioner, but for the promoters to object to his *locus*.

The Committee decided that it was for the promoters alone to object.

Mr. BEVERIDGE, representing the promoters, remarked that he did not object, because he thought they had most excellent *locus*. They were consumers of gas.

Mr. SZLUMPER then resumed his examination of witness, who said that the Bill as assented to by the ratepayers was a very different one from that which was now brought forward. With regard to the differential rate to large consumers, which was in the original Bill, he said they were now debarred from giving consideration of this kind, and it would react to some extent to the detriment of small consumers. There was no doubt that of late years competition with electric lighting had become very seriously felt; and if the Corporation could not give considerations of this kind to large consumers, there was the possibility that they would make their own gas or take electricity, because the electrical authorities had power to give very large concessions in this respect. They were not asking to give advantage to the consumers in Glasgow alone, but to all consumers alike on the basis of consumption. Under the present clause 26, they would be unable, however large a consumer might be, to give him the slightest concession.

In reply to Mr. JOHN WILSON, representing the Lanark County Council, witness said the petition was signed by the owners of property, or a factor for an owner. The factors represented those who paid for the gas.

Mr. WILSON: Supposing the Corporation had power to give a reduction in price to large consumers, the Corporation would get the most benefit, would it not?

Witness: I think not.

Supposing a large consumer paid £1000 a year for his gas, and you pay him £100 off under the power you desire, who would have to contribute this £100?—It would come from the increased earnings of the concern.

But it would be contributed to by the poor consumers?—By all the consumers.

In reply to further questions, witness said he did not agree that because the Corporation owned the electrical undertaking as well as the gas undertaking that whoever had the benefit it would come to the same thing. The Bill gave them power to differentiate between the City limits of supply and the supplementary area, and they were entitled to charge 50 per cent. more in the latter area, which was the maximum. In the City area, the maximum was 4s. 7d.; but they were only charging 2s., and in the supplementary area 3s. He did not know any company in Scotland with so high a charge in the outside area. Asked why they should want to charge 3s. in the Baillieston district, just over the line, and 2s. to consumers on the other side, witness said they must draw the line somewhere.

Replying to Mr. CLODE, who appeared for the boroughs of Partick, Govan, Rutherglen, and Carmunnock, witness agreed that these boroughs could not start gas undertakings at all; they could not compete with the Corporation. He would express no opinion now upon the differential rate; but he did uphold it before the House of Commons Committee, and was still of the same opinion. If the differential charge were allowed, it would be an advantage to the manufacturers of Govan, Partick, and other places, as well as to those in Glasgow. The total number of consumers was 259,727; and the large consumers numbered 821.

In answer to Mr. JOHN WILSON, witness said 50 per cent. was none too high a difference in the supplementary area; and if they had to supply a great distance outside, in some cases it would not be sufficient.

At this point, with the permission of the Committee,

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Gas Company, was called by Mr. LEWIS COWARD, in support of the petition of the manufacturers, engineers, and other consumers of gas. Having referred to his connection with the Newcastle and Gateshead Gas Company, witness said their output last year was 3350 million cubic feet, and their capital was about 2½ millions. The present price of gas ranged from 1s. 1½d. to 1s. 7d. per 1000 cubic feet; the present gross price being 2s. 2d. They recognized the principle that large consumers should have a rebate; and their scale of discounts ranged up to 25 per cent. Newcastle was very similar to Glasgow, in that it depended largely upon the engineering trade; and it was necessary in an industrial town that large consumers of gas should have a discount unless the town was to be handicapped in competition. The large consumer of gas was very seriously handicapped if he did not get these discounts. The discounts reduced the price of gas to the small consumers as well as to the large ones. It had been the practice in Glasgow hitherto that they should be allowed; and their withdrawal would tend to lead to the scrapping of plant, and electricity being used instead of gas. The principle had been recognized by Parliament in numerous Acts; and there was a Model Clause on the subject. It was the same with electricity and water; and it was the case in all trades that the large consumer was allowed a discount. The only argument that might be used against a scale of discounts would be that it told hardly on the consumer; but so far from this being the case, his experience was that the small consumer was benefited. In Newcastle, the scale was 10 per cent. to small consumers, and an additional 15 per cent. to the larger ones. Nevertheless, the larger consumer was the more profitable to the Company. It followed that, with the small consumers, for every 1000 cubic feet distributed, the cost of distribution, leakage, the collection of small amounts, and so on, was very much greater than with the large consumers. These were elements which should be taken into consideration in fixing the price of gas to large consumers. Turning to the South Metropolitan Company, witness said that last year they manufactured 13,000 million cubic feet of gas; and the present gross price was 2s. 2d. per 1000 cubic feet. They had a scale of discounts which varied from month to month. This showed the elasticity required in these matters. The result of giving these discounts was that in 1909 it was recorded to him that 44 consumers, with an average consumption of 1¼ million cubic feet each, were retained as gas consumers. They were absolutely kept from

taking power gas by the large discounts the Company offered. Altogether, their department had traced, as the immediate result of the larger discounts, an increased consumption of gas during the year of 52½ million cubic feet. It was the fact that, as the result of the larger consumption of gas due to the discounts, they were able to reduce the price all over the district to their consumers by 1d. per 1000 cubic feet, which represented, roughly, £52,000. "I consider," witness said, "that, both for the producer and the consumer, it is of the utmost importance that there should be a certain amount of elasticity allowed to gas companies in giving reductions to large consumers."

Mr. FITZGERALD: Is it not a reasonable thing that the profits made in a gas undertaking, after all charges have been met, should go to a reduction of the price of gas?

Witness: Yes.

It would not be fair to the gas consumer to increase the price of gas at the expense of the electric undertaking, or to reduce the price of electricity at the expense of the gas undertaking?—No.

Wednesday, June 29.

When the public were admitted to the Committee room this morning, The CHAIRMAN announced that the Committee had been considering the question of area. With regard to the triangle in the parish of Mearns, they were of opinion that it ought to be included in the supplementary area. They considered also that Baillieston should be included in the supplementary area.

The Marquis of BRISTOL asked whether it was understood that in the City area there was a flat-rate for lighting and another flat-rate for power, and whether in the supplementary area, the Corporation might charge any sum up to 50 per cent. more than the City rate. It was not quite clear to the Committee whether in the supplementary area there was a flat-rate or whether the Corporation had the power, up to 50 per cent., of charging to any particular area what they liked.

Mr. BALFOUR BROWNE said he thought there was no flat-rate in the supplementary area. At the present time, although they were seeking to have a 50 per cent. maximum in the supplementary supply area, they did not mean to charge everybody alike in that area—it depended on circumstances. In a portion of Mearns, they had charged 3s.; while in Carmunnock the people laid their own pipes at great expense, and the Corporation had charged them 2s., although they were both in the supplementary supply area. The Corporation desired to have this power in future, even if the flat-rate should continue in the City of Glasgow. The Act provided that: "The Corporation may, within the supplementary supply district, or any part thereof, charge rates for gas higher than those charged within the City supply district, and such higher rates may vary in different parts of the supplementary supply district, but shall not at any time exceed the rates charged for any similar purpose within the City supply district by more than 50 per cent. of the rate charged for private lighting purposes within the City supply district, and shall not in any case exceed the said maximum price." Therefore they had power to vary the charge in the supplementary supply area.

The CHAIRMAN said that, with regard to Carmunnock, they thought that the portion of the parish above the imaginary line which had been referred to should be taken into the supplementary supply area.

Mr. BLENNERHASSETT said that, with regard to Baillieston, he supposed the decision of the Committee meant that the agreement between the Corporation and the Company should be carried out.

Mr. BALFOUR BROWNE: We cannot do that.

Mr. BLENNERHASSETT asked the Committee to say that, until the Baillieston Company were purchased by the Corporation, there should be no power on the part of the Corporation to supply gas in the Baillieston Company's area.

Mr. BALFOUR BROWNE: We are not going to purchase. It is a non-statutory Company.

The Committee decided that they could not agree with Mr. Blennerhassett's suggestion.

Mr. BALFOUR BROWNE pointed out that Baillieston was at present within the City supply area; so that the consumers were entitled to a supply at 2s. The decision of the Committee put them in the supplementary area; and the Corporation could now charge them 50 per cent. more.

Mr. BLENNERHASSETT said that if the other House had put Baillieston in the supplementary supply district the Corporation would have been bound to purchase their undertaking; and he asked that, now they had been put in, the Corporation should be called upon to purchase.

Mr. BALFOUR BROWNE pointed out that the agreement between the Corporation and the Baillieston Company was absolutely dead.

The CHAIRMAN said the Committee's decision was to include Baillieston in the supplementary area without any further provisions.

Mr. CRAIG HENDERSON, with regard to the parish of Carmunnock, pointed out that the line to be drawn across the parish had been agreed, and would be placed before the Committee later on.

Mr. Alex. Wilson, who gave his evidence in chief on the previous day, was then examined by Mr. LANKESTER, on behalf of the Railway Companies. He said it was the common practice of gas companies to allow discounts; and they found it to their advantage to do so. It was in the interests of lowering the price generally. He was in favour of a reduction in price to large consumers. It was in the interests of all the consumers. He could not understand why the manufacturers in the boroughs of Govan and Partick should be placed in any different position in regard to the competition they had to meet from other places. Asked if the Corporation were anxious to reduce the price of gas to the Railway Companies, witness said they wished to reduce the price to everybody. As the Manager of the Gas Department, he would like the Bill amended.

Replying to Lord ROBERT CECIL, witness said there was a modern case of a differential rate being allowed in Edinburgh, where the charge was 3s. 6d. and 3s.; but in the case of Glasgow, if they were not given the 50 per cent., it was possible that it would be unremunerative to them to give a supply.

Mr. Corbet Woodall, the Governor of the Gaslight and Coke Company, next gave evidence. He agreed that, under the circumstances, it was fair and reasonable that there should be an extra charge of

50 per cent. as a maximum. If there were many places where they might supply without great extra cost, there might be no reason for making an extra charge; but there were a great many undertakings where as much as 1s. per 1000 cubic feet extra was allowed in the outlying districts. There was a long list of cases where a differential rate had been given, and the amount of this differential rate would diminish as the years went on. In this case, the supplementary district was fairly treated.

Replying to Mr. LEWIS COWARD, witness agreed to a differential rate to large consumers.

In answer to Mr. LANKESTER, witness said it was not true, as had been suggested, that there was no power to give discounts in London. The matter had become more and more acute since the introduction of electric competition. Electrical corporations and companies were allowed to make special terms; and the difficulty of gas manufacturers was very great indeed when large manufacturers asked for a lower price and they were unable to give it. It was not unusual for railway companies to pay £4000 or £5000 to gas companies annually; and if they were lost to a gas company because they were unable to offer a lower price, it would be a very serious matter.

Replying to Mr. VESEY KNOX, witness said that, in accordance with the general law, gas companies could not merely differentiate between large and small consumers, but they could make any special bargains they liked. He knew of no other case where a gas undertaking had been placed under such restrictions that they were compelled to give a flat-rate. It was quite novel, and he did not know of any case where a gas undertaking had been compelled to give the same terms to all consumers, apart from the amount of their consumption.

Replying to Mr. FREEMAN, he agreed that by section 9 of the Glasgow Act of 1882 all consumers were to be treated on the same basis.

Mr. FREEMAN: You are going to charge on the small consumer what you lose on the big one?

Witness: We do not lose on the big consumer.

You are in favour of altering the law which has worked very well for a number of years past, and therefore the onus is on you to prove that it will not be a hardship?—It is only by supplying the large consumers that we are able to keep the small ones.

Continuing, witness denied that the outlying places would be injured in any way. There were precedents for what they were asking; but he agreed that they were of very old date. The tendency had not been to abolish differential rates. He did not agree that the practice of Parliament had been to say that gas companies were not to milk the outside district to the benefit of the inside area. There were certainly a great many places where no geographical differential rates had been allowed; but he would be very much surprised to hear that there were 200 cases in England without a differential rate, against 30 with. He agreed that in Scotland there were 53 cases without a differential rate, as against 8 with. With regard to Baillieston, he thought this area could be supplied by the Coatbridge Company. Their price for gas was 2s.; but he did not know whether they would be able to supply the district at the same rate.

Re-examined by Mr. BEVERIDGE, witness said it was the working charges that made the outside districts so costly. There were longer service pipes and many things to be considered. Fifty per cent. was a just amount to be allowed.

This closed the evidence on behalf of the Corporation upon clauses 26 and 27.

Mr. COWARD then addressed the Committee on behalf of the manufacturers, engineers, and other consumers in Glasgow and Govan. He said that with the provisions of the Bill as it was introduced in the other House, the manufacturers were quite content; and they hoped it would become law. Unfortunately, in the absence of any evidence from the large consumers of gas, it had emerged a mutilated Bill. It was most unreasonable that the differential rates allowed in respect of the gas supplied in other industrial communities should be denied to the manufacturers of Glasgow. When section 9 was inserted in the Glasgow Act of 1882, prohibiting differential rates, the gas industry was in a very different position to what it was now.

Mr. David M'Ausland, representing the Felix Tube Works, Glasgow, said they paid £1516 a year for gas for lighting purposes. They had also a supply of electricity from the Clyde Valley Company, by whom they were allowed a reduction according to the quantity consumed. Gas ought to be put on the same footing. Competition was very keen; and the Bill would put them in an unfair position.

Mr. VESEY KNOX, on behalf of the Glasgow House-Owners Association, said that every recent gas company had had to incorporate provisions which, by implication, empowered them to give discounts for large quantities. It was the general law, both in this country and in Scotland. The provision prohibiting a gas company from giving such a discount was an antiquated and altogether absurd restriction. If this very stringent provision were applied to this Bill, the effect would be that the Glasgow gas undertaking must one by one lose the large consumers. They would either make power gas or take electricity; and the consequence would be disastrous in the first instance to the small consumers, and in the second instance to the ratepayers. He did not think it would be possible for those who wished to keep the Bill in its present form to call evidence from anyone who had experience of managing gas undertakings who would say that the restriction in the Bill was reasonable.

Mr. W. R. Herring, the Chief Engineer to the Edinburgh and Leith Corporation gas undertaking, said they had been allowing discounts in Edinburgh of 2½ per cent. for between £50 and £100, and going up to 10 per cent. for £800 and upwards. These discounts were based on the total amount of any individual account. It was not the fact, as had been suggested, that, if they allowed a discount to a large consumer, the loss of revenue represented by the discount must be made good by the small consumer. There was a gain by giving discounts; and the large consumer cost less to supply.

Mr. H. E. Jones said the Railway Companies, who were large consumers, should certainly have discounts and every encouragement to use gas. By these means the price would be reduced to the smallest consumer. It was the universal practice of all gas companies; and they had a sliding-scale, by which, if they could cheapen the gas, they got larger dividends. It was the practice of his Company (the

Commercial) to give discounts up to 25 and 30 per cent. They kept the price down to the working man consumer with a view of developing the use of gas for fuel. There was a saving to the producer in supplying in bulk to the large consumer; and if they did not charge him less than the smaller consumer, they were being compelled to charge him more than they really ought to. He knew of no case except this where the general practice had been departed from. If he were in charge of the Bill he could not accept it, because it would hamper him and prevent him from seeing to the best interests of the shareholders and consumers. He would refuse the Bill. He believed it was the general law in Scotland that when a gas undertaking was in the hands of the local authority the profits must be applied in the reduction of the price of gas. He would not describe this rule as Socialistic. The price of 1s. 10d. per 1000 cubic feet which his Company charged was due to the fact that they gave discounts to all the large consumers.

Thursday, June 30.

Mr. LANKESTER addressed the Committee this morning on behalf of the Railway Companies, and contended that they, being among the largest consumers, should be encouraged to take as much gas as possible, whether for illumination or power purposes. They challenged the promoters of the Bill to produce a precedent which prevented anything like a discount or consideration being given in regard to the quantity of gas taken. What they asked was that the clause should be altered so as to provide that the price to be charged for gas consumed by meter should at all times be charged equally "under like circumstances" to all consumers in the City supply district. Upon clause 27, dealing with discounts, he asked the Committee to follow the practice of all modern undertakings and introduce the Model form, which provided for discount for prompt cash payments, and allows for discounts or rebates to large consumers not exceeding in any case 15 per cent. They wished the Glasgow undertaking to be put on a reasonably sound and commercial basis, not only in the interests of the producer, but in the interest of the consumer. All the trouble had arisen from the unfortunate fact that a clause had been drawn to protect the burgh of Govan and the outside areas from preferential treatment to Glasgow. It was this unfortunate clause which prohibited the giving of discounts. The only objectors to what they were asking, and who would rather that the Corporation's undertaking should not be carried on in the most modern way, were the burghs of Govan and Partick, who had electric lighting undertakings of their own, which they were anxious to push in preference to gas.

Lord ROBERT CECIL then addressed the Committee on behalf of the County Council of Lanark. What he was asking was a modification of the section of the Bill which gave the Corporation the right to charge within the supplementary supply district 50 per cent. more than the rate charged for lighting purposes within the City district. It was said that it was Glasgow's duty to its own constituents to make as much as they could out of the outside areas; but he contended that the outside areas should be protected, and have a supply given to them on reasonable and proper terms—20 per cent. would be an extreme figure. He referred to Chryston, in the parish of Cadder, where the Corporation had entered into an agreement to supply at 3s. per 1000 cubic feet.

Mr. E. H. STEVENSON gave evidence. He said that it was a most unusual provision to make the additional price in a supplementary district a percentage upon the price charged inside. The percentage, of course, had varied with the price of gas inside; but the cost of supplying the gas outside the district would not vary. The capital charges would be the same, as also would the charges for repairs and maintenance. The chief fluctuation in the price of gas would depend upon the cost of coal—that was to say, the price in the supplementary area would be affected by a general rise in the price of coal more than anything else. The general way was to fix a definite amount which might be charged in relation to the sum charged inside; and this should be, as nearly as possible, the extra cost of supplying the district. There were several precedents. In Birmingham, when the Corporation took over the gas undertaking, there was a difference of 1s. per 1000 cubic feet on the differential rate; and in 1878, the outside districts brought a Bill in Parliament to do away with the differential price, and Parliament passed the Bill. At present, in Birmingham there was a differential rate over the whole area. In the case of Salford, the differential rate was done away with in the outside districts. In Manchester, there was an outside district; but it was not a wide one, because there were so many gas undertakings in the immediate neighbourhood. Manchester charged 2s. 3d. in the city, and 3d. extra outside. In Leeds, there was a flat-rate; in Oldham and district, there was no additional charge outside; and in Nottingham, there was a flat-rate—in that case, there was a large outside area.

Mr. VESEY KNOX: But there are discounts allowed?

Witness agreed. But so far as he knew, there was no example in England of so large a differential rate as 50 per cent. He thought it was a wrong principle to put a percentage into a Bill. Assuming there was to be a differential rate, he would limit the price by ascertaining what would be the additional cost; and in this case, he did not think anybody could prove more than 6d. per 1000 cubic feet as the outside maximum. He thought it was the general rule either to have a low price fixed by Act or a single price fixed as a maximum. In Scotland, including Edinburgh and Glasgow, there were only eight corporations who were charging a differential territorial rate. In the conditions of the Glasgow undertaking, he could not see anything to make it reasonable that they should be allowed to charge in Baillieston 1s. over the lighting charge made in the City. Glasgow had all the favourable conditions for the cheap manufacture of gas. Carmunnock, Baillieston, and Cadder were all within such distances that they could be easily and inexpensively supplied. It was not a widely-extended area; and the cost of mains would be very small.

Mr. BALFOUR BROWNE: If we have ascertained that 1s. in addition to the 2s. will not pay, then we are entitled to charge 1s. extra?

Witness: There is no question of doubt in my mind that any part of these three additional places can be supplied at less than 1s. extra. Continuing, witness said that in Baillieston all that would have to be done would be to extend the existing mains which were within 200 yards of the boundary.

Mr. FITZGERALD, on behalf of the burghs of Partick, Govan, Rutherglen, and Pollokshaws, said that it was especially for the protection of the gas consumers of the outside burghs that they got from Parliament a statutory prohibition preventing the City of Glasgow from charging higher rates outside the City than they were charging inside. This principle was adopted in 1882. When the present Bill came to be considered in the House of Commons, the position in Glasgow was that they were bound to charge for private lighting the same price to everyone; and they were, in fact, charging for trade supplies a lower price. As originally introduced, the effect of the Bill on the outside districts would have been most serious, and, accordingly, for the purpose of preserving the *status quo*, the decision given in 1882 should be preserved; and in future every person within the City supply district should be entitled to get gas at the same price for lighting, and every local authority should be entitled to gas for public lighting at the same price. With regard to trade supply, all they asked was that the rate charged should be the same to all consumers.

Mr. BALFOUR BROWNE, on behalf of the promoters, said they were content with the Bill as it passed the House of Commons; and it was for the Committee to judge between the two sets of opponents where the truth lay. He would be perfectly neutral, but asked that part 5 of clause 26 might be retained, giving the Corporation power to charge the 50 per cent.

The CHAIRMAN, after a deliberation in private, announced the decision of the Committee on clause 26. The effect of the decision was that the price to be charged for gas consumed by meter shall at all times be charged equally *under like circumstances* to all consumers within the City supply district. The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating, and for the particular requirements of any trade, &c., provided that the rate charged for the gas supplied shall be the same *under like circumstances* to all persons. Sub-section 4 of the clause, relating to the price to be charged for public lamps, and sub-section 5, relating to the price to be charged in the supplementary supply district, were passed without any amendment. Clause 27, giving power to the Corporation to allow discounts of 5 per cent. to consumers in consideration of prompt payment, was struck out, and the following clause, from the Model Bill, inserted:

The Corporation may, if they think fit, allow discounts or rebates to consumers of gas in consideration of prompt payment of gas charges, not exceeding in any case 10 per cent. per annum, and, in addition thereto, or irrespective thereof, they may, if they think fit, allow discounts or rebates to large consumers not exceeding in any case 15 per cent.: Provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers: Provided, also, that notice to the effect of this enactment shall be endorsed on every demand note for gas charges.

Consideration was then given to clause 50, with regard to the application of revenue.

Mr. Walter Nelson, the Chairman of the Gas Committee, gave evidence. He said the clause was struck out in the other House; but the views he gave when the Bill was before the Commons Committee in its favour, he still held. The important part of the clause was that which empowered the Corporation to carry any balance from the undertaking to the credit of the Corporation for their general purposes. The Corporation wished to retain this power. Altogether, they had allocated £21,000 to public purposes. Their present indebtedness on the gas account was about half the capital which was put into the undertaking.

Replying to Mr. FREEMAN, witness agreed that the raising of the price of gas by 1d. per 1000 cubic feet would bring in £25,000.

Friday, July 1.

Mr. VESEY KNOX, on behalf of the House Owners' Association, was this morning permitted to call, in support of their petition.

Mr. CORBET WOODALL, who said he attended before the Committee under an Order of the House. It was his opinion that a reserve fund should be established to meet extraordinary claims and demands. As an instance, he said that in this particular case the gasholders were blown up, and the undertaking suffered a loss of £44,000. It was also desirable to avoid fluctuations in the price of gas as far as possible. In the case of gas companies, any alteration in the price would mean an alteration in the dividend in the majority of instances; and this was undesirable from the shareholders' point of view. With regard to undertakings such as this, if the price went up there was almost inevitably a check on the rate of increase in the undertaking. People were discontented, and asked for other sources of supply. A regular price and a regular dividend were of very great importance to gas undertakings. The accumulation of the reserve fund was a matter involving a comparatively small sum which was not felt by the consumer; but the raising of the price of gas, even by 1d., was a serious thing. There was a sum allowed for depreciation under the clause; but this was not available for the purposes of reserve. In the other House, he calculated that the allowance for depreciation, when added to the cost of repairs, was 7d. per 1000 cubic feet. In the case of the Tottenham Company, it was 10d.; and with the Gaslight and Coke Company, it was 8d. In regard to the establishment of a reserve fund, and having in addition a sum available for the "Common Good" not to exceed 1 per cent. per annum on the amount of the outstanding capital charges, not to be paid in any year in which the price to ordinary consumers exceeds 2s., his opinion was that where the municipality was supplied at an even rate over a large area, part of which was within its own area and part not, they ought to have either a differential rate or power to take a certain amount of profits in aid of the rates. If a differential rate was charged as against the outside burghs, then he had no sympathy with the idea of making further profit. The consumers within the area would be sufficiently benefited by a differential rate, and would not need the protection of a sum taken in aid of the rates. In the Salford case, 1 per cent. was allowed for what was called "brains and risk"; and he thought this a fair limitation. It would be a great injustice if the loss of one year had to be made good and the profits of another year could not be applied to make that loss good. In the case of Glasgow, the gas supplied was of an illuminating power of over 19 candles; and under these circumstances, he did not know of an instance where a lower rate than 1s. 10d.

had been charged. If the outside consumers were assured that no profit should be put to the "Common Good" unless the present low price was maintained, there would be no injustice to the outside consumer.

In reply Mr. J. D. FITZGERALD, witness said he did not at all represent that L. was appearing there as an unwilling witness.

Mr. FITZGERALD: You could not come without the leave of the Corporation of Glasgow, because you have been already retained to give evidence for them?

Witness: You may put any interpretation you like on it.

Of course, a witness cannot appear for a Bill and against it, and that was your position?—I think the Committee have already found there is a mixture somewhat between the promoters and the opponents here. I may say that I should not have been here this morning had not it been for the Order of the House.

I hope you do not think I am making any personal imputation upon you at all?—Not at all.

Replying to further questions by Mr. FITZGERALD, witness agreed that the burghs of Govan and Partick were quite capable themselves of supporting profitable gas-works, and from these burghs there must be a considerable profit made on the supply. These places had the advantage of the capital raised by Glasgow, they had the advantage of the management of the Glasgow Corporation, and they had the security from any loss resulting from accident or what not. In Glasgow, the maximum price was 4s. 7d., and the present actual price 2s.; and it was almost inconceivable that they would want to go beyond the maximum price. It was sometimes the case that if any unusual demand came upon a gas undertaking it had to be met out of revenue; and if the revenue of the year was not sufficient, it was carried to a suspense account. In the same way, if there was a deficit in one year, it was usually met out of the profits of the next year.

In answer to Lord ROBERT CECIL, witness agreed that the reserve fund was to be a very considerable sum—£20,000 per annum. This was not quite equal to 1d. per 1000 cubic feet on the price of gas.

Mr. VESEY KNOX said he intended to place before the Committee a clause with regard to the reserve fund; and he proposed that it should be the same as in the Salford case— $\frac{1}{2}$ per cent. per annum, and a maximum of 10 per cent. on the outstanding capital. In round figures it would be £11,000 a year, and a maximum of £220,000.

Mr. Nelson then resumed his evidence. Replying to Lord ROBERT CECIL, witness said that where they were trading in an area outside the City boundaries, he thought it right to tax the consumer of gas and place the profits to the relief of the rates. He would tax those outside for the benefit of those inside; and the more profit that could be made out of them the better. But there were limitations.

Mr. Thomas Stuart, a solicitor, then gave evidence on behalf of the House Owners' Association. He said that there was a gas guarantee rate of 6d. in the pound, which might be levied in the event of any deficiency in the payment of the gas annuities. There was a liability on the owners and occupiers of a capital debt exceeding £2,000,000, for which the entire obligation was upon the City of Glasgow itself—it was not shared by the outside areas. He agreed that the best way to keep the charge for gas down was to devote the profits of the gas undertaking to the reduction of the price of gas. If there was a loss on the gas undertaking it was not always advisable to raise the price of gas in order to meet it. There was a strong feeling that the borrowing powers asked for by gas authorities should absolutely prohibit the pernicious practice of selling dear gas to relieve the rates; but he disagreed that establishing a reserve fund would make the gas dear.

Mr. H. E. Jones said the reserve fund was only spreading over a number of years, in the shape of a small composition of $\frac{1}{2}$ per cent. per annum, a sum which would equalize the price of gas over a long period; and whether they charged a higher price in some year after making a loss (which meant a large contribution from the gas consumers), or whether they took a small contribution from him for a number of years until there was 10 per cent. accumulated and then took nothing more from him, was really a matter of indifference, except that the reserve fund made the undertakers more safe in surviving fluctuations of the coal market and such like things. The Glasgow Corporation had not a reserve fund; but they had power to carry any surplus to the "Common Good," and they had been singularly self-denying in exercising it. A corporation trading outside its own limits might be regarded as a company taking a risk and carrying on a trade for the benefit of outsiders. In this case, the outer areas would have to depend, and did depend, on very expensive supplies of gas, and very small gas undertakings which could not possibly manufacture cheaply. This was a consideration which not only justified an extra price of gas in these cases, but even in the cases within the Metropolitan limits; so that the consumer got the advantage in his neighbourhood of a large and a very successful gas undertaking. He did not think these people ought to expect the ratepayers in Glasgow proper to take any risk on their shoulders in respect of what might happen in the case of some great invention superseding gas altogether. In the Salford case, Lord Donoughmore, the Chairman of the Committee, laid down lines which he (witness) was bound to admit the Salford Corporation would not accept; but to his mind, they were fairly clear and reasonable conditions to lay down. Lord Donoughmore made provision not only for the reserve fund, but for what he called brains and risk. But he clearly did not mean so much brains as risk, because he limited it to 1 per cent. upon whatever the capital outstanding on the undertaking might be; and clearly, with an undertaking that was redeeming its capital, this balance diminished while the concern probably grew and extended, so that his measurement of the brains could not have been in proportion to the scale of the undertaking. He must have had in his mind the risk, because he re-mitted it to the diminished amount of the outstanding capital; and that seemed reasonable. Witness considered it fair, in the circumstances of Glasgow, that this should be allowed, inasmuch as they had power to carry sums to the "Common Good." This was part of the statutory bargain between the owners and the ratepayers of Glasgow and all others concerned at the time that the undertakings were purchased from the Companies. This power had not in any respect been abused; and the only amount now standing to the credit of the gas undertaking in this respect was about £21,000 over a period of forty years. He distinctly disapproved of the large sums carried to the rates in many cases. There was no reason why Glasgow should be

deprived entirely of the powers they had had without abusing them for 41 years; and they ought to have a sum which would go towards diminishing the risk to the house owners in case of some sudden invention which might convert the whole thing into a total loss.

Mr. FITZGERALD: I am sure you do not want to retract in any way what you told the Committee the day before yesterday?

Witness: No; not in the least. But you then put it to me that all the profits should go in the reduction of the price of gas. My answer was intended to mean that profits should go in the direction of a reduction in the price of gas—that is to say, that they should mainly go in the reduction of the price.

Mr. VESEY KNOX then addressed the Committee on behalf of the House Owners' Association. He said that when the Corporation took over the gas supply on terms set forth in their Act of 1869, one of the terms was that a surplus might be carried to the general purposes of the Corporation, and he now asked that a reserve fund be established. He asked the Committee to accept the following additions to clause 50, with regard to the application of revenue.

Eightieth: In providing, if the Corporation think fit, a reserve fund, by setting apart a yearly sum not exceeding ten shillings per cent. upon so much as is outstanding for the time being of the moneys borrowed or re-borrowed for the purpose of such undertaking, and investing the same, and the resulting income thereof, in statutory securities, and accumulating the same at compound interest until such fund amounts to a sum equal to ten per cent. of the moneys so outstanding, and whenever the said fund amounts to that sum the income therefrom shall be applied in the same manner as moneys received by the Corporation by way of revenue in respect of the said undertaking: Provided that if and whenever the said reserve fund shall fall below the said last-mentioned sum the Corporation may set apart such yearly sum as aforesaid until the said reserve fund shall amount to such last-mentioned sum.

Ninthly: In any year when the price charged to ordinary consumers within the City supply district does not exceed 2s. per 1000 cubic feet of gas, in setting apart a yearly sum not exceeding one pound per cent. upon the amount of moneys borrowed or re-borrowed in respect of the undertaking, and for the time being outstanding, and upon the amount of the estimated capitalized value of the annuities as on the 31st day of May, 1909, after deducting all sums repaid and all sums outstanding to the credit of the sinking fund, which sum shall be carried to the credit of the Corporation for their general purposes.

Counsel went on to say that 1 per cent. would amount to £22,000 a year. This was a very modest profit for the people who had found the whole of the capital and had run all the risk. If the Committee followed the decision given in the Salford case, justice would be done to the ratepayers.

Lord ROBERT CECIL said that the application of the profits of the undertaking in the past had been in payment of capital charges. This had been contributed to by all, and had been to the benefit of Glasgow, because it was a repayment of the loan they had raised. The outside districts were all quite ready to share in the remote possibility of raising a guarantee fund. They did not desire to resist the Corporation in creating a reserve fund if it were thought a desirable course. He asked the Committee to give the Corporation the reserve fund, but not the right to apply any profits to the relief of the rates. If the Committee thought the Corporation ought to have the right to apply profits to the relief of the rates, however, he asked that it should be made conditional upon their charging no more than 2s. per 1000 cubic feet all through their area.

Mr. Hauston, the Town Clerk of Govan, giving evidence in support of this position, said the burgh were absolutely tied to the Corporation for their supply of gas; and the profits from the undertaking ought to go to the benefit of the consumers. With regard to the House Owners' Association, he said the guarantee rate was levied on the occupiers, and did not fall on the owners at all. Moreover, he did not think there was any chance of this rate being called for. If the burghs were allowed to set up gas-works of their own, they could supply themselves as cheaply as they got it from Glasgow.

Mr. FITZGERALD said the question of principle really was, where they had a gas undertaking vested in a municipal body, an undertaking by which not only the constituents were supplied but large districts were supplied who were not constituents, whether the proper application of the fund resulting as profits from carrying on the undertaking was the reduction of the rates of the inside district or the reduction of the price of gas to the consumers throughout the district. If the second method were adopted, the result was that the profit made from all the consumers of gas was returned to all the consumers equally by means of a reduction in the price of gas. If, on the other hand, it were applied in the relief of the rates of the central town, it was applied only in relief of the ratepayers of that town, many of whom were not consumers of gas, and did not contribute to the profit at all. The great majority of English towns had the right to apply profits in relief of their own rates. The power had been considerably abused, and, in consequence, there was a strong tendency to do away with the practice. But in Scotland, since the year 1856, it had been the rule to apply the profits in the reduction of the price of gas. In this case, of the £22,000, something over £5000 a year would be paid by the outside burghs, which would be most inequitable.

The Committee, after a brief deliberation in private, decided that provision should be made for the creation of a reserve fund; but that there should be no relief of the rates by the profits from the gas undertaking.

Mr. BALFOUR BROWNE said he understood that in Mr. Vesey Knox's clause "Eightieth" would stand, and "Ninthly" would be struck out. This was agreed.

The clauses were finally adjusted yesterday (Monday).

Prepayment Gas-Meter Charges at Bolton.—The agenda for tomorrow's meeting of the Bolton Town Council includes the following special motion standing in the name of Mr. France: "That it be an instruction from this Council to the Gas and Lighting Committee that the charge for gas supplied through the prepayment meters be fixed at the rate of 1d. per 30 cubic feet, instead of 1d. per 25 cubic feet as at present; and that such reduced charge take effect as from the 30th day of September next."

BRIGHTON AND HOVE GAS BILL.

PUBLIC LIGHTING QUESTION.

House of Lords Committee.—Monday, June 27.

Before the Duke of BEDFORD, Chairman, the Marquis of BRISTOL, the Earl of WESTMORELAND, Lord BASING, and Lord DIGBY.)

The consideration of the clauses of this Bill (the opening proceedings of which appeared in the "JOURNAL" last week, p. 967) was resumed to-day.

Mr. BROWN (representing Messrs. Dyson and Co., Parliamentary Agents), on behalf of the County Councils of East and West Sussex, stated that the remaining points in the Bill to which they took objection were such as not to justify their further occupying the Committee's time.

Mr. TALBOT (representing the Brighton Corporation), remarked that there were two clauses to which they took exception; but on one of these they had practically arrived at a settlement with the Gas Company. On the other, which dealt with the terms under which the Company were to provide gas for public lighting, he said the substitution of the incandescent mantle for the old form of gas-burner had relieved the Corporation of the necessity which they were under, under the existing law, either of burning more gas than they wanted or of paying for more than they burned. They were asking now to be obliged only to take and pay for the gas which was actually wanted for the street-lamps. Section 31 of the Act of 1866 provided that the Company were to supply not less than 5 cubic feet of gas per lamp per hour, and in the Act of 1873, instead of the provisions in the Act of 1866 it was provided that it should be 5 cubic feet per lamp per hour; and there was a provision of 15,000 feet for each lamp each year, which worked out at about 4 feet per lamp. These provisions were with reference to the then type of burner—the old flat-flame burner. In 1908, the Corporation and the Company came to an agreement—the Company meeting them most fairly and properly; and they agreed to convert the 576 street burners into incandescent burners. The Borough Surveyor reported to the Corporation that, by the substitution of 3-feet burners for 4-feet burners, there would be a considerable saving. When approached on the matter, the Company pointed out that they had just made a conversion, and had based their estimate upon a contract of seven years; so the Corporation agreed that nothing should be done during the existence of the contract. They asked to be allowed to take 3 feet per lamp instead of 4 feet.

Mr. Hugo Talbot, the Town Clerk of Brighton, said the proposal would have the effect of repealing certain parts of the Company's Acts of 1866 and 1873 in regard to street lighting, the latter of which prescribed a minimum of 15,000 cubic feet per lamp to be taken in each year. If they took this quantity, it worked out at 4 feet per lamp per hour. In 1891, the Corporation established an electric lighting undertaking; and the bulk of the streets were now lighted with electricity. The use of 4 feet of gas in an incandescent burner gave an undue amount of light; and they were advised that a 3-feet burner would give 75-candle power, which would be sufficient for the purpose of their ordinary streets, and would give a better light than any of the electric incandescent lamps. They were seeking to preserve the contract between the Corporation and the Company until 1915.

In reply to Mr. BALFOUR BROWNE, who appeared for the Company, witness said that if their clause was accepted it would remove a contract which had been sanctioned by Parliament; but there was now a difference in the burner. The Corporation were the manufacturers and sellers of electricity. All the principal streets were lighted by electricity. It was competent for the Corporation, at the end of this agreement with the Company, to give up the use of gas altogether. Replying further to Counsel, who asked: "Supposing 4 feet per hour is just sufficient to give a really good light, why should it be reduced," witness said that at the present moment it was the Sanitary Authority, under the Public Health Act, who had the duty of providing street lighting; and they were the proper judges of what light was sufficient or not. He could not agree that 3-feet burners would give a bad light. Such light ought to be given as the Local Authority considered to be a good one; and so far as his observation went, the 75-candle power which was obtained from the 3-feet burner was a far brighter light, and compared most favourably with ordinary incandescent electric lamps.

Mr. TALBOT: At the end of this period of seven years, you are at liberty to discontinue the taking of gas altogether?

Witness: Yes; but we do not want to do that if we can help it. We shall continue it if we can do so on a business-like footing; but we do not want to burn more gas than we require, or pay for more than we burn.

Mr. RAM, on behalf of the Corporation of Hove, remarked that their position was almost identical with that of Brighton. But at Hove there was no agreement with regard to public lighting such as there was in Brighton.

Mr. A. M. Paddon, the Chairman of the Company, gave evidence. He stated that Hove took as much or as little gas as they wanted, and it had no effect on them at all. With regard to Brighton, he said the electric competition was one of the keenest in the kingdom.

Mr. BALFOUR BROWNE: In order to compete with the electricity, even by means of incandescent mantles, you want to give a really good and effective light?

Witness: We do, and we have done so. The Corporation have taken all the more favourable public lighting for themselves, and have left us with the less profitable portion.

Would 3 feet an hour give an effective and efficient light?—It would not. It would seriously impair us in the contest we are carrying on with the electric light.

Replying to Mr. TALBOT, witness said the Corporation were at present pledged to burn 4 feet; but that was by agreement, and wholly to the advantage of the Corporation. It was no hardship on them to burn 4 feet. He was not willing that the question as between 4 feet and 3 feet should be submitted to arbitration.

Mr. BALFOUR BROWNE (to witness): In Hove they are using just about 4 feet per hour?

Witness: Yes; because that is the amount necessary to give a good light.

Mr. Joseph Cash, the General Manager of the Company, said they wanted to give a better light than the incandescent electric lamps; and if they burnt less than 4 feet of gas per hour in a public lamp, they would have a half-filled mantle. It would be a dismal failure. The Company wanted to have sufficient gas burnt to give a good light, and one that would compete with electricity, in order that gas could hold its own.

In reply to Mr. TALBOT, witness said that, with the old fishtail burner, they got 2 candles per cubic foot—about 10-candle power. They could now get 60-candle power with a 3-feet burner. The illuminating power of the electric lights was about 25 candles. The Corporation were trying to drive the Company to the 3 feet; so that they could compare their electric light more favourably with gas.

Mr. BALFOUR BROWNE, in addressing the Committee on the point, remarked that in Hove, where they were absolutely free to burn as much gas as they pleased, they used 4 cubic feet an hour, because they thought it necessary to have a really good light. The Brighton Corporation were asking for the 3-feet burner, because they had the electricity supply in their own hands; and if the light they proposed were given, it would be a dismal failure in the Company's lamps, and the people would say they would not have gas, but electricity.

The Committee declined to amend the clause in the Bill.

The Chairman of the Company having formally proved the preamble, and the clauses having been adjusted, the Bill was ordered to be reported.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

Gas Companies and the Smoke Nuisance.

The Local Legislation Committee of the House of Commons, presided over by Sir FRANCIS LAYLAND-BARRATT, concluded their consideration last week of Part IV. of the above Bill.

The CHAIRMAN intimated that, with regard to the amendment of the meaning of the word "chimney," there were only two cases, so far as he understood, which it would directly affect. One was the railway companies steaming-up engines, and the other the gas companies discharging their retorts. The Committee, he said, had had no evidence brought before them by the promoters as to the existence of the nuisance, and it was very difficult for the Committee to give the extension of power in the absence of such evidence.

Mr. FITZGERALD remarked that, following the expression of opinion given by the Committee, they did not now ask to have included in the Bill any definition of the word "chimney." The only point for discussion was in regard to the elimination of the word "black;" so that in the future what would have to be determined by the magistrate would be simply whether a nuisance had or had not been created by the emission of smoke from a chimney. What the petitioners were really complaining of was that the emission of black smoke should be treated as a nuisance at all, forgetting the fact that it had been the law for fifty years. It was because the sanitary authorities had enforced this law that the petitioners were setting up a grievance. A loophole of escape had been found which had prevented the law from being effective in one case, and which certainly would prevent its being effective in other cases; and the petitioners against the Bill asked that the loophole should be left open, so that they might escape through it.

The CHAIRMAN: Then we may take it that the County Council are absolutely opposed to the suggestion made by Mr. Balfour Browne?

Mr. FITZGERALD replied in the affirmative. Continuing, he said that for the last forty years or longer gas companies had been placed by Parliament in the position that they were not excused under any circumstances at all if they created a nuisance. It was not a question of doing their best or not being negligent, or using the best appliances, or anything of that sort. It was found that the South Metropolitan Gas Company had never during the last forty years been proceeded against at all, or been the subject of complaint. In regard to the Gaslight and Coke Company, they had not been proceeded against for a number of years. Of course, there was a time when the Company did not enjoy so high a reputation as it did at present. Rather than have the law weakened, the County Council would sooner have the clause struck out altogether. There was the alternative way of substituting the word "dense" for the word "black;" but the much simpler method of dealing with the matter was to strike out the word "black" altogether. If the word "dense" were inserted, they got rid of the question of colour. But the smoke had to be dense and create a nuisance; and if these two conditions were satisfied, the person emitting the smoke would be convicted. He agreed that by striking out "black," and inserting "dense," the Committee would be strengthening and not weakening the law, because they would get rid of the difficulty created by the Lots Road decision, and by the terms of the Act of 1891. Something had been said by opponents of the Bill about the nuisance created by the chimneys of private houses; but he did not see what bearing it had upon the question at all. Parliament had enacted in all the Acts that these provisions were not to apply to smoke coming from chimneys of private houses. All the local authorities in London were in agreement that the word "black" should be omitted.

The Committee considered their decision in private; and when the parties were again called in,

The CHAIRMAN said that they had given the proposal a considerable amount of attention, and they noted particularly, in the course of Mr. Fitzgerald's speech, that the County Council repudiated the suggestion of a clause on the lines which were proposed by Mr. Balfour Browne. He was not talking of the terms of the words; but the Committee had given the matter the most careful consideration, and had come to the conclusion that they had had no evidence before them which would justify them in assenting to the omission of the word "black" from the clause. It would have been of very considerable assistance to the Committee if some evidence had been produced as to the effect on the working of the omission of the word "black" in Scotland. The unanimous decision of the Committee was that the word "black" be not omitted; and therefore clause 20 would be struck out of the Bill.

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons who have been charged with the consideration of the above Bill (see Vol. CX., p. 879) met again on Thursday, the 16th ult.—Lord MacDONNELL presiding. When the proceedings were resumed,

Dr. HENRY N. DICKSON was examined. As regarded the provisions of the Bill, his view was that, as the law at present stood, it was not adapted to modern natural conditions, which were now so modified by artificial conditions as to cause serious injury. Suppose a large town required a considerable quantity of water, and that the supply had to be obtained without going to a distance, it must then be had from an artesian basin which caused injury in two ways. If water circulated easily within the basin, the basin as a whole became depleted through the extraction from underground exceeding the supply to the basin from the surface. Under these conditions, the injury was probably not apparent near the point or points of abstraction so much as in the more distant parts of the collecting area, because the water flowed towards the wells almost as fast as it was pumped. The second instance was that if water did not circulate freely the level of the underground water was lowered, temporarily or permanently, near the point of abstraction, and little or no effect was produced at a distance. With regard to the first case, the example best known to him was that of the effect of extensive pumping by the Metropolitan Water Board (and their predecessors, the New River Company and the East London Water Company) in the valley of the River Lee before Hereford, on the area lying to the north of Hertfordshire. From examination of the water conditions of Hertfordshire, and comparison with those in surrounding counties in which circumstances were similar, he had ascertained that in parts of Hertfordshire the flow of the rivers and springs were clearly affected by something abnormal and outside natural seasonal variations.

Lord DESBOROUGH asked witness's opinion as to the expression "protected area" in the Bill.

Dr. DICKSON replied that it meant an area within a radius of two-and-a-half miles from the works. It seemed to him a reasonable one, on the ground that the influence of a large extraction of water from a central point in a water-bearing formation of this kind was two-fold—a local "cone of depression" was formed, and the gradients determining the flow of underground water in the vicinity of the well were altered in directness and steepness. The formation of the local cone of depression was universally admitted. The disturbance due to alteration of gradients arose primarily from the influence of the local cone; and damage done by one well or supply to another in either case could be described as the result of "mutual interference." In witness's opinion, the passing of the Bill would be advantageous to those who could not afford to fight Water Bills before Parliamentary Committees.

Mr. THOMAS HANNELL was the next witness. He gave evidence to the effect that long years of experience had convinced him that the water supplies of the inhabitants of areas which were suitable, and which were now largely and every-day more and more called upon to supply water, were not sufficiently protected. Pumping from wells in the porous strata of these districts injured the private supplies; and under the existing law, no compensation could be obtained for such injuries. He supported the plea for the general necessity for protection being afforded, giving as instances his experiences in regard to wells that had been pumped dry, but which became serviceable after pumping had been discontinued for some time.

The CHAIRMAN said that the Committee were satisfied with the evidence on the points to which it related up to the present. They had not, of course, made up their minds; but he suggested that the points already discussed had been sufficiently dealt with by evidence.

Mr. G. J. GRIFFITHS, the Engineer to the Thames Conservancy, gave the result of his experiences in connection with the work of the Conservancy. The water of the Thames was considerably affected by pumping operations in the neighbourhood. This was proved when new locks were being put in place.

Replying to Lord DESBOROUGH, Mr. Griffiths said it was most important to the Thames Conservancy to protect the river by protecting its neighbourhood. If pumping was allowed without restraint, it would very seriously affect the interests of the Thames Conservancy.

The CHAIRMAN: As I understand your evidence, in order to enable the Conservancy to efficiently perform their duties, it is necessary that they should have full means to estimate the effect of any wells sunk in the neighbourhood of the Thames?

Mr. GRIFFITHS: That is so. We have not that power now; but the present Bill would give us the necessary authority.

At this point,

The CHAIRMAN said the Committee did not desire to take further evidence in regard to the affirmative proposition—that the Bill should be reported to the House. They desired to hear evidence against the measure. He understood there were several interests in question.

Some of the Parliamentary Agents present asked for time for consultation before calling evidence; and the Chairman acceded to this.

When the proceedings were resumed on the 21st ult.,

Mr. ALFRED BLACKBURN, the Resident Engineer and Manager of the Sunderland and South Shields Water-Works, stated that the effect of clause 3 would be to prevent the construction of new works and the extension of existing authorized works without further parliamentary sanction. This clause should not apply to any land already authorized by Parliament for the purposes of new works. All that could reasonably be required in future applications was a statement as to the land proposed to be acquired, and the purposes for which it was wanted. Undertakers should not be required to give details as to their works. Clause 3 would operate oppressively, because, under it, if suppliers wished (say) to deepen a well, make a borehole, or lengthen a drift, they would have to apply to Parliament for authority. If any great development of an original project, amounting practically to the construction of new works, were contemplated, there would be much to be said for a proposal that an application to Parliament should be necessary; but a general measure, such as the one now before the Committee,

should not apply to existing undertakings. Where it could be proved that lowering of the water level had produced actual damage, and that it was due to the operations of the water authority, the principle of compensation should be admitted. The shifting of the burden of proof proposed by the Bill would not be fair. There was great difficulty in fixing a limit to the area of compensation, because the conditions varied so much in each case. The limit depended almost entirely upon the geological conditions. Each case should be dealt with on its merits, without limitation of distance. He did not think they could fix on a distance limit which would not do injustice in a great many cases. In equity, whoever did damage by depleting water in a neighbourhood should compensate; but the damage should be proved. With regard to water in transit, he did not think intermediate authorities should have an absolute right to demand a supply. Each case should be dealt with when the Bill providing for the taking of the water was before Parliament. The matter should not be left to the Local Government Board. There were peculiar conditions in the north-eastern portion of the county of Durham which constituted a strong case why the Bill should not go through in its present form. His authority had a number of pumping-stations there; and there were several collieries whose shafts went through the water-bearing strata. Under clause 4, pumping from the collieries would be just as likely to give rise to a claim for compensation as pumping from the water authority's wells. To put on the water authority the onus of proving that they were not responsible, when the cause might just as probably be the sinking of the collieries through the water-bearing strata, would be inequitable. Any Bill for the protection of water supplies should provide for remedying any *bona fide* injury to a water supply, whether caused by the works of authorized water suppliers or by those of private undertakings. The owners of private supplies—collieries, breweries, railway companies, and other industrial undertakings—should not be specially favoured by being exempted, as they would be by the Bill, from any such claim. When mine shafts were being sunk in the district, pumping was enormous; and it might continue for months, and even, in some cases, for two or three years. It would not be fair to compel authorized undertakers to give compensation in the absence of registration of private supplies. All private water supplies ought to be registered; so that water undertakers would know before they entered on new work what private supplies they were likely to interfere with. The term private water supply should be limited to effective supplies. He did not agree that at present there was any property in underground water. In his authority's statutory area, there were twelve collieries, six private water supplies, and 22 wells sunk for industrial purposes. All drew water in varying quantities. It would be impossible, therefore, fairly to make a claim against his authority unless the extent of the depletion by these other wells and shafts was ascertained. Yet under the Bill the authority would be the only body against whom a claim could be made. Water given as compensation should be given at such cost as the owner or user of the private supply was put to before. Under the Bill as it stood, however, it would be possible for the owner of a private water supply to claim a free supply. In the county of Durham, little or no water was obtained until a depth of 200 feet was reached, and frequently water was pumped from a depth of 300 or 450 feet. It seemed improbable, therefore, that the surface wells above the clay would be affected. Yet it would be difficult for an authorized undertaker to prove that injury was not caused by his works. There was probability of the flow of water to private water supplies being diverted and so injured or diminished in consequence of disturbance of the strata by colliery operations. For years the coal companies in his district had been endeavouring to shift the liability for subsidence to the water companies; and they would take advantage of the Bill to evade their liability for draining wells by disturbance of the strata by mining and by their pumping operations. The principle of protecting both public and private interests had been recognized by Parliament, and should be extended; but he was strongly of opinion that a partial and one-sided revision of the water-works law, as provided in this Bill, would cause confusion, and involve authorized undertakers in great expense and costly arbitrations, and that a comprehensive inquiry into the whole question of the national water supply ought to precede any general revision of water-works law. Valuable information for the purposes of such an inquiry would be furnished if the registration of all water supplies, both public and private, and a record of their condition from time to time were made compulsory. A central or controlling authority would be necessary to obtain a thorough knowledge of all the facts relating to the conservation and allocation of water areas; and this central authority, having the knowledge, could advise Parliamentary Committees on any scheme put forward, with a view to serving the best interests of the community and ensuring that no injustice should be done to any interests unable to protect themselves.

By Lord DESBOROUGH: It would not be fair that local authorities on the route of a supply which was being brought from a distance should have a right to a share of the water. These authorities might be supplied from the surplus (if any) by agreement as a matter of business. The authorities on the watershed from which the water was drawn had a right to a supply.

Sir ALEXANDER BINNIE, formerly the Chief Engineer to the London County Council, expressed the opinion that the Bill would be improved if it were modified so as to be one merely for the protection of private persons and others interested in the preservation of underground water. The principles adopted by Parliament with regard to supplies derived from surface sources were so just and so well understood that such supplies should be excluded from the purview of the Bill. Although the Bill was called the Water Supplies Protection Bill, it contained no provision for the protection of wells from pollution. While clause 3 followed in general terms the wording of Lord Onslow's Model Clause, it appeared to have a retrospective character. It would be improved if it were amended so as to become operative only in the future. Some provision, such as clause 3, was necessary so that, before any powers for sinking wells were granted, there should be a general public inquiry into all the local circumstances. With regard to clause 4, and the definition of "protected area" in clause 7, he considered that an arbitrary radius of $2\frac{1}{2}$ miles stereotyped in a Public Act of Parliament would be inconsistent with the public interest. The proposal to shift the onus of proof with regard to alleged injury to the water undertakers was most unjust. It would upset the whole law of the country to start

with the assumption that a certain party was *prima facie* guilty, and then throw on him the onus of proving that he was not. A person accusing a water company should prove his case as every other person making an accusation had to do. Questioned as to whether a farmer or a small landed proprietor would have facilities for proving damage equal to those of a great water company capable of maintaining accurate gauges for proving that the damage was not caused by them, Sir Alexander Binnie said, of course, the poorer man would not be able to compete with the richer body; but it was just the small man who would always, if the Bill passed, hang on the skirts of the undertaker. Legalized blackmailing would go on round the skirts of all water undertakings in the country. The expense of collecting evidence would not be so great as to be prohibitory in the case of private individuals, because if a water company pumped excessively the effect would be felt not by any one individual alone, but by the whole of the community; and the community would be well able to defend themselves. Compensation should be paid by a water company if it was proved that it was doing damage. Referring to clause 4 of the Bill, he said it was only with the greatest possible difficulty that the surface area from which a well derived its supply could be defined. In some cases, wells might affect the underground flow of water at a distance of five or six miles; while in other cases, owing to geological faults or the dip of the strata, they might not affect other supplies within a few hundred yards. It was so difficult to define the course of underground water that the law must remain as it was, or the subject must be dealt with by the most careful local inquiry. With regard to the portion of clause 4 which dealt with possible injury by the subsequent enlargement of authorized works, while it was conceivable that damage might be done by undertakers enlarging or deepening their wells, sinking boreholes, or driving adits so as to obtain a larger quantity of water than was originally contemplated, no obstruction should be placed in the way of a public body charged with the obligation of supplying water increasing the quantity they pumped as necessity might require. The quantity of water that could be obtained from a well was often very uncertain until the well was actually sunk. It would be absurd, therefore, to say that the undertakers must obtain a certain quantity from any particular well. A well, when sunk, however, might prove far more prolific than was originally contemplated; and there was no reason why the undertakers should not avail themselves of this abundant supply for the benefit of their district, so long as they caused no injury to other persons. The whole of clause 4 appeared to aim at preserving the right to sink wells to any extent by private individuals, while depriving public bodies and companies of their statutory rights as landowners—of course, governed by the provisions introduced by Parliament when granting the powers—to sink wells in the first instance. His only suggestion on this subject was that when Parliament or the Local Government Board were sanctioning, after careful inquiry, the sinking of any well, the undertakers should be limited to pumping only such quantity as was necessary for the supply of their district with such reasonable development as, after inquiry, might be considered proper under the circumstances. He considered that the time had arrived for a general inquiry into the whole water supply of the United Kingdom by either a Royal Commission or some other competent body. Year by year the available sources of supply were gradually being absorbed, often to the prevention of the adoption of a well-digested scheme. Such an inquiry would first of all have to undertake consideration of the rainfall of the United Kingdom. Many water areas were being absorbed piecemeal without being utilized to their full advantage; and so parliamentary rights were being acquired, not so much to the exclusion of other bodies as to the spoiling of what, if properly and comprehensively dealt with, might yield better results.

Mr. JOSEPH PARRY, Engineer-in-Chief to the Liverpool Water-Works, said the Liverpool water supply was derived from three different sources—wells sunk in the new red sandstone in and around Liverpool, a gathering ground of 10,000 acres in Lancashire, and the River Vyrnwy. At present Liverpool had power to enlarge and improve its sandstone wells under statutory provisions; and they objected to these provisions being interfered with in any way, as they would be if the Bill became law. Some years ago an unexpected drought occurred, with the result that the water supply to Liverpool had to be greatly curtailed. One of the first things done was to deepen the existing bore-holes and make new ones. This was done without application to Parliament. These works, however, which were essential for the safety of the town, would have been prevented if the Bill had been in operation. Frequently towns like Liverpool and Manchester had to resort to temporary sources of supply when there was an unexpected drought, or pending the completion of works authorized by Parliament. In either case the demand for water might greatly exceed the yield from the resources. In such circumstances, arrangements were often made with riparian owners whereby a certain proportion of the water discharged into rivers as compensation water was retained. Such an arrangement would also be prevented by the Bill. With regard to clause 4, there were a great number of private wells in and around Liverpool drawing water from the red sandstone; and it would be exceedingly difficult to prove that a particular private well was affected by the sinking of, or the pumping from, a public well. If a public authority was to be liable to give compensation, it was only fair that other persons whose operations affected private wells should be placed in a similar position. Water companies were becoming fewer every year; so that what the Committee had to deal with was local authorities. Most of the draining of wells, in consequence of the sinking of wells in the red sandstone, related to shallow wells—wells not exceeding 30 feet in depth, which were, almost without exception, polluted and not desirable for domestic purposes. If a public authority gave a supply to a district, it was a good thing that these shallow wells should be drained, and that the authority should distribute water from a central station. With regard to the question of supplying water to districts on the route of a line of pipes, Liverpool should not be in the position of having its valuable supply reduced in quantity by claims from places along ninety miles of aqueduct. The question of compensation for injury was very difficult when considered in relation to a water undertaking. Speaking broadly, when a person was injured, he ought to have a remedy; but in connection with water-works and public undertakings of this character, they had to consider many questions. At present a water company knew what their obligations and

risks were; but with a clause such as clause 4 of the Bill, the risks attaching to the sinking of a well would be very serious, and might prevent authorities from carrying out desirable schemes. He emphatically objected to leaving it to the Local Government Board to decide whether or not water should be supplied en route. This matter was one which Parliament should decide in each case.

When the proceedings were resumed on the 23rd ult.

LORD BELPER, the Chairman of the County Councils' Association, detailed the circumstances connected with various water supplies in Nottinghamshire. He pointed out that the underground system there covered a considerable area, and asserted that pumping from one district was bound signally to deplete the water supplies even at a considerable distance. When colliery shafts were sunk through the water-bearing strata, large quantities of water were pumped to waste. A simple remedy for such waste would be provided if those sinking shafts were placed under obligation to bank-back the water. Hydrographical maps of the whole country, showing the water-bearing strata, would be of great use. The Nottingham County Council had found it essential to have such maps of the county in order to protect their own district. He approved of the suggestion that the country should be divided into catchment areas, which would follow the courses of the main rivers and their tributaries, with local boards or committees appointed with the object of conserving the water in each catchment area. In fact, the County Councils' Association, after full inquiry, drafted a Bill some years ago for the purpose of constituting water authorities with powers for the protection of water supplies in their areas. The principle that a district had first claim to the water in it might be embodied in a Bill, and then it could be left to Parliament, in individual cases, to apply it. It was very bad policy to allow the water for which collieries were responsible to run to waste. Generally speaking, he was in favour of the Bill. There should be public control over the water supply of a district. No one should be at liberty to take water without regard to other people.

Mr. J. H. LEWIS: I understood you to say that an individual ought to be compensated for loss clearly sustained by the sinking of a well and the artificial depletion of his water supply. On the other hand, if a public authority were to sustain loss by the sinking of a private well, should the public authority have an equal right to compensation?

LORD BELPER said he would not like to express a very definite opinion with regard to equal rights. He had great sympathy with a private individual, and he thought it was quite as important to protect his rights as it was to protect the rights of anybody else. He did not think the common-law right of pumping water was intended to enable a man to obtain water and sell it. Water obtained in this way should be limited to what the person required for his own use. There was great danger of undertakers acquiring land for the purpose of pumping without applying to Parliament or to the Local Government Board. He did not see how they could give the Bill retrospective effect unless they compensated undertakers for the cost to which they would thereby be put. Regarding clause 4, particularly from the point of view of Nottinghamshire underground water, his opinion was that it was absolutely impracticable. It was impossible to say whether a lowering of the depth in a particular well was due to the seasons or to pumping, or to both. With regard to the proposal to shift the burden of proof, he held that, in Nottinghamshire at all events, the water undertakers could not prove a negative.

Mr. W. J. FREER, Clerk of the Peace for Leicestershire, said it was difficult to conceive a district which required to have more care exercised for the preservation of the small supplies of good-quality water which existed than his county. He was in favour generally of the Bill, but considered the county councils should be authorities under it. As to placing on water undertakers the obligation of proof that damage was not caused by them, he said the case was so complicated that it would be rather hard to do so. The County Councils' Association generally approved of the Bill.

Mr. PERCY GRIFFITH, the Secretary of the Association of Water Engineers, said the provisions of the Bill would very considerably increase the charges imposed on the water authorities of the country; and as these charges would ultimately fall on the consumers, his Association urged that the interests of private consumers, as well as, if not in preference to, the interests of private owners, should be considered. It was a popular fallacy that water companies worked for dividends, and were on a totally different basis from local authority water undertakings. If there were a general inquiry, evidence should be obtained as to the cost of capital in both cases. Generally, the dividends paid by water companies were equivalent to, and not, as a rule, in excess of, the amount of interest and capital charges which local authorities had to meet. Forty-six water authorities, representing three-and-a-quarter million consumers, had passed resolutions in opposition to the Bill. His Association did not understand why the provisions of a Bill affecting public interests did not apply to Scotland and Ireland. Clause 3 should not be made retrospective or of general application. While his Association did not object to a clause in a Private Bill the operation of which was confined to the prevention of the abstraction of water from a site not specially authorized by Parliament, they submitted that the clause went much beyond this, and was very undesirable in the public interest. The clause was very indefinite as regarded the information which might or might not be required under it. Many of the authorities he represented would object to the restriction. If he had to choose between specification of works or specification of the amount of water, he would select the latter. Procedure by Provisional Order should be continued. Undertakings constructed under section 51 of the Public Health Act, 1875, should, if the Bill was passed, be exempted from its operation. With regard to clause 4, the Association urged that it was necessary for each case of compensation to be judged according to the local conditions, which varied considerably. This clause, and the definition of "protected area," could not possibly apply to gravitation supplies. There were cases in which compensation was right and proper. Each case should be considered on its merits. He did not, however, see how under a General Bill such consideration could be given. Generally, the onus of proving that depletion of private sources was not due to the works of the undertakers could not equitably be placed on the water authorities. Compensation required under the general law should not exceed the restoration of the conditions as to quality, quantity, &c., existing

previously to depletion, or an equivalent in money; and any provisions in the general law relative to compensation for depletion should be applicable not only to owners of private water supplies against water authorities, but also to water authorities against owners of private sources. He very strongly opposed any alteration of the law that a person claiming damages should prove his case. There were many instances in which water supplies were being seriously interfered with by works of those who, according to the Bill, were private owners. In the interests of public health, as well as in the interest of justice, it was necessary to protect the public interest before, rather than after, the private interest. If the Bill were passed, unwarranted claims would be made. If the Committee adopted the idea of throwing the onus of proof on water authorities, it would follow that the water authorities must be given specific and not general power to go on the lands and property of the private owners making the claim. They had not this power at present. With regard to clause 5, the Association objected to it, because they held that it would allow a district council, on a line of pipes, whose area had been allotted to an authorized undertaker, to go to the Local Government Board and demand a supply of water in bulk from the authority bringing the water from a distance. The parenthetical words in the clause allowing this to be done should be deleted. The clause needed defining in a practical way. Clause 6 appeared to be inconsistent with the opening words of clause 4. If existing statutory powers were to be subject to abrogation by a General Act, the liabilities of water authorities should not be exempted from the same effect. Select Committees, when passing Water Bills, considered liabilities and powers together; and in future legislation the two should still be considered together.

Mr. EDWARD SANDEMAN, the Engineer to the Derwent Valley Water Board, also gave evidence on behalf of the Association of Water Engineers. Speaking with special reference to gravitation supplies, he said his only objection to clause 3 was that it would prevent small authorities from constructing works without applying to Parliament. With regard to clause 4, the words "private water supply" and "protected area," as defined by clause 7, made the clause apply to gravitation works. It appeared that the idea of a protected area was originally intended to apply to wells and boreholes taking underground waters, and that its extension to upland waters was an inadvertence. The expression "protected area" was defined as the area within a radius of $2\frac{1}{2}$ miles from the works; and hitherto it had been used only in connection with underground supplies. He could see no reason to make it applicable to gravitation works, which should be excluded from the section. In connection with gravitation schemes, it was usual to give compensation by returning a portion of the water to the river or stream affected. If such schemes were not excluded from the clause, compensation would be given twice over. With regard to clause 5, in all schemes upon which a burden of this kind was placed, the district councils seeking supplies should be required to define the points of delivery and the quantities required when the scheme was under consideration by Parliament; otherwise the water authority carrying out the works might be put to unnecessary expense in providing aqueducts of a size which would not be proportioned to the quantity of water passing through them. If water was set aside for the use of the district through which the aqueduct ran, it should be set aside altogether; the quantity being determined when the Act was passed. It was unsatisfactory to provide for supplies being given from surplus water, because the district undertaking the scheme might eventually require all the water that it would yield. The Association recognized the propriety of appropriating a certain quantity of water for the use of intermediate districts through which an aqueduct passed; but the quantity should be definitely limited to a small proportion—at most, 10 per cent. of the whole supply. With regard to the rights of persons on the route, the district most urgently needing water was the one entitled to it. A central authority should be set up to deal with the whole question of water supply.

Mr. WILLIAM MATTHEWS also gave evidence, on behalf of the Association of Water Engineers, with reference to the bearing of the Bill on supplies from underground sources. Clause 3, he said, was quite unnecessary. The Lord Chairman's Model Clause met every reasonable requirement. He strongly objected to the other clauses on grounds nearly all of which had been laid before the Committee.

LEGAL INTELLIGENCE.

A LIGHTING RATE QUASHED.

At the Devonshire Quarter Sessions, held at Exeter last Wednesday, Mr. Spencer Pickering appealed against a lighting rate made by the Parish Council of Morthoe.

Mr. T. E. HAYDON and Mr. W. BERESFORD represented the appellant. No appearance was entered for the respondents, the Barnstaple Union Assessment Committee, the Overseers of Morthoe, and the Parish Council.

Mr. HAYDON said the appeal really was against the whole rate made on the 31st of December last year; but Mr. Pickering, who resided at Morthoe, would be satisfied if the rate for lighting by gas were quashed. The case hinged upon the Parish Council's unsuccessful determination to adopt the Lighting and Watching Act for part of the parish; and the facts connected with these attempts were of some public interest. The objections to the rate were based mainly on the ground that the Act had never been validly adopted for the whole or any part of the parish; that none of the meetings at which the Act was purported to be adopted were legally convened; that the proceedings at these meetings were invalid and irregular; that if the Act had been validly adopted it was for the whole parish, at a meeting held on July 5, 1909; and that no proceedings thereafter were competent for the adoption of the Act for a particular area, until the Act had been abandoned for the parish, under the provisions of section 15 of the Act. On Jan. 6, 1908, a meeting was held to consider the question of adopting the Act, and fifty ratepayers were present. The meeting was irregular, because

the majority in favour of adopting the Act was not a two-thirds majority. On Jan. 25, 1909, the Woollacombe Gas Company was registered, and a parish meeting was called. To this Mr. Pickering objected; pointing out that it was not regularly called. Moreover, those who took part in the proceedings were either Directors or shareholders of the Gas Company. The Act was again adopted; and then, extraordinarily enough, the meeting resolved itself into one of part of the parish which it was desired to light. Subsequently the Local Government Board advised the Parish Council that their proceedings of January, 1908, and July, 1909, were of no legal effect. Nevertheless the rate was made; but Mr. Pickering was not served with a demand note. He had, in fact, to go and ask for it. At length, when he gave notice of appeal against the rate, the authorities announced that they withdrew the rate; and Mr. Pickering's Solicitors at once pointed out that the Overseers could not abandon the rate, but that application must be made to Quarter Sessions to quash it.

The CLERK said the whole matter was very simple. If the Court so ruled, an order could be made to quash the rate.

Formal evidence having been given,

The CHAIRMAN announced that the rate would be quashed.

Mr. HAYDON asked for costs as between solicitor and client; but the Bench would only award costs against the Parish Council in the ordinary way.

Winding-Up of the Mid Oxfordshire Gas Company.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Swinfen Eady had again before him the petition presented by a judgment creditor (a debenture holder) for £736. The Hon. F. Russell, K.C., for the petitioner, having reminded his Lordship that the matter stood over on June 7 in order that the Liquidator (Mr. Stephens) might call a meeting of the creditors, and ascertain their wishes with regard to continuing the voluntary liquidation,* said an affidavit had now been filed by the Liquidator giving the result of the meeting, which was an overwhelming majority in favour of a compulsory winding-up order. The numbers in favour of the resolution submitted to the meeting to continue the voluntary liquidation were 3932; against it, 24,760. Under these circumstances, he did not suppose the Company would further resist the order, and it would not be necessary to go into the evidence which had been filed, showing how the petitioner would be prejudiced by a voluntary winding-up. Mr. Christopher James, representing the Liquidator, said he should have submitted, on the question of prejudice, that there was no evidence of it; but as this part of the case had not been opened, it was not necessary to go into it, beyond pointing out that the Liquidator had sworn positively that he was perfectly independent, and had not known or heard of Mr. Preston, whose nominee he was said to be, until the amended petition had been filed. He admitted that the majority of the creditors were in favour of a compulsory order; and he did not know that he could properly ask the Court to disregard their wishes, though the unsecured creditors seemed about equal. His Lordship said the only proper order to make, under the circumstances, was the usual compulsory one.

Bucks and Oxon District Gas Company, Limited.

Last Friday, application was made to Mr. Justice Joyce, by Mr. Hughes, K.C. (with him Mr. Ward Coldridge), on behalf of Miss Eveleigh, a debenture holder, for the appointment of a Receiver and Manager of the undertaking of the above-named Company. The Company was incorporated on May 15, 1907, with a nominal capital of £25,000; and plaintiff was holder of two first debentures of £25 each, which became payable in the event of the Company making default in payment of interest for three months, or of passing resolutions for winding-up. On the 25th of June, the Company passed a resolution for voluntary winding-up, and appointed Mr. G. Montague White as Liquidator. It was asked that this gentleman should be appointed Receiver and Manager. Mr. Galbraith, appearing for the Company, said he could not resist the application. His Lordship appointed Mr. White, who is to act at once, and give security in due course, but not to act beyond Oct. 31 without further order.

A Gas Official Sentenced.

At the Warwickshire Quarter Sessions last week, Ernest Harry Clarke, a clerk, pleaded guilty to stealing various sums of money while in the employ of the Corporation of Stratford-on-Avon. Mr. Maddocks, for the prosecution, said the prisoner had been a trusted servant for years. He was employed in the Gas Department; and part of his duties was to receive the money collected, enter the amounts on a counterfoil, and account for the whole sum. He defrauded his employers by entering a smaller amount than he received, and stealing the difference. The total amount of the defalcations, which spread over three or four years, was about £440. Apart from this offence, he bore an excellent character, and gave the officials every assistance; but the Corporation had no option but to set the case before the Court. The prisoner absconded to Stow-on-the-Wold, but returned and gave himself up. A sentence of six months' hard labour was passed.

* See "JOURNAL" for June 14, p. 705.

It was, of course, only what one would have expected that a Saturday evening should be chosen for a "sudden failure" of the electric light at Pontypool. "Considerable inconvenience," we are told, was caused to tradespeople and pedestrians; and in a large number of instances persons resorted to candles and oil lamps, for which there was a rush. For some time, the market place was in total darkness; and something akin to panic occurred among the people in the large hall. Considerable quantities of goods were stolen from the stalls. The cause of the failure is, it seems, in doubt; but the blame has been thrown upon the main switchboard.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Accounts for the Year.

The Edinburgh and Leith Gas Commissioners had before them on Monday of last week the accounts for the financial year ending May 15. In submitting the accounts, the Treasurer—Mr. John S. Gibb—also lodged an abstract statement to the effect that: The Commissioners will notice that the "abstract" is considerably more detailed than has been the case in former years. The general features are in accordance with the suggestions of the Scottish Office, as confirmed and approved by the Commissioners. The following short statement shows the financial result of the year's operations:—

The balance carried to profit and loss account on the year's working is	£125,361
There has been paid during the year—	
For Edinburgh and Leith annuities	£31,430
„ Edinburgh-Portobello gas annuities	1,028
„ Amount transferred to sinking fund in respect of annuities redeemed	2,741
„ Do. in respect of mortgages redeemed	2,535
„ Interest on mortgages, &c.	40,722
„ Expenses of mortgages	444
„ Special reserve fund, in terms of 1908 Act	16,686
	94,586

Showing a net balance on the year's working of	£30,774
to which falls to be added the balance brought from the year 1909 (after charging the contributions to the sinking and reserve funds applicable to that year)	2,619

Making the total sum at the credit of net revenue account	£33,393
This is subject to the statutory minimum charges for the sinking funds, as follows:—	
(1) For repayment of money borrowed (20s. per cent.)	£11,764
(2) For redemption of annuities (15s. per cent.)	6,861
(3) For reserve fund (Commissioners' Gas Order, 1902, section 9), $\frac{1}{2}$ per cent. on £181,251	1,204
Together	19,828

Which leaves a balance of	£13,565
at the credit of profit and loss account, to be carried forward to next year, or to be added to the reserve fund, as the Commissioners may determine.	

A further proportion of the costs of the alteration and extension of the offices and workshops at Waterloo Place and Calton Hill has been charged against revenue. The contribution to the special reserve fund, required by the 1908 Act (£15,686) has been met out of this year's revenue, by instructions of the Commissioners.

The gas sold has been 80 million cubic feet more than last year; but the revenue from gas is less by £2894, consequent upon the reduction in price. The return from residual products has been greater by £2637 than last year.

The present value of 1d. per 1000 cubic feet of gas is £8180.

Under the Commissioners' Act of 1908, the capital of the Edinburgh Gaslight Company (£200,000) has been converted into perpetual annuities, redeemable at any term of Whitsunday or Martinmas, at 28½ years' purchase. The capitalized amount is £570,000, and the amount of yearly annuities, £20,000. The capital of the Edinburgh and Leith Gas Company has been similarly increased in amount from £150,000 to £399,000, with £14,000 of annuities; and the capital of the Portobello Gaslight Company, Limited, has been increased from £20,000 to £24,000, with £1200 of annuities. The total capital authorized is stated at £993,000, and the total annuities at £35,200. Annuities have been redeemed to the amount of £2793, at a cost of £78,149. A year ago, before the conversion of the stock, the total capital authorized was stated at £370,000; and the annuities redeemed amounted to £2646; the cost of redemption having been £28,107. Money has been borrowed on mortgage to the amount of £1,281,250, out of a total authorized of £1,400,000. Of the amount borrowed on mortgage, £118,749 has been repaid; leaving mortgage debt amounting to £1,174,877—a reduction of £28,073 during the year. There are also deposit receipts, bearing interest at the rate of 3 per cent., to the amount of £1500.

The cost of the acquisition of the undertaking is stated at £1,068,933, under deduction of £15,360 received for plant or properties sold or transferred to Granton. Of the sum stated, there was expended upon the acquisition of the Edinburgh Company £599,189; of the Edinburgh and Leith Company, £441,100; of the Portobello Company, £26,794; and of the Corstorphine Company, £1850. The amounts expended since the date of acquisition in 1888 have been: On works, manufacturing plant, &c., in New Street, £26,530; in Baltic Street, £1550; in Salamander Street, £6811; in Portobello, £54; in Corstorphine, £25; at Granton, £841,721; in Assembly Street workshops, &c., £5512; and upon Craigleith quarry and water-main, £5631. Upon main and service pipes there has been expended £192,693, of which £985 was expended last year; upon gas-meters, £64,228; upon office furniture, £363; upon heritable properties not embraced in the works, £9650; upon gas cooking and heating stoves, £13,852 (subject to deduction during the year of £804); and upon the cost of the Commissioners' Act of 1888, £22,671. The total capital outlays of the Commissioners have been £2,246,377, of which £1505 was incurred last year. With deductions amounting to £1849, the capital account stands at £2,244,528.

In November last, the price of gas was reduced from 3s. to 2s. 10d. per 1000 cubic feet to ordinary consumers. The quantity of gas sold

during the year was 1,963,184,400 cubic feet—an increase of 80,894,400 cubic feet. The quantity sold to ordinary consumers was 1,708,616,400 cubic feet; to prepayment meter consumers, 71,538,500 cubic feet; and for use in gas-engines, 26,401,200 cubic feet. The revenue from the sale of gas was £281,360—a decrease of £2894. Coke realized (less £5248 working expenses and railway carriage) £32,171—an increase of £1424. Tar brought in £11,480—a decrease of £1298. Sulphate of ammonia produced (less £5150 working expenses) £21,242—an increase of £2513. The total revenue from residual products was £64,893—an increase of £2638. The revenue from all sources was £359,373—an increase of £11,871.

The quantity of coal carbonized was 187,153 tons—an increase of 6533 tons. The cost of coal was £93,605—a decrease of £19,452. The cost of oil for carburetted water gas was £2919—a decrease of £1723. The wages of workmen, &c., carbonizing, amounted to £12,634—an increase of £210. Salaries, wages, and charges at works for general purposes, works staff, &c., amounted to £12,901—an increase of £272. Purifier material, and wages of purifier men came to £861—an increase of £48. Repairs and maintenance of works and plant, tools and implements, &c., at Granton, New Street, &c., and dismantling old works, cost £31,878—an increase of £5482. The total cost of manufacturing gas was £154,799—a decrease of £15,153. Distribution cost £28,255—an increase of £645. There was expended on repairing and fitting up gas cookers, fires, and appliances, £8797—an increase of £6952. Management cost £11,472—an increase of £344. Feu-duties and rents amounted to £625—an increase of £5. Rates and taxes came to £17,388—an increase of £860. Pensions and allowances amounted to £1234—a decrease of £240. The contribution of the Commissioners to the superannuation fund created by the Act of 1908, equivalent to the contributions by the employees, amounted to £1811; and the interest upon the special contribution to the superannuation fund, amounted to £2035. Accidental damages cost £187—an increase of £180. Law and parliamentary expenses amounted to £205—a decrease of £1814. Discounts, abatements, and bad debts amounted to £7202—an increase of £150. The total expenditure was £234,012—a decrease of £1342. There was left a balance of £125,361—as compared with £112,147 a year ago.

Out of the balance of £125,361, and £32,839 brought forward from the previous year, the Commissioners have paid, in respect of annuities, £35,200; interest, £43,256; expenses of mortgages, £445; contribution to special reserve fund, £15,686; to sinking fund for redemption of annuities, £6890; to sinking fund for repayment of borrowed money, £12,104; and to the general reserve fund, £1226, and to the special reserve fund, £10,000. These payments amount to £124,807, and leave a net balance of £33,393.

The Commissioners have expended £80,437 in the redemption of annuities to the amount of £2793. They have, from the sinking fund, invested in mortgages over heritable property £212,010—an increase during the year of £1743. The sinking fund for redemption of annuities amounts to £249,884, and for repayment of money borrowed, to £132,920. The general reserve fund amounts to £19,340; the special reserve fund to £25,973; and the superannuation fund to £5688.

LEEDS GAS-WORKS RESULTS.

The Leeds Gas Committee met last Tuesday—Alderman Tetley in the chair—when Mr. R. H. Townsley, the Engineer and General Manager, presented the financial statement of the gas undertaking for the year to March 31.

The total revenue for the twelve months was £380,500, and the total expenditure £282,179; leaving a gross profit of £98,321, as against a gross profit for the previous year of £95,587. From the gross profits, £52,296 is paid out in income-tax and interest, £37,918 goes to the redemption fund, and £2092 for repayment of stoves. This leaves a net profit for the relief of the city rates of £6016, as compared with a net profit of £5068 for the previous twelve months. The sales of gas show a decrease of 99,234,300 cubic feet, or 3½ per cent., compared with the quantity sold the previous year. This decrease is attributed partly to depression in trade, partly to lessened consumption due to the greatly extended use of incandescent burners, and partly to the extraordinarily bright winter. The latter cause was particularly operative during the quarter ended March 31, when the consumption decreased by 70 million cubic feet compared with 1909. During the year, the net debt on capital account was reduced by £30,446, and now stands at £1,273,524.

Altogether, the report is considered by the Committee to be a satisfactory one.

LEICESTER GAS AND ELECTRICITY UNDERTAKINGS.

Separation of Management.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee presented a report dealing with the future management of the two undertakings under their control. They were unanimously of opinion that it was desirable that there should be separate management of the gas undertaking; and they recommended that the Council should advertise for a Gas Engineer and Manager at a commencing salary of £800 a year, rising by annual increments of £100 to £1000 a year. With reference to the control of the electricity undertaking, the Committee recommended that expert advice should be taken as to the practicability of amalgamating the administration of the two generating systems of electricity at the gas-works and the tramway power station.

Alderman SMITH, the Chairman of the Committee, in moving the adoption of the report, after referring to the growth of the gas undertaking and the electric lighting department under the control of the late Mr. Alfred Colson, proceeded to remark that the Committee had to consider the question of the future management from two aspects. The first was: "Is it desirable to run each of the two undertakings on its own merits or under separate management?" and the second: "Is it better, in the

public interest, to amalgamate the two works under the control of one special Electricity Committee?" There were probably some advantages and disadvantages in regard to the adoption of either plan. It was alleged, for instance, and probably with some truth, that the Aylestone electricity works had not had a fair chance in competition with gas for lighting purposes, and that under separate management it could do much better; that its present reserve power might be used by the Tramways Committee, and thus improve its day-load and financial position. The advantages of unification might be briefly summarized as follows: (1) The whole electricity production and supply for lighting and power would be under the control of one special Committee, whose duty it would be to supply electricity at the cheapest possible rate. (2) It would stop friction between Committees, and abolish insane and unnecessary competition. (3) Consumers and users of light and power would have free choice in taking alternating or direct current, whichever suited them best, at equal rates. (4) The present ducts, cables, and machinery could be more economically used for the present purposes and future extensions of supply. (5) One central office—part of the present gas offices being available—could be extended, where all requiring electricity for light or power could apply. (6) Amalgamation would mean the retention of the present engineering and clerical staffs, with less friction and better control and economy of management. Having regard to certain engineering difficulties that might have to be overcome in carrying out the changes indicated, the Committee thought they should have the best available expert advice before any change was made. They asked for power, in conjunction with the Tramways Committee, who were equally interested in the change, to obtain such expert advice as the Joint Committee might think necessary, in order to guide them to a right conclusion.

Mr. G. E. HILTON seconded the motion; and, after some remarks, it was carried.

COVENTRY GAS AND WATER UNDERTAKINGS.

At the Meeting of the Coventry City Council last Tuesday, the management of the gas undertaking of the Corporation was warmly eulogized on account of the successful year's working, which had produced a net profit of £18,000; and the Council marked their sense of appreciation by increasing the salary of Mr. Fletcher W. Stevenson, the Engineer and General Manager, by £150 per annum. The result shown above was described by the Chairman of the Gas Committee (Mr. W. H. Batchelor) as the first of a series of good reports which the citizens might confidently expect from the undertaking in future. Naturally there were some who thought the advance granted was too high; and there were two amendments to the Committee's recommendation, which was made with unanimity—one being that a rise of £100 should be given, and the other providing for an increase of £50. The latter was characterized by one councillor as "paltry;" and the Committee's recommendation was eventually accepted. The point was very strongly emphasized that, when Mr. Stevenson was appointed, he was given to understand that if he made the concern a financial success, and showed good results, the Council would reward him accordingly. This he had done; and, apart from his capabilities as Manager, he had saved the Gas Department considerable sums by his great engineering skill, as shown in the design of the new works at Foleshill, of which the report presented embraced the first year's working. Another point impressed with some effect upon the Council was that had Mr. Stevenson been in the service of a private company he would have been paid a higher salary than was now proposed, and that, in fact, there were smaller towns than Coventry where the salary of the gas manager was higher.

In reviewing the past year's results, Mr. Batchelor referred to various economies that had been effected under the improved methods of working, and held out a hope of still better results in years to come. At the same time, he was not unmindful of the keen competition the Gas Department had to face in the matter of the supply of electricity, particularly for power purposes; and he remarked that some of those who previously used gas-engines had now adopted electric motors. Satisfaction was expressed at the continued increase of customers through the prepayment meters; but in regard to gas-cookers, the Chairman mentioned that there was a good deal of expense involved in the frequent removal of users from one house to another—there being a disposition on the part of people to require either a new cooker entirely or to have one already in use thoroughly cleaned and overhauled. This work was necessarily very expensive, particularly when it was considered that as many as fifteen removals not infrequently occurred in one day. Dealing with the proposal to reduce the price of gas by 1d. per 1000 cubic feet to ordinary consumers, and 2d. in the case of those using prepayment meters, it was pointed out that a promise was given, when the new works were opened, that there should be some concession made to small consumers at the earliest possible moment; and the Committee were hopeful that this was only the commencement of further reductions that would be rendered possible by the more advantageous methods of production they now had.

In the course of a short discussion, the view was expressed by one speaker that the price of gas was still very high in Coventry, so far as ordinary consumers were concerned, particularly in view of the substantial nature of the profits shown as the result of the past year's working; but the Chairman explained that, in recommending that only £4000 should be devoted to the relief of the local rates, the Committee had regard to the fact that they must make ample provision for the loss of capital consequent upon the abandonment of the old works—an amount that was estimated at £67,000. Moreover, the Council must not forget that they had exhausted their borrowing powers in respect of the gas undertaking, and that there was a tendency now for large sums not to be voted towards the relief of rates. The Committee were anxious to wipe off the amount referred to as early as they could, and place the undertaking in as favourable a financial position as possible. For this reason, they were proposing this year to make a grant of £13,000 out of the net profits towards the loss of capital. A further point to be considered was that if they went to the Local Government Board for sanction to borrow more money, they might be met by a

refusal; so that by keeping the powers they possessed in their own hands, and using the profits earned in the way they thought best, they could avoid the necessity for anything of the kind.

The report was unanimously adopted, together with the recommendations submitted as to the disposal of the surplus.

The wisdom of the step taken by the Water Department some time ago in deciding to acquire an additional supply of water from the Birmingham Corporation, was shown in the excellent report presented to the City Council at the same meeting. The net profits realized as the result of the past year's operations amounted to £5577, against a profit of £2133 in the previous year. Alderman Drinkwater, the Chairman of the Water Committee, in presenting their report, said that but for certain extra amounts that had to be included in this year's accounts, under the new system adopted in the presentation of the figures relating to the department, they would have been able to show a record surplus. Reference was made to the arrangement with the Birmingham Corporation, whereby Coventry has to make a minimum payment of £5000 a year for the water received; but it was pointed out that care was taken to see that the full quantity allowed was used. The city had been well provided for throughout the year; there being no scarcity recorded. It was correct that they had had to make an increase of 25 per cent. in the scale of charges, and though some thought this was excessive, the wisdom of it had been fully justified in the result now submitted. Allusion was made to the additional expenditure incurred upon the department in the last twelve months; and the Chairman said they had to face a further outlay of between £30,000 and £40,000. The satisfactory result shown was due to the increased number of consumers and the successful management of the concern by Mr. J. E. Sindlehurst, the Water Engineer. The Council adopted the report, and decided to apply £3500 in relief of rates.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

Below are given some particulars from the report of the Engineer and General Manager (Mr. W. Langford) on the Longton gas and electricity undertakings, as well as some figures from the accounts relating to the past year's working—that is, to March 31.

The report states that the total quantity of gas made during the year was 155,100,000 cubic feet; being an increase on the previous year of 3,959,000 cubic feet, or 2·6 per cent. The gas sold shows an increase of 2,844,600 cubic feet, or 1·9 per cent. The quantity of gas unaccounted for through leakage equalled 4·59 per cent. There was, says Mr. Langford, a substantial increase in the quantity of gas produced per ton of coal carbonized; and the unaccounted-for gas is very low for a mining district. The amount paid over to the borough fund in relief of the rates was £5000; the total so employed since the purchase of the gas-works by the Corporation having been £73,397. The gross profits on the year's working amounted to £9937. After providing for interest and sinking fund charges on capital, there remained a net profit of £4225, which, together with an amount of £2175 received from the depreciation and reserve fund, has been dealt with as follows: Paid over to the borough fund, £5000; expended on fitting up cottages on the slot system, £295; expended on new mains, £294; on new meters, £713—total, £6302, and leaving a balance of £98 to be carried forward.

With regard to the supply of electricity, the report states that the total number of units generated during the past year was 329,268; being an increase of 55,867 units. The total number sold was 306,186. All new meters, repairs, and renewals of machinery and plant were paid for out of revenue. The average price paid per unit for motive power was 1·49d.; for lighting, 4·5d. The gross profits for the year amounted to £2119, and after deducting the interest and sinking fund charges there was a net profit of £537.

Following the report are the accounts. The first table shows the quantity of gas made, sold, and unaccounted for from 1879 till the past financial year. In 1879, the make was 65 million cubic feet, of which 56½ millions were sold, and the leakage was 13·28 per cent. Last year, the figures were 155 and 148 millions, and a loss of only 4·59 per cent. At the outset of the Corporation's management, the price of gas was 3s. 6d. within the borough; but it was lowered to 3s. in 1885. It had to be put up again in 1901; but it was quickly brought down 3d., then another 2d., and is now 2s. 9d., less 3d. discount, with a charge of 2s. 3d. to 1s. 9d. for power, according to quantity. The next table shows the amounts paid to the borough fund since the gas-works were transferred to the Corporation. They range from £500 in (1899) up to £5000 for the past year. Since Mr. Langford took office, £2000 has been transferred to the borough fund annually for six years, £2500 for three years, then £3000; now £5000. The total capital outlay stands at £158,475, of which £78,475 has been spent on new works; but in March, 1905, a sum of £1450 (not shown in the account) was written off for depreciation. The £80,000 originally borrowed in respect of the gas undertaking, as well as £20,000 subsequently raised, will both be repaid in eighteen years; while a further loan of £10,000, repayable in thirty years from June 30, 1894, will be cleared off in fourteen years. The capital actually employed is: Mortgage loans, stock, and debentures, £132,450; less repaid and in sinking fund £44,340—total, £88,110. As mentioned in the report, the gross profit is £9937; being the difference between revenue, £24,508, and expenditure, £14,571.

The following are the general results of the year's working: Coal gas made, 142,988,000 cubic feet; water gas made, 12,112,000 cubic feet—total, 155,100,000 cubic feet. Gas sold to private consumers, 128,137,000 cubic feet; for public lighting, 18,086,000 cubic feet; used on works, 1,745,000 cubic feet; unaccounted for, 7,132,000 cubic feet. The quantity of coal carbonized was 11,083 tons. The make of gas was 12,901 cubic feet per ton; and the average illuminating power was 15·8 candles, tested with the No. 2 burner. The sale of gas per ton was 12,100 cubic feet. The production of residuals was: Coke, 7204 tons; tar, 743 tons; sulphate of ammonia, 119 tons 6 cwt. They had realized 5s. 6·66d., 1s. 5·28d., and 1s. 9·52d. per ton of coal used.

LINCOLN GAS AND WATER UNDERTAKINGS.

The Past Year's Working.

The audited accounts of the Lincoln Corporation for the past financial year have lately been abstracted under the supervision of the City Accountant (Mr. J. H. Burgess); and the following figures show the progress of the gas and water undertakings.

The quantity of gas sold was 356,590,501 cubic feet, of which upwards of 327,000,000 cubic feet were taken by private consumers. This produced £36,485; the sale of residuals realized £12,371; and the gross profit was £14,235, of which £3000 was used in aid of the general district rate. Redemption of debt accounts for some £8000; and gas cooking-stoves have been purchased to the extent of £1012—the balance carried forward being £1133, or more than £700 in excess of the previous figure. The balance-sheet shows the assets and outlay to amount to £253,268, nearly half of which has been paid off, as the total liabilities are £148,464, and the balance of assets is £104,803.

The water-works revenue account shows that the income last year was in excess of the expenditure by £17,449, out of which had to be paid the interest on, and repayment of, loans, amounting to £10,546, and certain special expenses. The balance standing to the credit of the net revenue account on the 31st of March was £3907. Turning to the capital account, there was a balance due to the Treasurer in March, 1909, of £11,333; and the payments during the year amounted to close upon £46,000. To meet these, £14,229 was raised by the issue of stock, £50,000 was advanced by the Union of London and Smiths Bank, Limited (of the latter amount £13,000 has been repaid), and £1421 has been transferred from the net revenue account. The balance of payments over receipts at the end of March was £4392. Coming to the balance-sheet, the mortgage and stock debt amounts to £160,252. Adding the accounts due to sundry persons and the cash due to the Treasurer brings the total liabilities up to £163,201. The balance of assets, however, amounts to close upon £73,000.

KENDAL GAS AND WATER UNDERTAKINGS.

At the Meeting of the Gas and Water Committee of the Kendal Corporation on Monday last week, the Engineer and Manager (Mr. W. R. Wilson) presented his report for the year ended the 31st of March. It showed that the gross profits of the Gas Department amounted to £3734; and after setting aside £2725 for interest and sinking fund charges, there was a surplus of £1009, out of which the Committee had voted £800 in relief of the rates. The reserve fund remains at £5000; and the sinking fund, including debt repaid, stands at £13,675. The total quantity of coal and cannel carbonized amounted to 7713 tons 18 cwt., being an increase of 55 tons 4 cwt., or 0.72 per cent., on the preceding year. The cost of the coal delivered on the works was £5987, or 15s. 6.28d. per ton. The total quantity of gas made was 84,029,703 cubic feet, being an increase of 1,206,700 cubic feet, or 1.45 per cent. The amount of gas sent out, as shown by the consumers' meters was 77,177,800 cubic feet—an increase of 187,200 cubic feet, or 0.24 per cent. There are at present 1877 ordinary and 1807 prepayment consumers on the books; showing a net increase of 67 ordinary and 246 prepayment consumers over the year 1908-9. The receipts for coke show a decrease of £129; for tar, an increase of £18; and for sulphate of ammonia, an increase of £2 12s. 5d. The price of gas has been reduced from 2s. 8d. to 2s. 6d., and for public lighting from 2s. 7d. to 2s. 4d. per 1000 cubic feet. In the Water Department, the gross profit amounts to £2484. Interest on debentures absorbs £1539 (less £1 15s. 6d. being bank interest), and sinking fund £781; leaving a surplus of £164. The sinking fund, including debt repaid, stands at £10,860. The Committee resolved that the Borough Treasurer should transfer £800 from the Gas Department net revenue account to the general district fund account; and that the sum of £200, being the remainder of the surplus profit, should be carried to next year's net revenue account. As to the surplus profit of the Water Department, they decided that the Borough Treasurer should transfer it to the reserve fund account.

Miners and the Eight Hours Act.—At a conference of miners on the question of amending the Mines (Eight Hours) Act, held at the Westminster Palace Hotel last Wednesday, the following resolution was agreed to: "That this conference, having fully considered the position in South Wales, hereby reaffirm the resolution passed on March 30, 1910, and resolve to resist any amendment to the Mines Regulations Act, 1908, which is not introduced or sanctioned by the Miners' Federation of Great Britain." The resolution of March 30 referred to is the one which authorizes the South Wales miners to agree to the conditions negotiated with the South Wales owners for the continuation of the Coal Conciliation Board, and in it strong opposition was expressed to any amendment of the Eight Hours Act.

Fatal Explosion of Acetylene Gas.—A groom and a nurse were killed and three other persons seriously injured by an explosion of acetylene gas which occurred last Tuesday night at Lord Huntingdon's residence, Sharavogue House, near Birr, King's County. There had been an escape of acetylene gas, which was not considered serious; but as the nursery governess, Miss Jessie Dawne, was going to her apartments with a lighted candle, a terrific explosion took place in a long corridor on the first floor. She received terrible injuries, and succumbed within an hour. A stableman named Joseph Power, who was in the corridor at the time, was killed instantly. At the inquest, William Ennis, the steward, said that he had been working the gas-generator for upwards of two years, and no accident had happened with it. The gas was conveyed into the house by an iron pipe, but the one under the flooring of the passage where the explosion occurred was of lead; and his opinion was that the leakage could have been caused by rats gnawing through the pipe. A verdict was returned of "Accidental death."

PORTRAIT OF THE LATE SIR G. LIVESEY UNVEILED.

At the West Greenwich Gas-Works Institute, on the 24th ult., Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, unveiled a portrait of the late Sir George Livesey, the work of Miss Mabel Robinson, of Balham. The cost has been borne by the members of the Institute; a Committee, of which Mr. Alfred Showell is the Hon. Secretary, having charge of the collection of the subscriptions. Mr. J. F. Braidwood, the Engineer of the Greenwich station of the Company, presided; and there was a large attendance. Before unveiling the portrait, which was covered by a Union Jack, Mr. Carpenter dwelt upon the incalculable results of co-partnership, of which Sir George was the pioneer. He said his interest in the welfare of working men never abated; and nothing gave him greater pleasure than to get into conversation with them. Mr. Carpenter warmly commended the idea of the portrait. He then cut a string, and the portrait, "depicting the noble features of the late Sir George," as he added, was exposed to view, amid profound silence. Mr. Carpenter and Mr. Braidwood were cordially thanked for the part they had taken in the function, and it was brought to a close.

SOUTH METROPOLITAN CO-PARTNERSHIP SCHEME.

Its Coming of Age.

The first article in the "Co-Partnership Journal of the South Metropolitan Gas Company" for July is on "The Coming of Age of Co-Partnership." It is by Mr. Charles Carpenter, the Chairman of the Company, who offers the following remarks on the subject.

Under the name of the "Bonus Scheme" our co-partnership came into being in the troublous year of 1889; and it has now, therefore, had existence for twenty-one years. Sir George Livesey often related the circumstances which led up to its conception; and these need not now be recapitulated. Its great object was to improve the relationship between the Company and its employees, and at the same time to give them the opportunity of bettering their lot in life. With the present declaration of bonus at the rate of 8½ per cent. upon all salaries and wages earned during the past twelve months, the amount of money credited in this way to the Company's employees now exceeds half-a-million pounds sterling. This remarkable figure represents the sum of what has been paid over and above wages as the Company's return for the loyal and intelligent service of its large army of workers during the period under review. A friend of mine often applies to us a remark of an eminent statesman, now deceased, and says "We are all Socialists." Well, if this is Socialism, we have nothing to be ashamed of in the designation. I think, however, the similarity ends with the name.

With the welfare of working men and women near and dear to his heart, Sir George saw the fallacious basis upon which rested most of the socialistic teaching; and he set himself to work to devise a more practical one, for which his intense sympathies and wide experience so eminently fitted him. His great ideal was the formation into a new class, though under an old name, of those who, whether labourers or artisans, toil for a daily or an hourly wage. A fundamental part of the new order of things was a plan to give greater continuity and certainty of service. To this end, a system of agreements was instituted; and instead of following their vocation under the uncertain tenure of an hour's, a day's, or even a week's notice, workmen were assured regular and continuous employment for periods varying from three to twelve months.

Furthermore, beyond the wages which custom and trade societies had decreed as fair to live within and provide not only for a summer holiday but an occasional rainy day, a part of the varying profits of the undertaking was set aside year by year for the employees' benefit, and invested by the purchase of shares in the Company's business. These shares are bought in the open market, transferred to the workmen in their own names, and inalienably held by them. Surely the possession of such securities is bound to bring about a feeling of freedom and independence attainable in no other way. Must it not make a man less fearful and more self-reliant if he feels he has the means in his possession to run alone for a few weeks or a few months, instead of having to pass his life in complete dependence, living from hand to mouth?

Co-partnership has become as integral a part of our business as the supply of gas. I make this statement with firm conviction and full deliberation. But neither in gas supply nor in co-partnership must we be content with matters as they are. Undertakings which do not progress recede. I believe there is no such thing as standing still. Our aim must be to promote the economic use of gas in every way; and the greater the return the consumer gets for the money he spends with us, the more he is likely so to spend. And the same principle is true of the bonus. The more the employees invest their savings in the Company, the greater their interest in it becomes and their power to contribute to its prosperity. We cannot expect the whole half million to be in existence to-day as the employees' holding in the Company; but I do beg all to use their utmost endeavour to increase the amount.

Its Cash Value.

In the same number of the publication referred to in the opening paragraph, there is shown, from some figures furnished by the Chief Accountant of the Company (Mr. Sims), the money value of the co-partnership bonus to a workman earning the very moderate wage of 30s. a week. If such a man had decided at the inauguration of the scheme to leave his bonus and interest untouched, it would in the past twenty years have accumulated to £175 12s. 6d., thus: Withdrawable account, £108 15s.; trust account, £66 17s. 6d. This represents the cash value of the bonus to a man earning his 30s. weekly. Other amounts would be proportionate—i.e., for a man with £2 per week, the figures would be one-third more.

ABATEMENT OF THE SMOKE NUISANCE.

Deputation to the Local Government Board.

A deputation representing nineteen Municipalities (including Manchester, Liverpool, Glasgow, Belfast, Bradford, Leeds, Cardiff, Llandudno, and Brighton) and several public associations waited upon the President of the Local Government Board (the Right Hon. John Burns) last Wednesday, and presented a memorial on the subject of preventing the pollution of the air by smoke.

The memorialists set forth the evil effects of the smoke nuisance, and referred to the steps taken by the Legislature to cure the evil. This, they said, was curable by the application of thought and an expenditure on apparatus, which, carefully used, was accompanied by economy of fuel. Though the Public Health Act, 1875, intended the Local Government Board to take action on the failure of a local authority to do so, the memorialists considered that the Board was not sufficiently equipped. They therefore made a series of requests, among them being the following: "The creation of a Smoke Department of the Local Government Board, with inspectors, competent men with scientific training, who should supervise and report upon the success of the local authorities in keeping down smoke, and give them advice and assistance. If, in the opinion of the Board, these authorities prove ineffective, the Board should itself undertake the control of smoke. In order to remove the domestic smoke nuisance, all new fireplaces should, after a reasonable delay, be inspected and passed as drains and plans are. Believing that cheap gas will be a large factor in the ultimate solution of the smoke question, we trust the Board, in dealing with the borrowing powers asked for by gas undertakings, will absolutely prohibit the pernicious practice of selling gas dear to relieve the rates. This leads to wasteful expenditure, is unfair to large users of gas, and prevents the development of this clean and civilized way of obtaining heat and power."

The deputation, which was received in private, was introduced by Mr. GORDON HARVEY, M.P., who stated that, as a manufacturer owning four mill chimneys, he had practically succeeded in stopping smoke and making a profit.

Principal GRAHAM, the Chairman of the Smoke Abatement League, cited figures to show that the existing smoke legislation is a failure over most of the country. He said that seven towns were endeavouring to carry out the law—viz., Liverpool, Manchester, Glasgow, Birmingham, Bradford, Nottingham, and Sheffield. The total number of prosecutions instituted by these towns came to 2181 in the two years 1903 and 1904; leaving only 164 prosecutions to be distributed over the remaining 102 authorities in two years, or less than one prosecution each per annum, though they had received 6182 official reports of nuisance from black smoke. The new feature of the deputation was that they were there as representatives of municipalities themselves, asking the Local Government Board to come and assist localities where they clearly failed. They did not ask that the subject should be taken wholly out of their control; only that local control should be guided, stimulated, and, where it failed, supplemented by central control, with a staff of inspectors analogous to those who work under the Alkali Acts. It was extremely desirable that there should be in immediate control of smoky chimneys someone more influential and better informed than the ordinary smoke inspector, whose wages were not much above those of a skilled workman, and whose duty it was to control and even to annoy wealthy firms.

Mr. W. B. SMITH, the Convener of the Sub-Committee on Air Purification of the Glasgow Corporation, stated, as showing the necessity for action, that they had in Glasgow last winter one of the most striking examples of the direct effect of smoke-polluted air on the lives of the people. In nine weeks following the 30th of October there was an excess of 1060 deaths; and as the increased number of deaths each week exactly synchronized with the occurrence of black fogs, they thought it was conclusively proved that smoke-fog was the immediate cause of this excessive mortality. The speaker went on to say he had been requested to put before Mr. Burns, for his consideration, the desirability of consolidating the laws against the emission of smoke, and making one uniform code for the whole country. Various local authorities in England and Scotland had Special Acts under which they proceeded; and they varied considerably in the powers they conferred for dealing with this form of nuisance. It seemed to the deputation that all these differences should be put an end to, and that there should be one general law applicable to all manufacturers alike. It was now well known that for many of the smaller industries in a city the gas which was manufactured and sold by the corporation was utilized for the purpose of driving machinery and for heating and cooking purposes. Wherever gas was used in place of coal, smoke was entirely prevented; and hence they desired to specially draw Mr. Burns's attention to the difficulties which lay in the way of some manufacturers as against others in the utilization of this smokeless form of fuel. They referred to the practice which had grown in recent years in various towns in England whereby certain local authorities took an undue amount of the profits from their gas undertakings and applied them to a reduction of the general rates; thus keeping up the price of gas against the consumers, and therefore hindering the utilization of gas, both for heating and for power purposes. They contended that gas should be sold to the community at as nearly cost price as possible, so that its cheapness would encourage its use by the manufacturers, who now had to burn raw coal in small steam-boilers. It was well known among engineers that the smaller type of Cornish boilers, and also all vertical boilers, were among the worst smoke producers. In these circumstances, they appealed to Mr. Burns to take such steps as might seem fitting to prevent the undue amount of the profits of gas undertakings being utilized for the reduction of rates, as they were convinced that this practice not only tended towards some extravagance in public expenditure, but also had a direct bearing on the prohibition of gas as a fuel in the smaller factories.

Alderman FILDES (Manchester) and Mr. LEACH (Bradford) having given particulars in regard to the smoke nuisance in their respective towns,

Mr. BURNS said he sympathized entirely with the objects of the

deputation. He had listened with pleasure to what Mr. Harvey had said—that, as a manufacturer, he had proved that smoke was not necessary, and that its absence implied (as he, Mr. Burns, believed it did really imply) the economic management of the concern. Principal Graham had given reasons for preferring national and general rather than local action in these matters. Mr. Smith, of Glasgow, had raised an interesting point as to the action of local authorities in allocating the profits from their gas undertakings in relief of the rates; the effect of this being to make gas dearer than it ought to be, and so preventing its freer use as an illuminant and heater. He frankly sympathized with this view. Briefly, the contentions of the deputation were that penalties should be increased; that central control and inspection should go hand-in-hand with local administration; that there should be general, as distinct from local, action, both in regard to penalties and standards of smoke; and that there should be national and uniform supervision as against intermittent action on the part of a few public-spirited local authorities. Finally, the deputation asked that areas outside cities should have similar penalties to the cities which they adjoined, so that a man could not get over the border and in this way escape smoke liabilities and responsibilities. He associated himself entirely with the real and practical object of the deputation, because, as an engineer, and one who had taken an active part in improving the health and amenities of big cities, he believed that smoke, wherever it came from, was an insanitary nuisance. He considered that smoke was useless, dangerous, and ought to be abolished; and if this was the object of the deputation, he was certainly in entire accord with their views. He believed that a smoky chimney was a sign of waste, an evidence of defective combustion, and a proof of bad stoking. He believed that much improvement could be accomplished if employers would give practical and technical instruction to their stokers, and afterwards some little encouragement in the shape of an extra shilling or two a week in wages. He considered a man who was making money out of a factory, and at the same time polluting the air with smoke, was guilty of a most unneighbourly act. He must, however, point out that there were several difficulties to be faced. Legislation as it at present existed, with the splendid exception of Nottingham, struck only at the factory, the workshop, and large undertakings. He agreed that legislation should be made possible in many of the directions they had indicated; but they had not dealt with one of the chief causes of smoke nuisance—viz., the domestic house. In this matter he anticipated more from general progress than from any legislation for which they were asking. He believed that great progress had already been made in the designing of furnaces, and that electric and gas power were gradually taking the place of detached and badly-constructed factory boilers and smoky chimneys. All these improvements were a step in the direction of abating the smoke nuisance to which they had not perhaps attached sufficient importance. As an example of the extent of domestic smoke, Mr. Burns drew attention to the fact that while there are in Greater London about 35,000 factories and workshops, the dwelling-houses number a million. Unless anthracite was insisted upon (which, he thought, impossible) for every one of these million houses, reform could only be looked for by educating public opinion. He believed that this reform was coming more rapidly, particularly in London, than some people thought, in the shape of improved stoves and grates, and by the supersession of the coal grate and heater by gas and electricity. He had been at some pains to obtain figures that very morning from two large Gas Companies in London—the Gaslight and Coke Company and the South Metropolitan Gas Company—which confirmed his view that, so far as London was concerned, the smoke nuisance was not nearly so bad now as it was ten, twenty, or thirty years ago. He found that these two Companies had between them 1,300,000 gas-fires, gas-cookers, ring burners, or hot-water heaters; and he was of opinion that the use of all this additional gas in lieu of coal must undoubtedly have reduced considerably the smoke nuisance in London. In conclusion, Mr. Burns said he was prepared to take, so to speak, a hill-top view of this question, and to take counsel with the officers of the Board to see if anything could be done on some of the lines suggested by the deputation. But he warned them that there were difficulties in the way more serious perhaps than some of them realized. So far as sympathy with their object was concerned, he assured them that the Local Government Board was with them; and if the final result of their interview were some improvement in the directions they wished, no one would be better pleased than the officers of the Board.

PUBLIC LIGHTING OF ACTON.

Electricity v. Gas.

At the Meeting of the Acton Urban District Council last Wednesday, there was a long discussion in regard to proposals for the lighting of the district. It was, however, of purely local interest, and left matters very much as they were before.

Upon the agenda was a letter from Mr. Alex. A. Johnston, the Engineer and Manager of the Brentford Gas Company, containing an offer from them in respect of the lighting. He stated that the Directors had for some time had under consideration the means by which the street lighting could be improved, and at the same time reduced in cost; and that they were now in a position to make a proposal which would effect both of these objects. This proposal was: (1) To light the whole of Uxbridge Road and Churchfield Road West by 1500-candle power inverted lamps, fitted on the existing electric arc lamp columns, at a cost for cleaning, lighting, and maintenance of £12 per lamp per annum; and (2) to fix 300-candle power Welsbach self-intensified lamps where there are now eleven arc lamps other than those specified above, for the sum of £5 10s. per lamp per annum—the scheme to include fixing at the Company's expense. Automatic controllers would be put to all the existing gas-lamps; and the price of these lamps would be reduced to £3 each per annum. The high-pressure lamps would be extinguished at 1 a.m., and their places taken by 4-foot Kern lamps similar to those now fitted in most of the side roads; and they would be lighted at the time the others were extinguished. These low-pressure lamps would be fixed on the existing gas-standards. Mr. Johnston pointed out that

this scheme would give the Council not only the best lighted main road in any district outside London, but would also effect a very substantial saving on the lighting account. At the same time, in view of the very heavy capital expenditure involved in carrying it out, a contract for a period of not less than ten years was essential. There was no discussion on the letter.

Mr. Shillecher then proposed another motion, as follows: "That the resolution carried at the special meeting of the Council held on Friday, June 10, 1910, with reference to the handing over of the electricity supply to the Metropolitan Electric Supply Company, be rescinded, and that notice to terminate the agreement be given to the Company." He raised several objections to the proposed arrangements with the Company, and said he had come to the conclusion that the Council could get a supply of gas for £5000, instead of the £20,000 estimated by the Engineer. Mr. Dunsmore said, while he was opposed to giving the contract to the Electric Supply Company, he questioned whether the present was a proper time to discuss the matter, as negotiations were now proceeding. The Chairman (Mr. Schultess-Young, J.P.) expressed the opinion that street electric lighting was doomed, unless the cost was reduced. In Acton, under the present charges for current in bulk, the greater the consumption the worse it was for the undertaking. He pointed out that electricity for public lighting was being displaced by gas, and referred to the example of Westminster in adopting the latter illuminant. In the result, the motion was lost.

PLYMOUTH GAS COMPANY AND THEIR EMPLOYEES.

The Annual Outings.

At the invitation of the Directors, the employees of the Plymouth and Stonehouse Gas Company had their annual outings last week. This year the programme included a combined train and coach trip; the parties proceeding by train to Kingsbridge, thence by coach to Dartmouth, and afterwards by train to Torquay and Plymouth. As usual, the guests were divided into three parties; 200 going on Tuesday, and similar numbers on each of the two following days. Luncheon was provided at the Town Hall, Dartmouth, and dinner at Torquay. Mr. Percy S. Hoyte, the Engineer and Manager, was responsible for the excellent arrangements, and personally saw that they were carried out on each of the days.

There was a little speech-making after the luncheon on Tuesday, when, at the call of Mr. J. Walters, the foreman of the works, supported by other past and present employees, the Directors and Manager were heartily thanked for their work in the interests of the staff. Special reference was made to the good feeling prevailing at the works, and to the pensions bestowed on old employees, several of whom were included in the party. Sir Joseph Bellamy, in reply, said the Directors were doing as they would be done by, and acted towards the men from

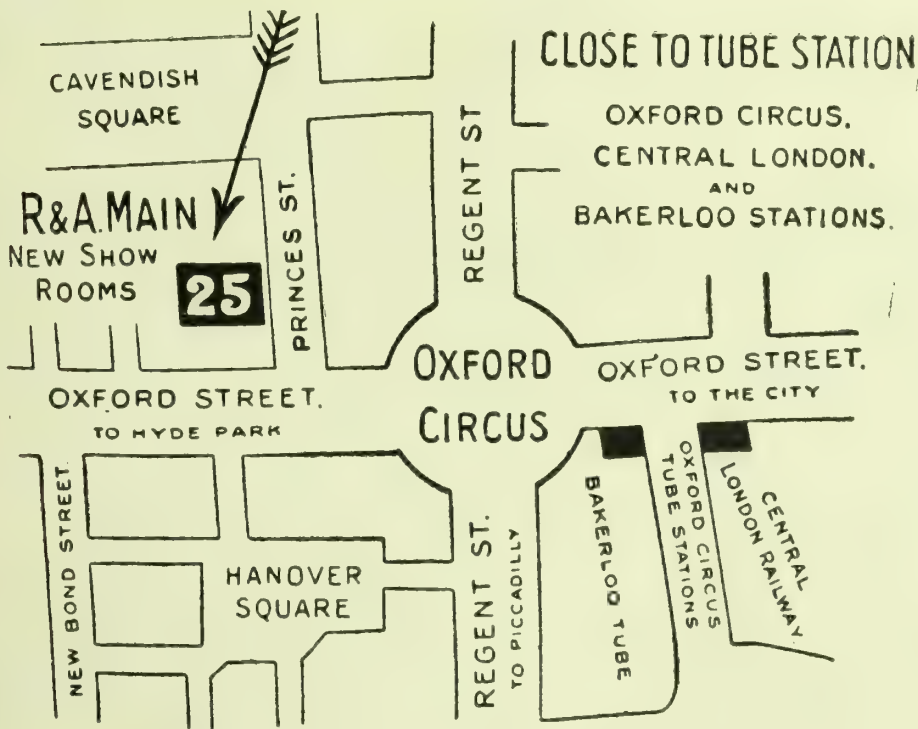
a sense of justice. They had been asked out of Plymouth why they favoured a pension scheme without contributions from the men. It was a fad of his that the men should not contribute anything, because they wanted the men to recognize that it was the carrying out of a sense of obligation on the part of the Directors for good work done. A man who passed forty years of his life in one concern, which, through his efforts and those of his colleagues—including those who might be Directors—had been brought to a successful issue, should receive a reasonable pension when he became worn out. The extension of the business outside Plymouth was to be undertaken. It would not produce profit for a long time yet; but it would enable them to make gas in increasing quantities, and to find employment for more men, while it would at the same time enable them to do good to a number of people who wanted more light. The gas-works had been maintained in a thoroughly efficient state for the last twelve months, and thanks were due to the employees for the way in which they had aided the efforts of the Board to bring about the successful results achieved. The reduction in the price of gas by 1d. per 1000 cubic feet meant a gift of £5000 to the consumers and an extra profit to the shareholders of only £500. They knew, however, that the lower the price charged for gas the greater the consumption; and as gas was the poor man's light, the cheaper it was the greater the benefit to the working classes. Mr. Hoyte spoke of the great assistance rendered by the officials of the Company in the carrying on of the works—specially referring to Mr. H. B. Heath, the Secretary, Mr. Richmond, of the Distribution Department, Mr. J. W. Cornish, and Mr. Clark, the Assistant-Engineer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Edinburgh and Leith Gas Commissioners published in another column, bear testimony to the vitality of the undertaking under its present management. The output of gas during the year was the largest the Commissioners have ever had, being 24 million cubic feet over the next largest output—that of 1907-8. The income from the sale of gas was the same as two years ago, when the price was 2s. 9d. per 1000 cubic feet for the first part of the year, and 3s. for the winter season. Last year the price was 3s. for the summer, and 2s. 10d. for the winter season. The largest revenue from gas was in 1901-2, when the price was 3s. 4d. per 1000 cubic feet; and the sum earned was £291,164. During the past five years, the gas consumption has increased by 110 million cubic feet, or, upon an average, more than 20 million cubic feet per year—a very satisfactory increment. During the past year, coal was cheaper than in the year before by over £19,000, which helped considerably in bringing about a favourable financial result; but the fact remains that economic working had more to do with it. For instance, to effect the purification of nearly two billion cubic feet of gas at the cost of £861 for



purifying material and wages is marvellous. The Commissioners are under obligations, imposed by their Act of 1908, more severe than hitherto. They have been able to meet them all, including a special contribution of £15,000 to a special reserve fund, and have £13,565 over. This result is a matter for congratulation. The next balance-sheet will be prepared under the working conditions of a new set of officials—Engineer and Treasurer; and it is to be hoped that it will prove equally satisfactory. We can scarcely wish, in face of the phenomenal prosperity of the past year, that it should be more satisfactory.

I have endeavoured to follow as closely as I could the proceedings at Westminster upon the Gas Bill of the Glasgow Corporation; but in the absence of a set of the documents, it is all but impossible to understand the bearing of some of the evidence and the arguments. It is quite apparent, however, that, subject to the decisions of the House of Lords Committee being acquiesced in by the House of Commons, the Corporation have done well in prosecuting the Bill in the House of Lords. They have, if nothing else had been attained, secured the consolidation of their Gas Acts, rendering administration easier and cheaper; but in the House of Lords the Corporation have had restored to them two things which the Commons refused them—the adjustment of the areas of supply as they wished, and the right to charge differential rates. The Commons' Committee took away a right which the Corporation have all along possessed, of applying profits from the gas undertaking to general purposes—that is, in relief of the rates; and the Lords Committee acquiesce in this decision, so that, to this extent, the Corporation are worse off than they were before going to Parliament at this time. But the right has not been of much service to the Corporation, as, out of profits amounting, in forty years, to nearly £350,000 net, and in gross to very much more, they have only drawn £21,000 from gas profits for the general good. The loss of this power will therefore not be much felt. It is of consequence, however, that the department should have power to differentiate in price. This is a power new to them, in the lighting branch of their business. Its careful application may be anticipated from the lightness of their requisition of gas profits for the relief of rates. The Corporation are empowered to create a reserve fund, which is in accordance with contemporary provisions. Regarded as a whole, it cannot be overlooked that the case for the Corporation has been excellently conducted. The Bill, as amended—shall I say mutilated?—by the House of Commons Committee was presented to the House of Lords Committee by the Corporation in its amended state, and it was left to outside influences to work whatever alteration upon the measure they required, or could obtain. The suggestion that the Corporation were the real movers in the policy of amendment was firmly resented; and we may accept the disclaimer the more readily in that the presumption is permissible that Counsel for the Corporation, seeing that the forces arrayed against them were antagonistic, relied upon their doing the work of persuading the Committee, by which means the ends of the Corporation were served, and the Corporation and Counsel for them have escaped the odium of seeking to pit one of the branches of Legislature against the other. It is to be hoped that, as between the two Houses of Parliament, the points still in question

will be amicably adjusted, and that the Corporation of Glasgow will obtain their much-needed Gas Acts Consolidating Act.

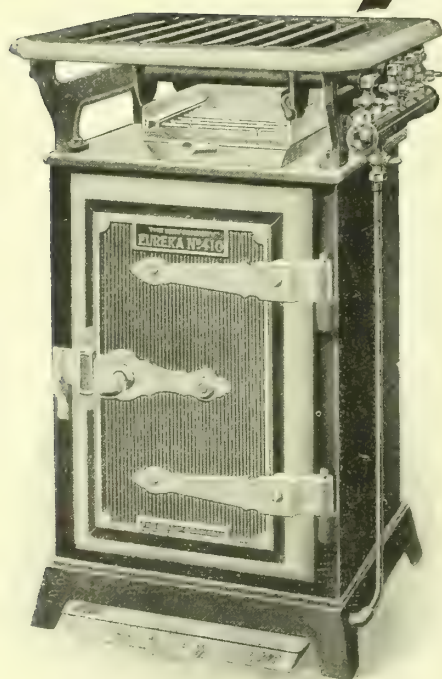
At the annual meeting of the Carlisle Gas Company, Limited, held last night, it was reported that the income for the past year had been £3114, and the expenditure £2435; leaving a profit of £679. A dividend of 10 per cent. was declared, and £179 was carried forward. It was reported by the Directors that the works had been maintained in an efficient condition, and that it is expected that additions and alterations which have been resolved upon will be completed in time to meet the winter's demands.

The Muirkirk Gaslight Company earned a profit last year of £223, out of which a dividend of 10 per cent. has been paid.

The Pittenweem Gaslight Company had a profit of £353 on the past year's transactions, and have paid a dividend of 10 per cent.

Sheriff-Substitute Scott Moncrieff, in the Glasgow Sheriff Court, has refused a petition for interdict against the Glasgow Corporation Gas Department, which had been presented by Mr. J. M. Ross, the Liquidator upon the estate of Messrs. Hutson and Son, Limited, Engineers, Glasgow. The Corporation were among the creditors of the Company in respect of unpaid accounts for gas and electricity supplied to their works before liquidation. These accounts the Liquidator refused to pay, whereupon the Gas Department intimated that, failing immediate payment, the gas would be cut off. It was contended, on behalf of the Liquidator, that the Corporation, by threatening to cut off supplies, were endeavouring to force payment of their accounts, and thereby to secure an illegal preference; while they were entitled only to rank for their claim as ordinary creditors. It was also urged that, by their threatened action, the Corporation would deprive the Liquidator of the supplies of gas and electricity which were necessary for carrying on the Company's business, and which, it was contended, he was entitled to get on his undertaking to pay for what was consumed subsequent to the date of the liquidation. On behalf of the Corporation, it was pleaded that they were within their rights in cutting off supplies for overdue accounts. The Court upheld this view. The same subject was before the Court of Session on the 17th of May last, in an application by the Liquidator of a hotel company to have the Corporation of Aberdeen interdicted from cutting off the electricity supply. The step, if taken, it was contended, would put a stop to business, and prevent its being sold as a going concern. Lord Cullen offered to grant interim interdict until caution for payment should be found, which would have enabled the question of liability in such circumstances to be afterwards considered and determined. Caution, however, could not be offered; and in this case also interdict was refused. In both these cases Liquidators have claimed to be in a higher position than ordinary creditors; and in both their claim has been repelled.

The hearing of the action by Mr. W. Ewing, late Gas Manager at Greenock, against the Corporation of Greenock, in which the pursuer sues for remuneration for extra services, is put down for Tuesday morning, in the First Division of the Court of Session. The case comes up by reclaiming note for the pursuer against the decision of Lord Mackenzie, which was adverse to him.



The "EUREKA"

The Pioneer Gas Cooker!

The "EUREKA" for a generation has been doing good pioneer work.

At the present day the name "Eureka" stands for all that is highest in Gas-Stove construction,

Both—

To the Gas Consumer,
To the Gas Authority.

The Standard Cooker!

The Standardised Cooker!!

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, July 2.

June requirements having been provided for, demand has been rather slack, and prices have been somewhat irregular. The closing quotations are £11 15s. per ton f.o.b. Hull, £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. Foreign buyers are not much interested in the prompt position at present, and buyers who have July contracts to cover are not in a hurry to operate. There has been good inquiry in the forward position, but the firmness of makers stands in the way of direct business. Makers' prices are for the most part £11 17s. 6d. per ton for July-December, 1910, delivery, and £12 per ton for January-June, 1911; but no business is reported thereat, and buyers abroad report that they can buy at 2s. 6d. to 3s. 9d. per ton below these figures.

Nitrate of Soda.

This article on spot Liverpool is easier, and the quotations are 9s. 3d. per cwt. for 95 per cent. and 9s. 6d. for refined quality.

Tar Products.

LONDON, July 4.

The markets for tar products have been very quiet throughout the past week, and pitch has been weak. The present high prices in this article are such that makers are induced to sell their make as soon as they secure their tar; and as both the Continent and the South Wales buyers appear to have ample supplies for some months ahead, they prefer to hold off in the present state of the market rather than purchase; while the Germans apparently are not only willing to sell pitch at a fairly low figure for delivery over next season, but are also taking a large number of fuel orders from the French makers. Business has been done in London pitch at 35s. per ton; and it is doubtful whether even this price can be secured on the east coast. Creosote is quiet but steady; and it appears to be the general impression that we shall have an improvement in the market for this article towards the end of the year. Benzols are very weak indeed. In the North, 90 per cent. quality has been sold at 5d. per gallon naked f.o.b.; while 50 per cent. quality has been done at 6d. on the same terms. Toluol is quiet, and there is little demand for it. Solvent naphtha is steady; but there is not very much buying just now. Heavy naphtha is quiet, with very few orders in the market. Crude carbolic appears to be slightly firmer, and there is some disposition on the part of Continental consumers to buy for a few months ahead. Crystals, however, are still neglected. Cresylic acid is firm, and prices are well maintained, as is customary at this time of the year. The price realizable for tar has fallen owing to the outlook for pitch.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., ex works. Pitch, London, 35s.; east coast, 34s. 6d. to 35s.; west coast, 34s. to 35s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7½d.; North, 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7½d. Toluol, casks included, London, 10d.; North, 9d. to

9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 3d.; North, 1s. 2½d. to 1s. 3d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2¾d. Heavy oils, in bulk, 2¾d. to 2¾d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. to 1s. 0½d. Naphthalene, 4 10s. to 4 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article still continues quiet, and buyers are very independent as to forward business. Actual Beckton is quoted at £12; and outside London makes on Beckton terms at £11 10s. In Hull, £11 13s. 9d. to £11 15s. is asked; in Liverpool, £11 15s. to £11 16s. 3d.; in Leith, £11 17s. 6d. to £11 18s. 9d.; and in Middlesbrough, £11 13s. 9d. to £11 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has shown ease of late; but a rather better tone seems to be setting in, more especially for forward deliveries. In the steam coal trade, best Northumbrians are about 10s. to 10s. 1½d. per ton f.o.b. For second-class steams, about 9s. 3d. to 9s. 6d. is quoted; and steam smalls are steady at from 5s. 6d. to 6s. 6d. There is a rather better demand for coal now that prices are lower; but the production is still ample for all the needs. In the gas coal trade, the period of lowest consumption is now passing; but the increase in the carbonization of coal is at first only slow. Exports are, however, fairly good. Durham gas coals are from about 9s. 3d. to 9s. 8d. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," up to 10s. 6d. is the current quotation. Some sales of gas coal for delivery over next year are reported at practically the same prices as the current ones. In addition, there are two or three contracts, including those for the Ostend Gas-Works for next year, under consideration, and the large sales are slightly stiffening the prices, though not very rapidly. In the coke trade, the tone is quiet. Gas coke is, however, still in small supply, and is firm at about 15s. 4½d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

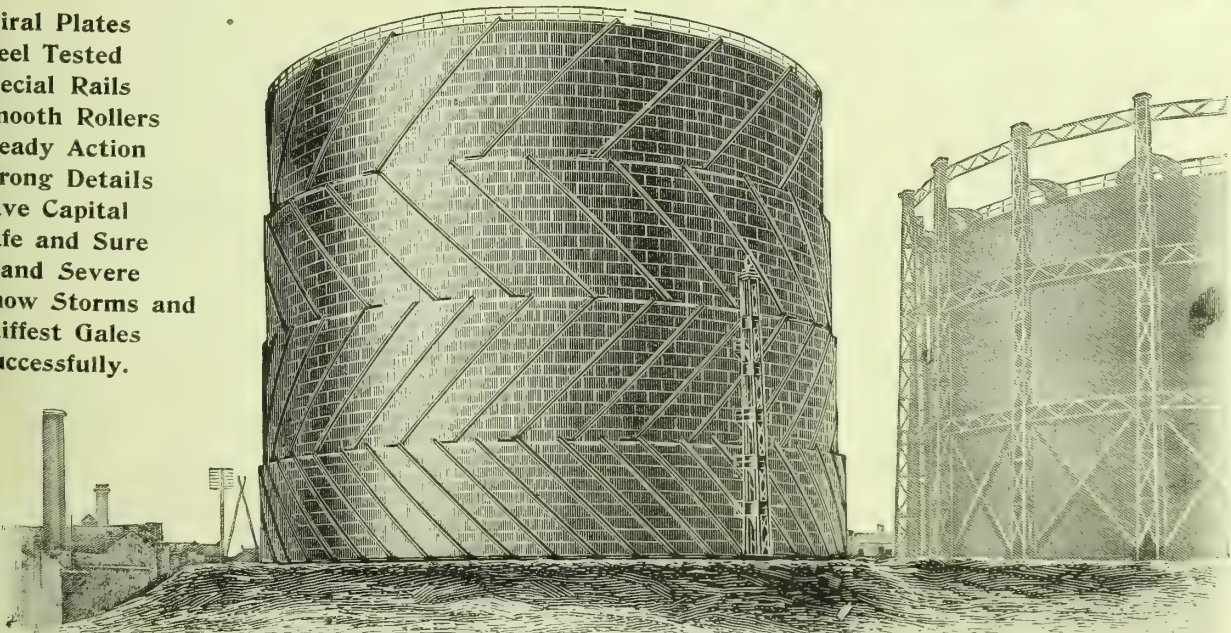
There are signs of improving demand, particularly in the foreign trade, which is about at the height of its season. The home market for steam coal and for washed stuffs is firm. The prices now quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 9d. to 10s.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 320,831 tons—a decrease of 21,083 tons upon the preceding week, and of 38,595 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,593,699 tons—an increase of 623,458 tons upon the corresponding period.

R. & J. DEMPSTER, LIMITED,

MANCHESTER.

Leading Makers of SPIRAL GUIDED
GASHOLDERS.

Spiral Plates
Steel Tested
Special Rails
Smooth Rollers
Steady Action
Strong Details
Save Capital
Safe and Sure
Stand Severe
Snow Storms and
Stiffest Gales
Successfully.



From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

Torquay Corporation Water-Works.

Members of the Torquay Corporation on Thursday paid their annual visit of inspection to the water-works. Among the points which especially attracted attention was the progress which is being made with the afforestation of the land constituting the gathering-ground. The reservoirs are situated on Dartmoor. On the more exposed portions of the land, larch and Scotch fir trees are being planted. Oak, beech, and sycamore are also being planted; and in the low-lying ground an osiery is being established. The Corporation have laid out a nursery for rearing young trees; and a number will be planted each year. Another matter to which attention was directed was the provision made for aerating the water from the Kennick reservoir. The water is now conducted along the side of a hill and down an inclined plane constructed in ferro-concrete, with a series of steps, by means of which the stream of water is broken into cascades before entering the trunk main. At a luncheon which was served in the Board-room at Tottiford, Mr. T. H. Wills, the Chairman of the Water Committee, who presided, said that the population now supplied with water was 54,000, and the daily consumption was 34 gallons per head. The farming and afforestation operations had been carried out with success. The aeration scheme would materially improve the quality of the water in summer. Mr. S. C. Chapman, the Water Engineer, referring to the planting of trees, said they had not a great deal of money to devote to this purpose, and were feeling their way. The idea was that in time the trees would be a source of revenue, and he thought that the growing of willows for making cricket bats would result in a good profit. The Town Clerk (Mr. F. S. Hex) remarked that the Water Supplies Protection Bill now before Parliament was one of great interest to Torquay. Its progress was being watched very carefully; and if it were considered advisable for the protection of the interests of the town, and the rights of the Corporation, steps would be taken to join with others in opposition to the measure.

Price of Gas at Shoebury.—In the course of a meeting of the Shoebury Ratepayers' Association, Mr. Hatcher remarked that the Urban District Council had been paying 17s. 6d. a ton for coal. Now, as the result of tenders having been invited, they could get it at 15s. 11d.; and if it proved satisfactory, he thought the price of gas should be reduced accordingly. At present, ordinary consumers paid 4s. 3d. per 1000 cubic feet. The Chairman (Mr. W. Neil) said while he was on the Council it was his ambition to bring the price of gas down to 3s. 6d. They started at 5s. 10d.; and now the charge was 4s. 3d. The Council could effect a saving of 1s. 7d. on each ton of coal; but they would never get the price of gas reduced unless they agitated very strongly for it. The hobby of the Council was to make the gas undertaking a paying concern, and it paid now. But to charge the ratepayers a high price so that the works should show a profit, was taking money out of one pocket to put into another. It was decided to inform the Council that, in the opinion of the Association, when the new coal contract was entered into, the price of gas should be reduced in proportion.

The Proposed Improved Lighting of Wandsworth.—The Lighting Committee of the Wandsworth Borough Council report having further considered the subject of the suggested adoption of inverted burners for street lighting. A Sub-Committee inspected the public lamps recently fitted with burners of this description in Clapham High Street, Balham Hill, and Balham High Road; and, with the view of extending the experiment, they had decided that inverted burners should also be fitted to all the lamps in Clapham Common South Side not already provided with them. The estimated cost is £4 19s., and the estimated annual saving £5 10s. The Committee will report further on the matter.

The Lighting of Launceston.—Approval was given by the Launceston Town Council yesterday week to a scheme for the better lighting of the town. The Lighting Committee reported the receipt of a letter from the Gas Company agreeing to the average consumption per lamp being ascertained by 15 meters fixed on certain lamps; the whole of the lamps being of one pattern, and a contract to be entered into for twelve months at the price of 3s. 3d. per 1000 cubic feet. The Mayor (Alderman Trood) said the matter had been under consideration for many years. The provision of new lanterns, &c., would cost £156; but he believed the Council would gain by the change in the system of payment, and that in two or three years the proposed outlay would have been recouped. The time had come to improve the lighting of the town. At present they had three sorts of burners; and those of the batwing type consumed 8 cubic feet of gas per hour, against 6 cubic feet in the incandescent burners. One or two members of the Council suggested that the matter might be delayed. But it was pointed out that the contract must be concluded at once; and the recommendation of the Committee was then agreed to.

Paignton Water-Works Plans.—Further discussion took place at the last meeting of the Paignton Urban District Council respecting the demand which has been made upon the former Water Engineer (Mr. F. W. Vanstone) for the return of certain plans and documents in his possession relating to the works of water supply which were carried out under his supervision. The Water Committee recommended the Council to instruct their solicitors to take the necessary steps to obtain the documents and plans, and to defend any action which the late Water Engineer might bring against the Council to recover fees alleged to be due to him. The Chairman of the Water Committee (Mr. Ham) stated that application was made to Mr. Vanstone in November, 1904, for these plans; but on his pointing out that the signed contract plans were necessary for his use during the construction of the works, they were allowed to remain with him. No question of the right of the Council to the plans was raised until Mr. Vanstone made his claim for payment for extra services. Mr. Hawkins, the new Water Engineer, was appointed in December last; but he had not had the documents necessary for the proper carrying out of his duties. Mr. Vanstone, who is now a member of the Council, criticized the management of the water-works, but made no reference to the dispute between himself and the Council. The recommendation of the Committee was approved.



PARKINSON "HOLBORN CIRCULATOR"

No. 70.

FOR ATTACHMENT TO EXISTING PIPES.

Provides

HOT WATER WITHOUT KITCHEN FIRE.

Some of its chief points are:—

- EFFICIENCY.**—Great Extent of Heating Surface, Vent Outlet at bottom conserves Heat.
- SIMPLICITY.**—Only One Water Chamber. No cross Tubes or Soldered Joints.
- DURABILITY.**—Made of Strong Copper. No Rust. Heat equally distributed.
- CONVENIENCE.**—Swing-out Pilot for Lighting. Double Burner with separate Taps.

MAY WE SEND YOU FULL PARTICULARS?

THE PARKINSON STOVE CO., LTD.
(INCORPORATING MAUGHAN'S PATENT GEYSER CO.)
STOUR STREET, SPRING HILL, BIRMINGHAM,
AND
129, HIGH HOLBORN, LONDON.

Cheaper Gas for Droitwich.—The Mayor of Droitwich (Alderman Gabb), when the annual report of Mr. F. Shewring, the Gas Manager, was before the Town Council, remarked that the results of the past year's working were very satisfactory. There had been a larger sale of gas, with a smaller make. The Council decided to reduce the price of gas a further 2d. per 1000 cubic feet, making the charge 3s.

Gas Profits at Workington.—The profit on the Workington Corporation Gas-Works for the past year is £3854. The price of gas is 2s. 4d. per 1000 cubic feet; and the quantity that has been sold constitutes a record. In no previous year, it is reported, has the result been so satisfactory, except in 1903, when, however, gas was for nine months 7d. per 1000 cubic feet dearer, and for three months 4d. per 1000 cubic feet dearer than it is now, and when the coal cost 6d. per ton less.

Birmingham Gas-Coal Contracts.—The principal business transacted at a meeting of the Birmingham Gas Committee on Monday of last week, says the "Birmingham Post," was the placing of the coal contracts for the year ending June 30, 1911. It had been generally anticipated that the Committee would have to pay probably 1s. or 1s. 6d. a ton more for their annual supply than they did last year. This would have meant an advance in the coal bill of, perhaps, £30,000 or £40,000; for the contracts to be entered into amounted to 550,000 tons. The Committee, however, have been more fortunate, as they have been able to place the contracts at an advance of only a few pence per ton as compared with last year. The increase in the price is substantial; but it is small in comparison with the amount originally anticipated.

The electric supply at Woking failed on Saturday evening; and was not restored until Sunday. This applied to the whole district; and being Saturday evening tradesmen and private residents were put to considerable inconvenience.

The East Surrey Water Company are about to sell by tender 700 ordinary shares of £10 each; the last day for the receipt of tenders being the 29th inst.

At the Exhibition of Meat and Meat Products and Refrigerating Machinery held at Moscow in May, the highest award (Diploma of Honour) was granted to the Pulsometer Engineering Company, Limited, of Reading, for their exhibit of ice and refrigerating plant.

Hitherto, the water used on the Basildon Estate, in Berkshire, has been obtained from wells. Captain Morrison, M.P., the new owner, has decided upon the erection of a large reservoir, from which pipes will be laid so that in future the cottagers and others will be able to draw water from taps in their own houses.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have received instructions to add a second lift, on their cable system, to No. 3 holder at the Ainslie Street Gas-Works of the Barrow-in-Furness Corporation. The holder is 125 feet diameter and 25 feet deep, and is the sixth order received from the Barrow Corporation for cable-guided gasholders. The firm have also been given a contract to supply and erect two cast-iron tower scrubbers, 15 feet diameter and 47 feet high, by the Leicester Corporation for their Aylestone Road Works, to the design of the late Mr. Alfred Colson.

The residents in Port Elizabeth have lately been afforded, by the Manager of the South African Lighting Association, Limited (Mr. W. Arnott), an excellent opportunity of witnessing the capabilities of the gas-stove in domestic culinary operations, as he arranged for the delivery by Miss Mercer of a series of cookery lectures, with demonstrations, in the Loubser Hall, from the 6th to the 20th ult. The lady holds several diplomas and certificates; and her lectures, which, with one exception, were free, were attended by appreciative audiences. At the opening ceremony, the Chairman of the School Board (Mr. Charles Mackay) presided, and offered some appropriate remarks on the value of a good knowledge of cookery.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Swadlincote Gas Department. Applications by July 12.
ENGINEER AND MANAGER. Leicester Gas Department. Applications by July 16.
WORKING FOREMAN. No. 5253.
TRAVELLING SALESMAN. Laddie Incandescent Mantle Company.

Situations Wanted.

ACCOUNTANT. No. 5259.
ASSISTANT-MANAGER OR MANAGER. T. E. Shadbolt, Grays.
INSPECTOR. No. 5260.

Patent Licences.

GENERATING AND USING HYDROCARBON VAPOURS FOR HEATING AND LIGHTING. L. Duvinage, Brussels.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. July 12.
LOWESTOFT WATER AND GAS COMPANY. July 12.
EAST SURREY WATER COMPANY. Tenders by July 29.
SOUTHEAST GAS COMPANY. July 12.
SOUTHEAST WATER COMPANY. July 12.
TONBRIDGE GAS COMPANY. Tenders by July 16.

Tank-Waggon for Hire.

CLAYTON ANALINE COMPANY.

TENDERS FOR Coal and Cannel.

COWES GAS DEPARTMENT. Tenders by July 9.
DARLINGTON GAS DEPARTMENT. Tenders by July 14.
GOOLE GAS AND WATER DEPARTMENT. Tenders by July 23.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
SMETHWICK GAS DEPARTMENT. Tenders by July 22.
STRATFORD-UPON-AVON GAS DEPARTMENT. Tenders by Aug. 6.

Fire-Clay Goods.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Pipe Laying.

HEDDINGHAM GAS-WORKS.

Pipes, &c.

STOKE-ON-TRENT GAS DEPARTMENT. Tenders by July 7.
WINSFORD GAS DEPARTMENT. Tenders by July 25.

Retort-Bench, &c.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Tar and Liquor.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
ROTHERHAM GAS DEPARTMENT. Tenders by July 18.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 18.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.		£ s. d.		£ s. d.	£	Stk.		p.c.		£ s. d.		£ s. d.
1,474,000	Stk.	Apr. 1	5	Alliance & Dublin Ord.	81 83	-1	6 0 6	4,940,000	Stk.	May 12	6	Imperial Continental	1 8-180	..	4 8 11
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	1,235,000	Stk.	Feb. 10	3	Do. 3 1/2 p.c. Deb. Red.	94-96	..	4 12 11
200,000	5	May 12	7	Bombay, Ltd.	6 1/2-6 3/4	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122-124	..	4 16 9
40,000	5	Feb. 25	15	Do. New, £4 paid.	4 1/2-5 1/2	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A	219-221	..	4 10 6
50,000	13	..	7	Bourne 1/2 p.c.	29-30	..	5 0 0	718,100	"	..	7	Do. B	164-165	..	4 4 10
311,810	11	..	7	mouth Gas B 7 p.c.	16 1/2-16 3/4	..	4 3 7	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10	..	6	and Water B 7 p.c.	15-15 1/2	..	3 17 5	75,000	5	June 29	6	Malta & Mediterranean.	4 1/2-4 1/4	..	0 4 5
380,000	Stk.	..	12 1/2	Brentford Consolidated	25 1/2-25 1/4	..	4 18 5	250,000	100	Apr. 1	5	Met of 1/2 p.c. Deb.	100-102	..	4 18 0
300,000	"	..	9 1/2	Do. New	18 1/2-19	..	5 0 0	20	20	..	4 1/2	Melbourne 4 1/2 p.c. Deb.	12 1/2-13	..	4 8 3
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	Stk.	May 27	3 1/2	Monte Video, Ltd.	12 1/2-13	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	93-101	..	3 19 3	1,775,892	Stk.	Feb. 25	4 1/2	Newcastle & Gt. Sh'd Con	8 1/2-9 1/2	..	4 4 6
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	13 1/2-14	..	3 16 11
246,320	"	..	11	Do. A Ord. Stk.	153-116	+1	5 2 7	300,000	10	Feb. 25	7	North Middlesex 7 p.c.	13 1/2-14	..	5 14 4
460,000	23	Apr. 1	10 1/2	British	41-45	..	4 14 8	60,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	6 8 0
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	118-120	..	5 0 0	31,800	53	Apr. 1	13	Ottoman, Ltd.	6-6 1/2	..	0 8 0
165,700	"	..	4 1/2	Do. B 3 1/2 p.c.	88-90	..	5 0 0	60,000	50	Feb. 25	13	Portsea Island A	134-136	..	5 1 0
82,278	"	..	5 1/2	Do. C 5 p.c.	105-107	..	5 2 10	100,000	50	..	12	Do. B	126-128	..	5 1 7
55,000	"	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	85-87	..	4 0 6	114,800	50	..	10	Do. C	119-121	..	4 19 2
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	90-95	..	4 1 8	398,490	5	Apr. 29	7	Do. D and E	100-102	..	4 18 0
100,000	17	..	—	Cape Town & Dis., Ltd.	34-44	..	—	488,980	5	June 29	5	Primitiva Ord.	7 1/2-7 3/4	..	4 15 4
100,000	10	..	—	Do. 4 1/2 p.c. Pref.	58-61	..	6 0 0	412,650	100	June 1	4	Do. 5 p.c. Pref.	51-53	..	4 10 11
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	5 0 0	250,000	Stk.	June 29	9	Do. 4 p.c. Deb.	57-59	..	4 0 10
100,000	Stk.	June 29	4 1/2	Do. 4 p.c. Deb. Stk.	83-90	..	4 10 1	62,500	10	Apr. 1	6	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 15 3	125,000	50	..	1	San Paulo, Ltd.	154-160	..	5 12 6
1,513,280	Stk.	Feb. 25	5 1/2	Commercial 4 p.c. Stk.	103-105	..	4 15 3	135,000	Stk.	July 1	5	Do. 6 p.c. Pref.	11 1/2-12 1/2	..	4 18 0
560,000	"	..	5	Do. 3 1/2 p.c. do.	80-82	+ 1/2	13 2	209,884	Stk.	Mch. 16	10	Do. 5 p.c. Deb.	49-50	+1	5 0 0
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	91-60	..	5 4 2	523,500	"	..	10	Sheffield A	232-234	..	4 5 5
800,000	Stk.	June 10	5	Continental Union, Ltd.	135-137	..	5 4 2	70,000	10	May 27	7	Do. B	232-234	..	4 5 5
200,000	"	..	5 1/2	Do. 7 p.c. Pref.	121-123	..	4 9 5	6,429,895	Stk.	Feb. 10	5/9 1/4	Do. C	232-234	..	4 5 5
492,270	Stk.	..	5 1/2	Derby Con. Stk.	104-105	..	3 16 2	1,895,445	Stk.	Jan. 13	3	South African	11-11 1/2	..	6 1 9
55,000	"	..	..	Do. Deb. Stk.	104-105	..	3 16 2	209,823	Stk.	Mar. 16	3	South Met., 4 p.c. Ord.	120-122	..	4 9 7
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	106-98	..	5 2 0	605,000	Stk.	Feb. 25	5 1/2	Do. 3 p.c. Deb.	80-82	..	3 12 2
486,090	10	Jan. 27	12	European, Ltd.	24 1/2-24 1/4	..	4 17 0	60,000	"	..	5	South Shields Con. Stk.	157-158	..	5 1 3
354,060	10	..	12	Do. £7 10s. paid.	18 1/2-18	..	4 16 0	117,058	"	Jan. 13	5	Sth Suburban Ord. 5 p.c.	121-123	..	4 12 0
16,198,671	Stk.	Feb. 10	4 1/2	Gas 1/2 p.c. Ord.	104-105	..	4 8 10	502,310	Stk.	May 12	5	Do. 5 p.c. Pref.	121-123	..	4 1 4
2,600,000	"	..	3 1/2	light 3 1/2 p.c. max.	88-90	..	3 17 9	120,000	Stk.	Feb. 10	6 1/2	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
4,002,235	"	..	4	and 4 p.c. Con. Pref.	104-116	..	3 15 6	453,940	"	..	5 1/2	Southampton Ord.	110-112	..	4 9 3
4,531,706	"	June 29	3	Coke 3 p.c. Con. Deb.	80-82	+ 1/2	3 13 2	149,470	"	June 29	4	Tottenham A 5 p.c.	133-135	..	5 1 9
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3 1/2 p.c.	93-95	..	5 5 3	182,380	10	July 1	8	Do. B 3 1/2 p.c.	113-115	..	4 13 6
82,500	"	..	6 1/2	Do. do. 5 p.c.	117-119	..	5 9 3	149,900	Stk.	Feb. 25	6 1/2	Edmonton 4 p.c. Deb.	97-99	..	4 0 10
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	17-17 1/2	..	6 5 9	236,476	"	..	5	Tuscan, Ltd.	9-9 1/2	..	8 8 6
131,000	Stk.	Mar. 16	7	Ilford A and C	145-147	..	4 15 3	255,636	Stk.	Feb. 25	6 1/2	Do. 5 p.c. Deb. Red.	97-99	+ 1/2	5 1 0
65,780	"	..	5 1/2	Do. B	109-111	+1	4 19 1	79,416	"	June 29	3	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,500	"	June 29	4	Do. 4 p.c. Deb.	95-100	..	4 0 0					Wands- B 3 1/2 p.c.	139-141	..	4 14 0
												worth 3 p.c. Deb. Stk.	73-75	+ 1/2	4 4 0

Prices marked * are "Ex div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

PENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

VOLCANIC FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.; MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams: Telephone:

"Dacolight London." 2836 HOLBORN.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD, MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E. WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS. REPAIRS RECEIVE PROMPT ATTENTION. Telephones: 815 Oldham, and 2412 Hop, London. Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,

NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

EDGAR OF HAMMERSMITH

FOR

STREET LIGHTING LAMPS AND ACCESSORIES.

BLenheim WORKS, LONDON, W.

Telegrams:

"GASONO LONDON."

Telephone:

14 HAMMERSMITH.

AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKEFIELD.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding

Oxide Lightly.

See Illustrated Advertisement, June 21, p. 914.

GAS-WORKS requiring Extensions

should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

GAS OILS.

MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.

SPECIALY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

"HALLITE" Asbest & High-Pressure

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

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GASHOLDERS, OIL-TANKS, ROOFS, and all kinds of LOFT and other PAINT WORK.

70, Balcombe Street, Well Street, HACKNEY, N.E.

SULPHURIC ACID.

SPECIALY prepared for Sulphate of AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD. Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

JOHN RILEY & SONS, Chemical Manu-

facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

CITY and Guilds Examinations in Gas

Engineering and Gas Supply. Students who have done badly at the recent Examinations should join Mr. Cranfield's Correspondence Classes for next Session. Assistance ample, individual, and private.

Write at once, 11, Avondale Place, HALIFAX.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, June 21, p. IV. of Centre.

ALDRIDGE AND RANKEN,

89, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams:

Telephone:

"MOTORPATRY, LONDON,"

5118 WESTMINSTER.

APPOINTMENTS.—Ambitious Men of

Parts invited to write—

HERBERT GREATORREX,

APPLICATION SPECIALIST,

BEECHWOOD, MATLOCK.

Specimen of many results:—

"Have got the job. Quite a good start.

To you the credit is due, and I think your

fee the best investment I ever made."

BUSINESS IS REVIVING. WRITE NOW.

IT is Worth Your While to Buy Direct.

The RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.

THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

CORRESPONDENCE CLASSES.

GAS Engineering and Gas Supply.

City and Guilds of London Institute.

Teacher: HERBERT LEES (Silver Medallist),
Assoc.M.Inst.C.E., Engineer and Manager of the Hex-
ham Gas Company, Lecturer at Rutherford College,
Newcastle-on-Tyne.

For Terms, &c., address ELVASTON ROAD, HEXHAM.

CHELTEMHAM GASLIGHT AND COKE COMPANY.

NOTICE, the Directors have made an
APPOINTMENT to the Vacant Office of Chief
Clerk.

All Applicants are THANKED.

SITUATION wanted by a Young Man,

Son of a Gas Manager, as ASSISTANT-MANAGER
or MANAGER of Small Works, or place of Trust.
Has been thoroughly Trained for Gas Management.
Address THOS. E. SHADBOLT, Gas-Works, GRAYS.

INSPECTOR (Age 35), Married,

thoroughly Practical, Seeks ENGAGEMENT,
London or Provinces. Twenty years with late Com-
pany.

Address No. 5260, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

ACCOUNTANT (Age 29), with Expert

Knowledge of Gas Accounts and Secretarial Ex-
perience, desiring change, is open to accept RE-
SPONSIBLE POSITION in Gas Company's Office.

Address No. 5259, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, for a Colliery Gas-Works in

the North of England, a WORKING FORE-
MAN—Handy Man Accustomed to Generator Furnaces
and Exhausters. House and Coal provided.

Apply, by letter, stating Wages required, to No. 5258,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLING Salesman wanted, one

thoroughly acquainted with the Gas-Mantle
Trade, and who has established Connections through-
out Great Britain.

Apply, by letter, to the LADDIE INCANDESCENT
MANTLE COMPANY, KINGSTON-ON-THAMES.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.

THE above Council invite Applications

for the Position of MANAGER (under a Con-
sulting Engineer) of the Council Gas-Works.

The Annual Make of Gas approximates about
47,000,000 Cubic Feet.

The Salary offered is £159 per Annum; and the Ap-
pointment will be terminable on Three Months' Notice
from either side.

The age of Applicants must not exceed 35 Years.

Applications, stating Age, Experience, and present
Position, and accompanied by copies of not more than
Three recent Testimonials, to be addressed to me, en-
dorsed "Gas-Works Manager," so as to reach me not
later than Twelve Noon on Tuesday, the 12th of July,
1910.

W. A. MUSSON,

Clerk to the Council.

Council Offices,
Swadlincote.

BOROUGH OF LEICESTER.

GAS ENGINEER AND MANAGER.

THE Gas Committee of the Corporation
of Leicester invite APPLICATIONS for the
Office of GAS ENGINEER AND MANAGER to the
Corporation.

The Gentlemen applying must have an Extensive
Knowledge of Modern Gas Manufacture, and must be
fully competent to Manage a Modern Chemical Works
for dealing with the Residual Products.

The Manager will have charge of the Commercial as
well as the Manufacturing Departments, and will be
held responsible for the General Supervision and Con-
trol of the Office and Works. He will be required to
Devote his Whole time to the Duties of his Business.

The Salary will commence at £800 a Year, rising,
subject to the Services of the Gentleman Appointed
being approved by the Committee, by Annual Incre-
ments of £100 to £1000 a Year.

Applications, stating Age, Previous Experience,
Present Occupation, and date when Duties can be
taken up, together with copies of not more than Five
recent Testimonials, and endorsed "Gas Manager,"
must reach me on or before Saturday, the 16th day of
July next.

Canvassing is strictly prohibited.

H. A. PRITCHARD,

Town Clerk.

Town Hall, Leicester,

June 30, 1910.

FOR HIRE—One Tank-Waggon suitable

for carrying Benzol, and one suitable for carry-
ing Crude Naphtha.

Address THE CLAYTON ANILINE COMPANY, LIMITED,
Clayton, MANCHESTER.

GASHOLDERS—Splendid 45 feet dia-

meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSEBURY.

HEDDINGHAM GAS-WORKS, ESSEX.

TENDERS are invited for the Relaying

of about 1½ Miles of MAIN, 4-inch and 3-inch.
Pipes supplied by the Company.

For Particulars, Apply to C. G. GRIMWOOD, Sudbury,
SUFFOLK.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to

receive TENDERS for the Supply of CANNEL
and Best Screened GAS COAL, to be delivered at their
Gas-Works in Lymm, for a term of Twelve Months
from the 1st day of September, 1910.

The probable Quantities required will be about 200
Tons of Cannel and about 2000 Tons of Gas Coal, which
must be freshly Wrought, well Screened, and free from
Sulphurous Pyrites and other objectionable matter;
but the Council reserve the right of increasing or de-
creasing the Quantities named.

The Person whose Tender is accepted will be re-
quired to enter into an Agreement with the Council for
the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by
Boat alongside the Works, to be sent to the undersigned
on or before the 23rd of July, 1910, and endorsed "Coal
Tender."

The Council do not bind themselves to accept the
lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to
the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,

Clerk.

Council Offices, Lymm.

Cheshire, July 1, 1910

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are

prepared to receive TENDERS for the Purchase
of the Surplus TAR and AMMONIACAL LIQUOR
made at their Gas-Works for a term of One Year from
the 1st day of September, 1910 (or for such longer term
as may be contracted for with the consent of the
Council).

Tar and Liquor will be delivered free into Contractor's
Boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before
the 20th day of July, 1910, endorsed "Tar."

The Purchaser will be required to enter into an Agree-
ment with the Council for the due performance of his
Contract.

The Council do not bind themselves to accept the
highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the
Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,

Clerk.

Council Offices, Lymm,

Cheshire, July 1, 1910.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to

receive TENDERS for the Supply of MATERIALS
and Execution of WORK required in Connection with
New RETORT-BENCH and RETORTS.

Specification, Conditions, and all Particulars may be
obtained from Mr. W. L. Donaldson, the Council's Gas
Engineer.

The Council do not bind themselves to accept the
lowest or any Tender or Tenders.

Forms of Tender are not Supplied.

Sealed Tenders, endorsed "Tender for Extensions,"
to be delivered to me not later than the 20th of July,
1910.

W. MULLARD,

Clerk.

Council Offices, Lymm,

Cheshire, July 1, 1910.

COWES URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS are invited for the Supply of

4000 Tons of First-Class GAS COAL for the Year
ending July 31, 1911.

Sealed and endorsed Tenders to reach the under-
signed (from whom further Particulars may be obtained)
by July 9.

The lowest or any Tender not necessarily accepted.

E. H. MILLARD,

Engineer and Manager.

Gas-Works, Cowes, I. of W.

COUNTY BOROUGH OF ROTHERHAM.

(GAS DEPARTMENT.)

THE Corporation of Rotherham are

prepared to receive OFFERS for the Purchase
of the Surplus GAS TAR and AMMONIACAL LIQUOR
produced at their Gas-Works during the ensuing Year.

Forms of Tender and Specification may be obtained
on Application to Mr. J. S. Naylor, Gas Engineer.

Offers, endorsed "Gas Tar and Ammoniacal Liquor,"
to be sent to me not later than July 18 next.

W. J. BOARD,

Town Clerk.

Town Hall, Rotherham,

June 28, 1910.

GOOLE URBAN DISTRICT COUNCIL.

(GAS AND WATER WORKS.)

TENDERS are invited for the Supply

of about 8000 Tons of GAS COAL, and 800 Tons
of STEAM COAL, or portions thereof.

Particulars and Form of Tender may be obtained on
Application to Mr. J. Fazakerley, Gas and Water
Engineer, Gas-Works, Goole.

Tenders, endorsed "Tender for Coal," to be delivered
to the undersigned not later than Noon on Wednesday,
the 20th of July, 1910.

ROBERT TYSON,

Clerk to the Council.

Council Offices, Goole,

June 28, 1910.

STRATFORD-UPON-AVON CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for

the Supply of 6000 Tons of Good Screened GAS
COAL or NUTS for delivery during Twelve Months
ending Sept. 30, 1911.

Forms of Tender and other Particulars can be ob-
tained upon Application to the Engineer and Manager.
Tenders to be sent in (and will be accepted only on
the Forms supplied) not later than Aug. 6, 1910.

The lowest or any Tender not necessarily accepted.

J. S. CRAMER,

Engineer and Manager.

July 2, 1910.

COUNTY BOROUGH OF SMETHWICK.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for

the Supply of about 39,000 Tons of GAS COAL
and NUTS and 1000 Tons of CANNEL.

Form of Tender and further Information may be
obtained of the undersigned.

Sealed Tenders, endorsed and addressed to the Chair-
man of the Gas Committee, Council House, Smethwick,
to be sent in not later than the 22nd inst.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order,

W. J. STURGES,

Secretary.

Gas Offices, Council House,

Smethwick.

WINSFORD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council are prepared to re-

ceive TENDERS for the Supply of 1000 Yards of
4-inch and 2½ Yards of 3 inch CAST-IRON PIPES,
with Spigot and Socket Joints, Bends, Syphon Boxes,
&c.

Tenders, endorsed "Gas Mains," to be delivered to
the undersigned on or before the 25th of July, 1910.

Specifications and Forms of Tender may be obtained
on Application to Mr. F. Sidwell, Manager, Gas-Works,
Winsford.

The Council do not bind themselves to accept the
lowest or any Tender.

JNO. H. COOKE,

Clerk to the Council.

Council Offices, Russell Street,

Winsford, Cheshire, July 1, 1910.

CORPORATION OF DARLINGTON.

(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas-Works Committee of the above

Corporation invite TENDERS for the Supply of
35,000 Tons of Freshly-Wrought GAS COALS, delivered
at the Gas-Works Siding, as required during the en-
suing Twelve Months.

Further Particulars and Form of Tender may be
obtained from Mr. Frank P. Tarratt, Gas-Works En-
gineer, Darlington.

Tenders, endorsed "Tender for Gas Coal," to be de-
livered at my Office, Houndgate, Darlington, not later
than July 14, 1910.

No pledge is given that the lowest or any Tender will
be accepted.

H. G. STEAVENSON,

Town Clerk.

Town Clerk's Office,

Darlington, July 2, 1910.

COUNTY BOROUGH OF STOKE-ON-TRENT.
(GAS-WORKS.)

TENDERS FOR CAST-IRON PIPES AND
WROUGHT-IRON TUBES AND FITTINGS.

TENDERS are invited for the Supply of
(a) the CAST-IRON PIPES and (b) the WROUGHT-IRON TUBES and FITTINGS which will be required at the Burslem, Fenton, Longton, and Stoke-upon-Trent Gas-Works during the Year ending the 30th of June, 1911.

Specifications and Forms of Tender can be had on Application to the undersigned.

The Council reserve the right of accepting the whole or any part of a Tender, or of dividing same as they may consider desirable.

Neither the lowest nor any Tender will necessarily be accepted.

Tenders must be sent to the Town Clerk, Stoke-on-Trent, so as to reach him not later than Twelve o'clock Noon on Thursday, the 7th day of July inst., endorsed "Tender for Piping, &c."

A Clause as to Trade Union Rates of Wages, Hours of Labour, and as to Sub-Letting will be inserted in any Contract for Supply which the Council enter into.

EUSTACE JOY,
Acting Town Clerk.

Stoke-on-Trent,
July 1, 1910.

SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER
COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER
STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of SOLOMON BLAIBERG, Esq.,
decd.

GAS AND WATER STOCKS AND SHARES,
IN THE
SOUTHEND GAS COMPANY,
SOUTHEND WATER-WORKS COMPANY,
LOWESTOFT WATER AND GAS COMPANY.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

TONBRIDGE GAS COMPANY.

NEW ISSUE OF £1000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

THE Directors of the above Company give Notice that they will be prepared to receive not later than Twelve o'clock Noon on Saturday, the 16th of July, 1910, sealed Tenders for £1000 FOUR PER CENT. DEBENTURE STOCK, in Lots of £10 each, or multiples of £10.

Minimum Price, £100 per £100 Stock.
Full Particulars and Forms of Tender may be obtained from the undersigned.

JAMES DONALDSON,
Secretary and Engineer.

Offices; 109, High Street,
Tonbridge.

EAST SURREY WATER COMPANY.

SALE OF ORDINARY SHARES BY TENDER.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER SEVEN HUNDRED ORDINARY SHARES, of £10 each, of and in the East Surrey Water Company. The last day for the reception of Tenders will be Friday, the 29th day of July next, at Twelve o'clock, at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Redhill, Surrey.

By order,
A. E. CORNEWALL-WALKER,
Secretary.

Redhill, Surrey,
June 24, 1910.

PATENT.

THE Proprietor of the British Patent No. 10,616/05 for "IMPROVEMENTS IN MEANS FOR GENERATING AND USING HYDRO-CARBON VAPOURS FOR HEATING AND LIGHTING PURPOSES" desires to sell his Patent or to Grant Licences thereof.

All Communications should be addressed, in the first instance, to L. DUVINAGE, Patent Agent, 10, Avenue des Nerviens, BRUSSELS.

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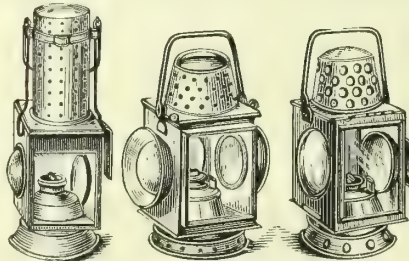
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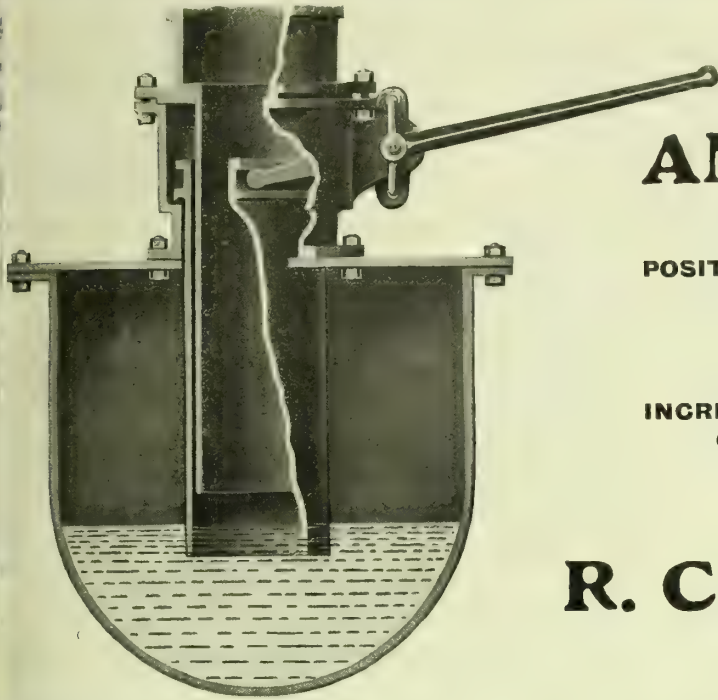
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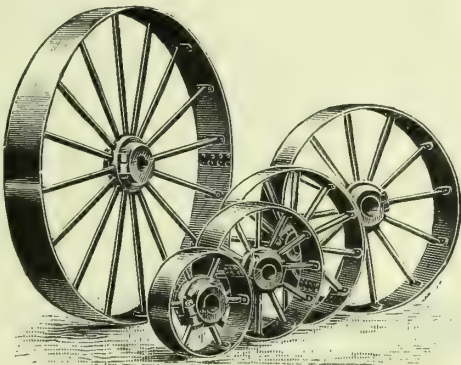
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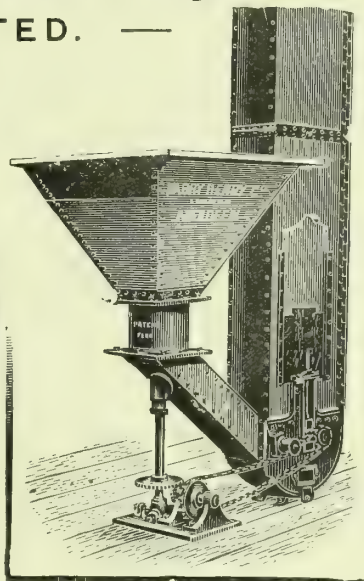
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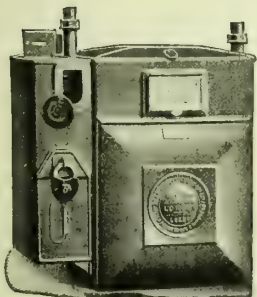
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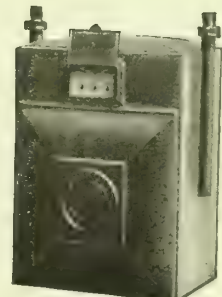


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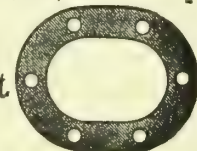
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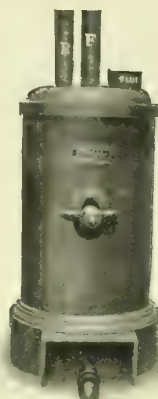
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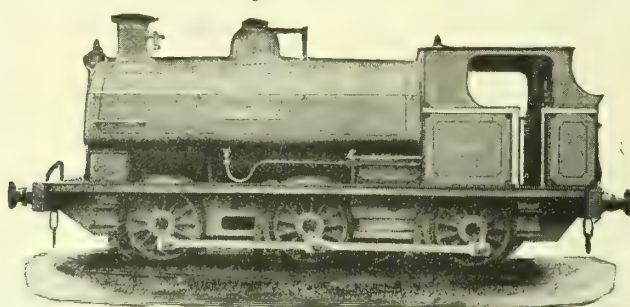
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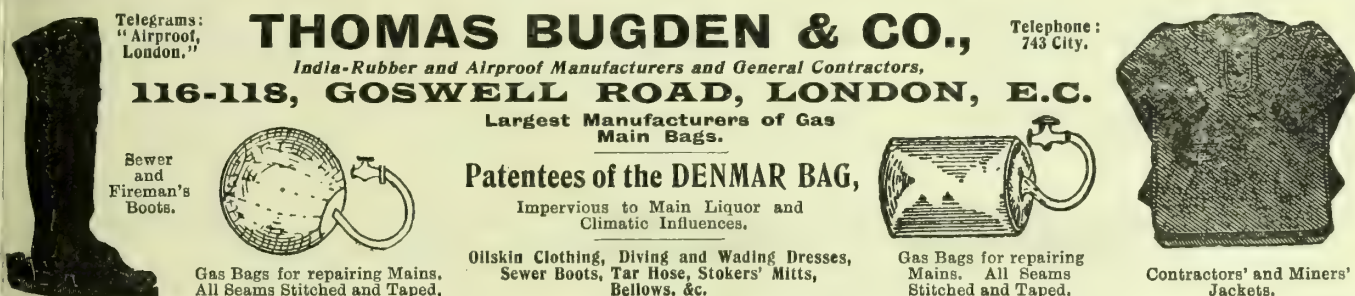
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SILCO BRICKS prevent all settling of setting.

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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
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Welsbach-Kern
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BRITISH MADE.

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Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

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1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

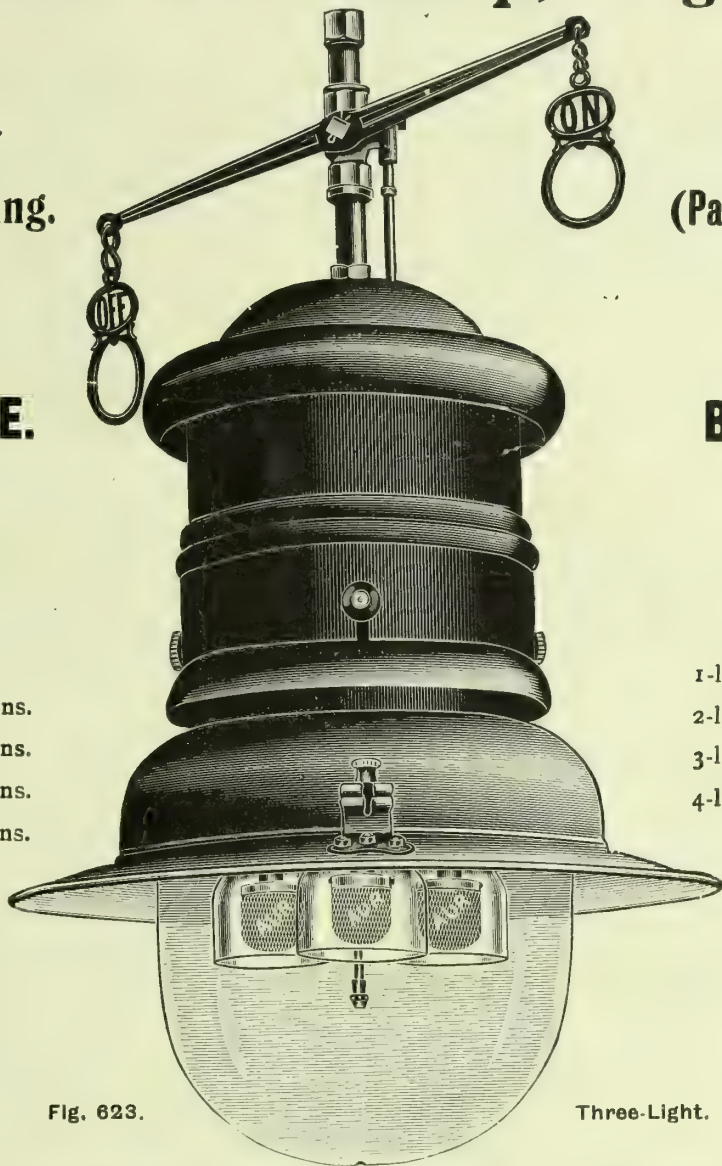


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

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1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

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RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

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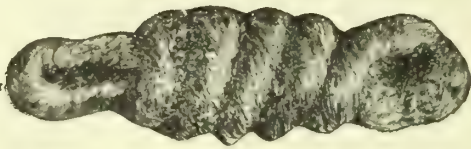
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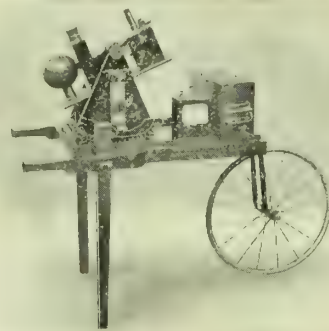
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 Will withstand high temperatures and is **Guaranteed**
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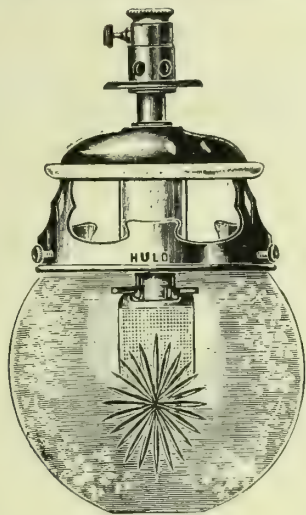
Gas Retort, Fire-Clay, Red and Blue Brick Works,
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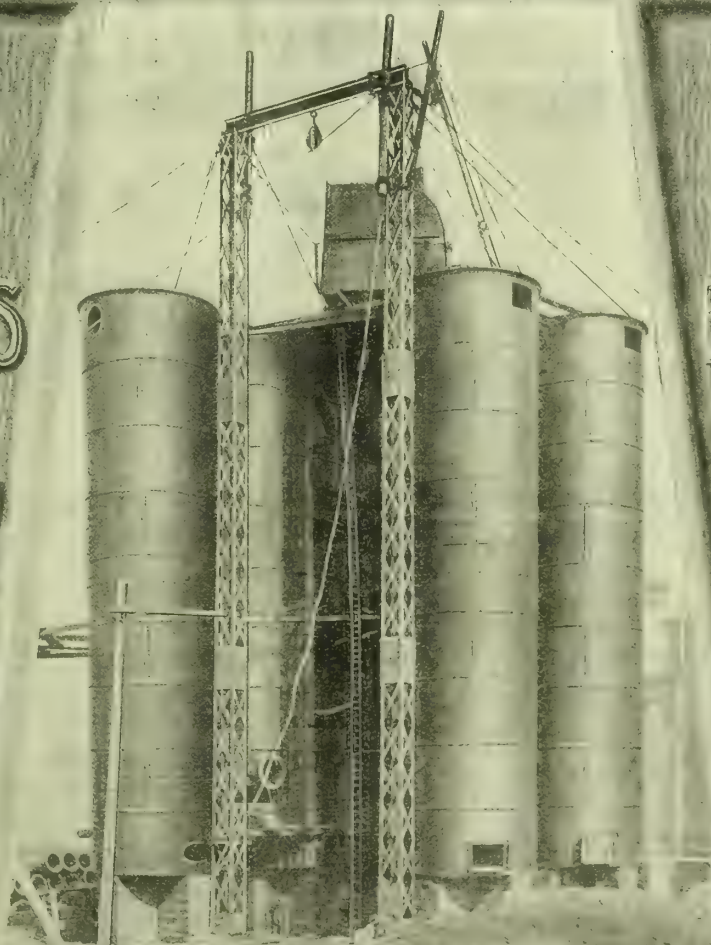
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LONDON, W.C.

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1818.



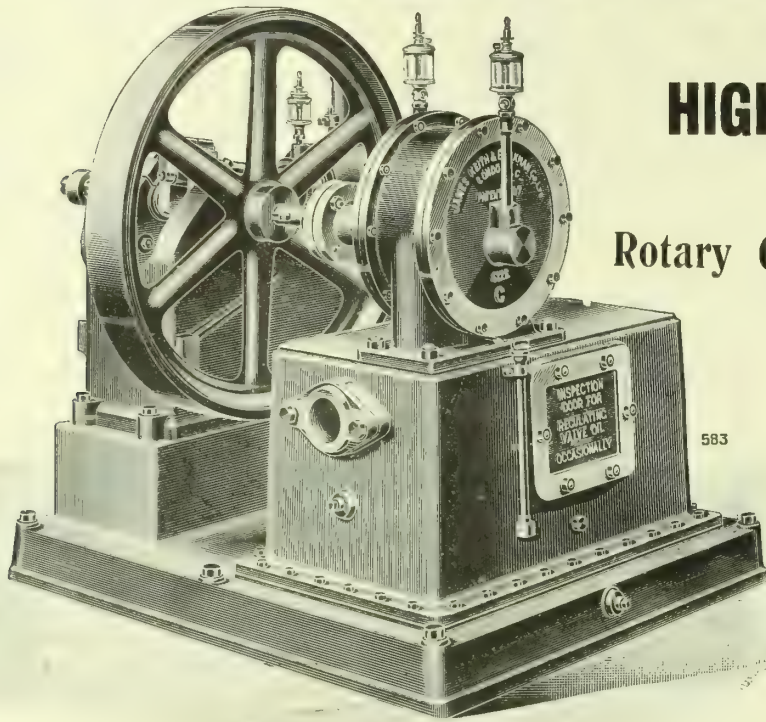
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HIGH PRESSURE GAS.

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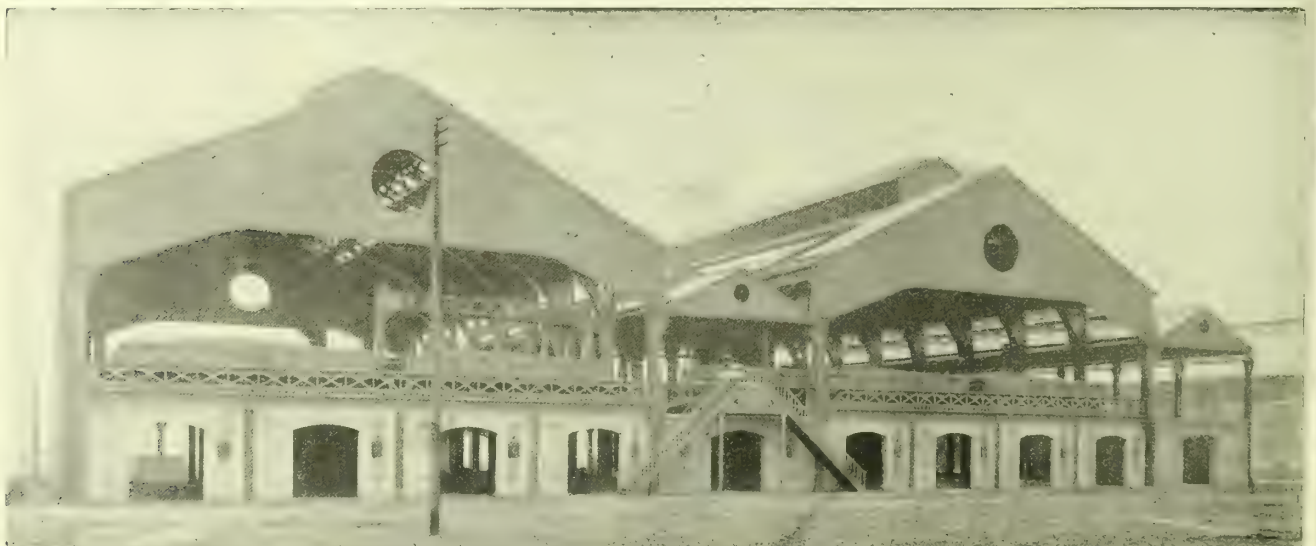
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JOURNAL OF GAS LIGHTING

WATER SUPPLY & SANITARY IMPROVEMENT

Vol. CXI. No. 2461.]

LONDON, JULY 12, 1910.

[62ND YEAR. PRICE 6d.

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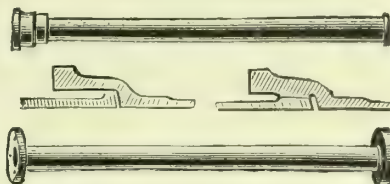
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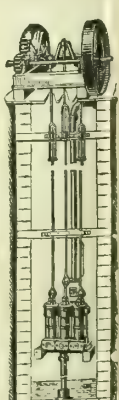
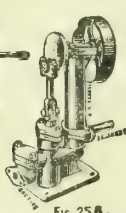
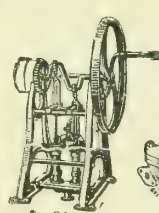
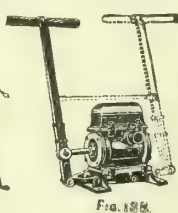
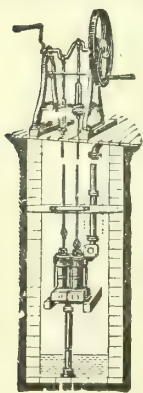
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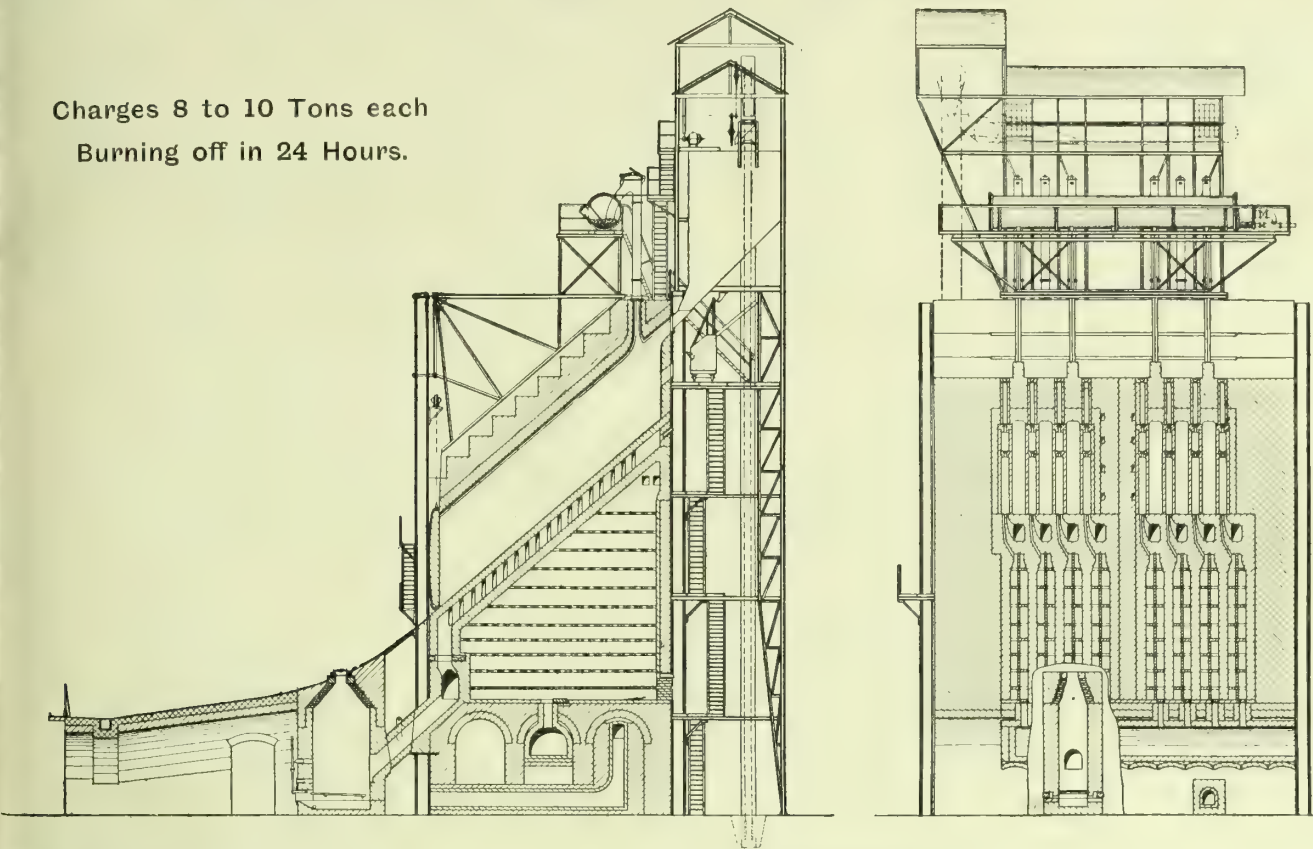


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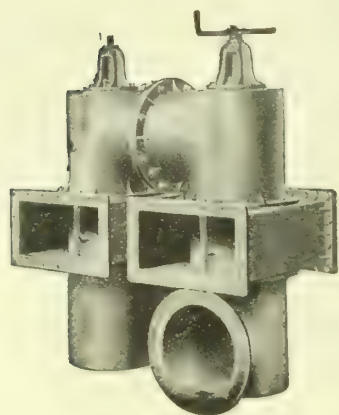
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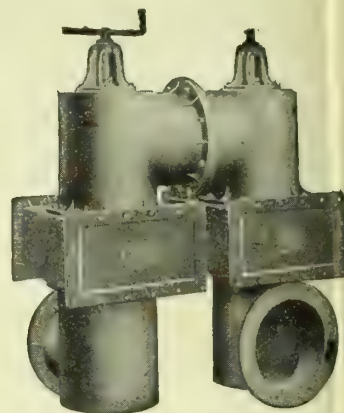
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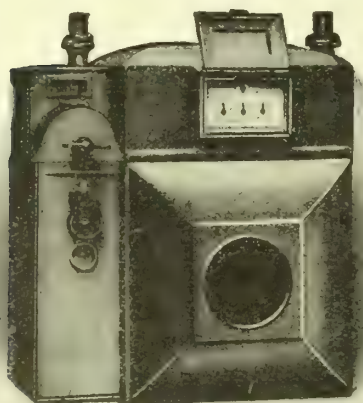
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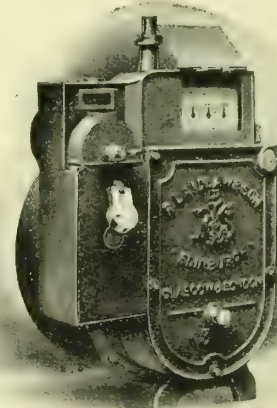


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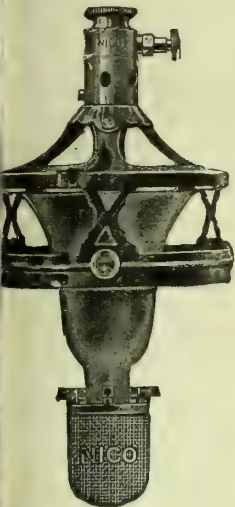
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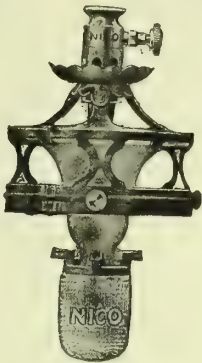
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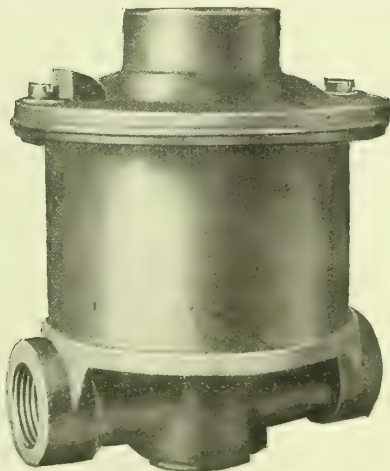
Of the Gas Engineers who reported to the Refractory
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(See "Journal of Gas Lighting," June 21, 1910, page 857.)

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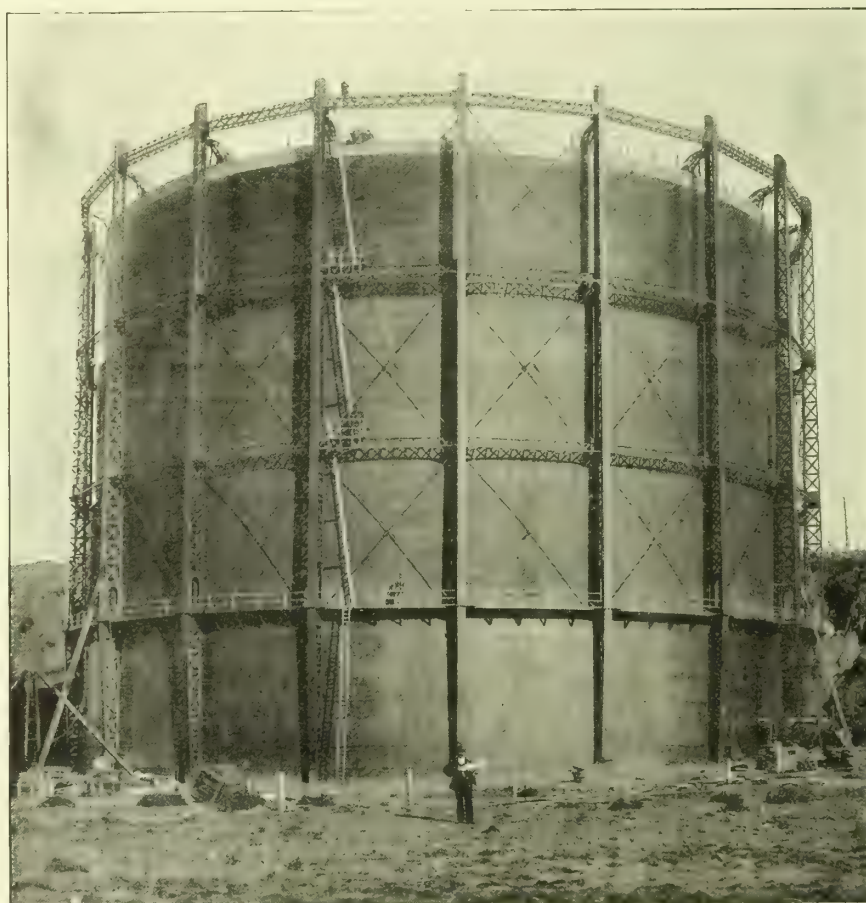
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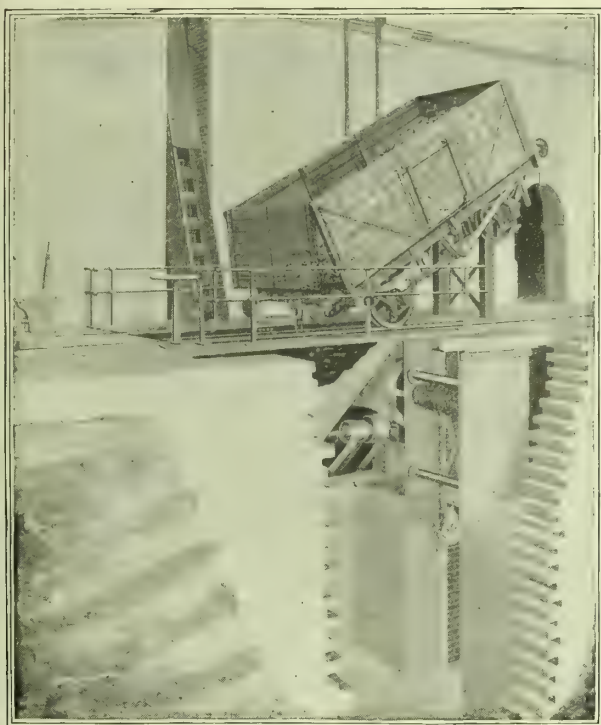
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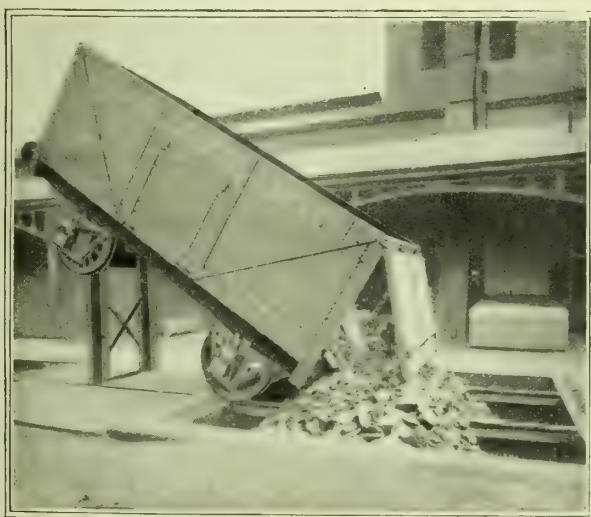
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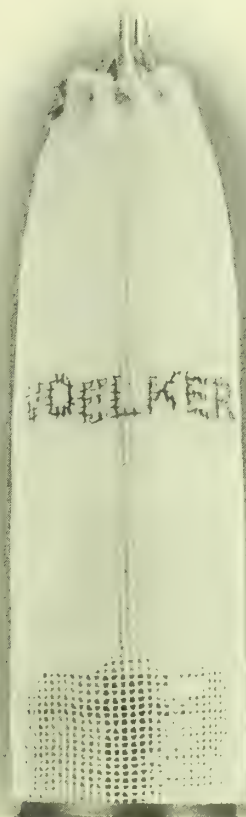
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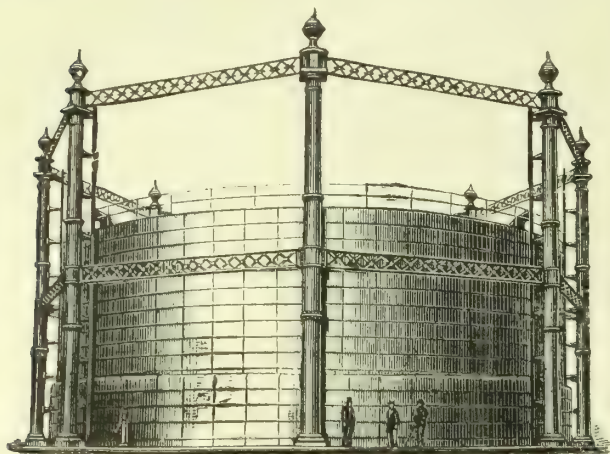
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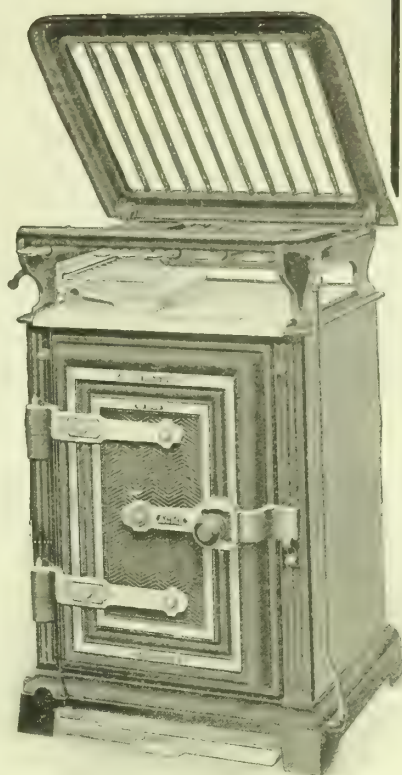
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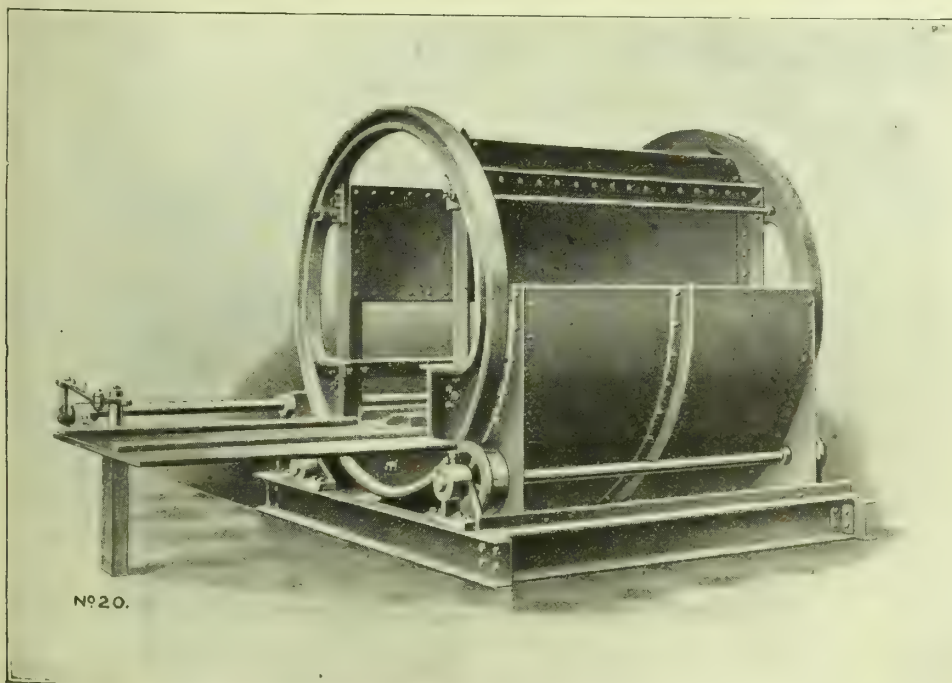
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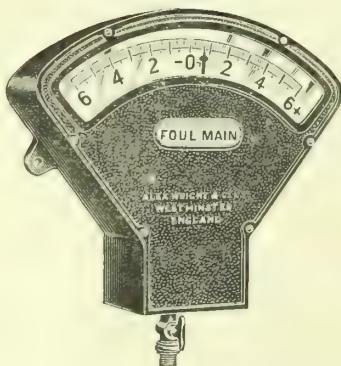
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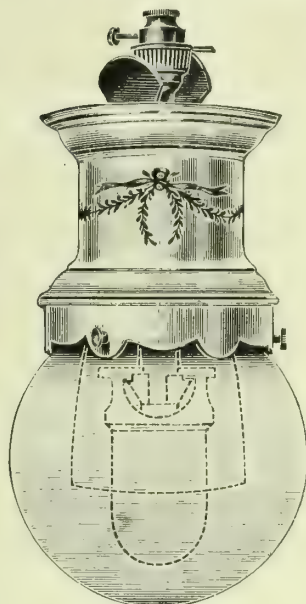
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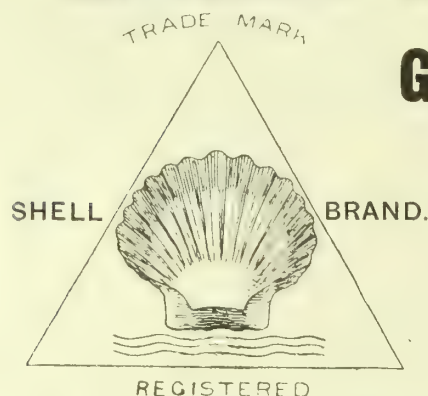


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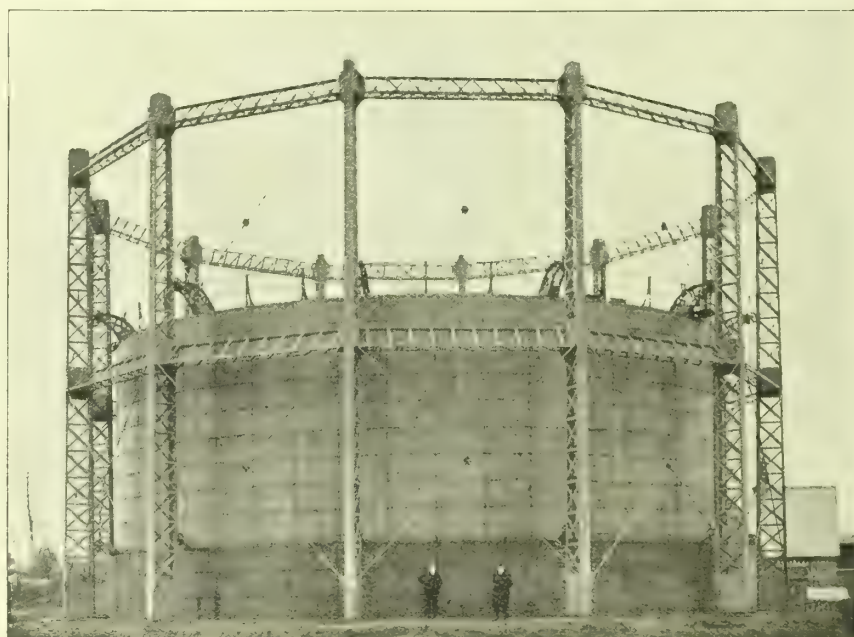
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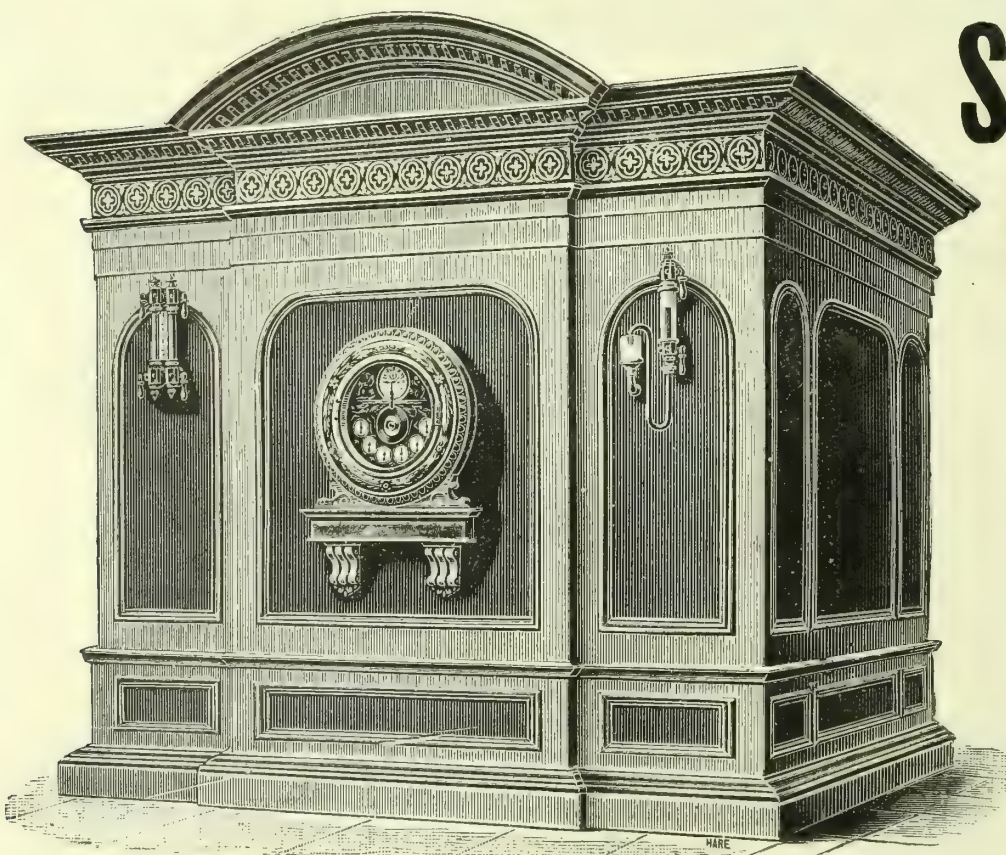
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EDITORIAL NOTES—GAS, &c.

The Fight for the Standard Burner.

It has seemed an interminable lane through which the gas industry has been passing in securing as the recognized standard test-burner the "Metropolitan" No. 2; and it is most sincerely hoped that the end of the lane has at length about been reached. The whole of the time devoted to the sittings of Sir Henry Kimber's Committee last parliamentary week was taken up in pacing ground beaten and worn by repeated passage, and every inch of which is now so well known. But the opposition weakens. Of that there is not the slightest doubt. For every contest before Committees leaves the case that hostility has so laboriously constructed more and more dilapidated, not only by the opponents' own resistance to obvious facts, but by throwing themselves blindly against the strength of years of parliamentary enactment and legislative intention, and by the mass of inconsistency of which their own case is composed. Those who represent the opposition are conscious of all this. It is as manifest as anything can well be to close observers of the proceedings in the Committee rooms. Still they persist in the quest for something definite to which no parliamentary enactment has given them the right, but which is gained, excepting in the case of some local authorities, by means which Parliament, in its wisdom and by its foresight, has provided. What the representatives of hostile local authorities do not, or will not, recognize, some of the hostile authorities themselves do recognize. They see the strength of the case for the burner; and they see the fatuity of continuing to oppose the inevitable, with the result that, when Nos. 1, 2, and 3 Standard Burner Bills came, on Monday last week, before Sir Henry Kimber's Committee, the opponents were comparatively few, although the whole case had to be fought precisely as though their number was great. As instructed by the House, the Liverpool case was set apart for distinct consideration, in view of surrounding special circumstances.

We will not devote time to any comment on the case for the new standard burner. It is known by all professional gas men in the country; and it is accepted by all but a modest percentage—so modest as to be negligible, were it not that this infinitesimal number claim the only exact knowledge on the question, and claim to have discovered, by their exploration, where the new burner leaves loopholes and invitations to the gas companies of the country (of course, not to the local authorities) to depart from the path of administrative morality. All that we will say in passing is that the case for the Bills was presented by Counsel (may we without exposing ourselves to any invidiousness specially mention as having done yeoman service, Mr. Honoratus Lloyd, K.C.?) and expert witnesses with a cogency and with a full sense of responsibility to the gas industry, present and future, that stand in striking contrast to the flimsy and disjointed case of the antagonists—a case that had all the weaknesses of the one submitted in the House of Lords accentuated, and a case in which the witnesses completely failed to support one another.

The Committee, it was early apparent, through the interjections and specific inquiries of Sir Henry Kimber and his colleagues, had set themselves the task of discovering from Counsel and witnesses two things: (1) What has been the intention of Parliament, as revealed by past enactment, in this matter of testing; and (2) which burner of those at present recognized statutorily is the most accurate for testing all qualities of gas? From these two points, the opposition struggled, mainly by keen and deliberate evasion, to escape. But they were unsuccessful, through the firmness of Sir Henry Kimber. There was nothing for it, but in the end to admit that Parliament has never established any legislative finality in the test-burner, but has always conceded the right

of gas suppliers—a right the opposition have tried their best to filch from them—to have the burner that would develop the maximum illuminating power of their gas. The standard candle power has been fixed, the standard or maximum price (usually the actual price is much lower) to be charged for that candle power has been fixed, but the standard test-burner has been given subject to the right of unconditional revision, either through Act of Parliament or, in many cases, on appeal to the Board of Trade. In the changes of test-burner that have been made, the original principle of maximum illuminating power development has prevailed; but never has there been the fuss, the allegations, the insinuations that have marked the latter-day essential, with lower illuminating power standards, of a burner that will accurately and relatively deal with all standards, without producing the exaggerations of a burner designed for one quality of gas, and that a straight coal gas. We heard again, *ad nauseam*, of the differences between the readings of testings with the No. 1 and No. 2 burners on grades of gas for which the No. 1 burner was never intended to be used, and which wide differences prove, if anything at all, the inefficiency of the No. 1 burner, and not the inaccuracy of the No. 2.

The Committee no doubt heard with amazement from Mr. Isaac Carr that, though the intentions of Parliament in the past may have been good enough, the House of Lords, the House of Commons, and the Board of Trade (though technically advised) had never understood this question, and that the whole of the legislation in gas matters has been directed and dominated by the gas companies, and some local authorities—Manchester for example—have ill-advisedly followed. Similar thoughts possessed his mind over the sulphur compounds abrogation clauses. His opinion is a reflection on successive Parliaments and numerous Committees of the House of Lords and House of Commons. There is danger in telling a Parliamentary Committee of the incapacity of their kind for judicially dealing with a question of this sort. Indirectly Sir Henry Kimber pointed out the reflection by remarking to Mr. Carr, "I hope you will give the present Committee credit for endeavouring to understand." Mr. Ram, K.C., rescued Mr. Carr from an unhappy predicament with the reply: "We feel that, Sir, strongly." But the assertion of Mr. Carr that Parliament and the Board of Trade have the last few years been ignorantly doing this thing, is an admission that the whole of the educational work of himself, Mr. J. G. Newbigging, and Dr. Frankland has been an utter failure. Wherein has been its defect in enlightening those whom it sought to instruct? We leave the answer to the gentlemen named, and to the profession generally.

Then as to the question of the most accurate burner for all qualities of gas, one after another the witnesses came forward and testified that of statutorily prescribed burners the No. 2 is the best—this not only from the witnesses for the Bills, but from the witnesses for the opposition, with one exception, and that Mr. Carr, who has shifted his ground in this respect since Mr. Charles Carpenter's evidence in the House of Lords. Now Mr. Carr is of opinion that the burner is capable of the most improper use at the will of the gas maker. "In other words, you think a gas company might fraudulently defeat the test?" he was asked. His reply was "I do. I say that this opens up a possibility I never dreamed of until this matter came forward." To do Mr. Carr full justice, readers may be asked to refer to the report of the cross-examination on the point in our "Parliamentary Intelligence." However, while Mr. Carr's conscience will not allow him to use the burner at Widnes out of a pure affectionate regard for the consumers, Mr. J. G. Newbigging's conscience will allow him to do so at Manchester, and the consumers do not appear to be a penny the worse.

The latter gentleman sees no objection to the burner if a *quid pro quo* is given to the consumers. Candle power has been dropping at Manchester by something like 4 candles during recent years, the price of gas remains the same,

profits have been taken in aid of the rates to the tune of from £50,000 to £70,000 a year, and profits have also been largely spent on the works. Since the undertaking has been under municipal control, an amount of profit greater than the whole loan capital of the concern has been transferred in aid of the rates! But, says Mr. Newbigging, companies must not be allowed any such free hand in dealing with the fruits of economy that may arise in consequence of the change of burner; and he doubts—in the case of gas companies—the sufficiency of the machinery already provided by Parliament to produce an equitable distribution of the fruits of economy, to which machinery local authorities have no equivalent. It strikes us as rather—well, interesting to have some one from Manchester to teach the portion of the industry represented by private enterprise the ethics of this question. We are not surprised at Sir Henry Kimber looking up wonderingly, and asking, “Are the gas companies ‘not to be trusted at all to act honestly?’” For whom, however, is the compensation required that has not been given in Manchester? For that stupid obstructionist, the flat-flame consumer, who continues to penalize himself by rejecting the economy and efficiency of incandescent burners. We may look round London, Glasgow, and numerous other places, and find no complaint from the consumers, and no confirmation of swelling gas accounts; and, notwithstanding the degradation of candle power ascribed by Messrs. Carr and Newbigging and Dr. Frankland, the incandescent street lamps are found giving excellent illumination. By the way, once more we heard from Dr. Frankland that the higher the illuminating power of gas, the better; and from Mr. Carr, the contradiction. All through there was the old want of cohesion and consistency in the case of the opposition. But enough of it. Do let the opposition witnesses look at the matter from the standpoint of solid practical experience, and not let fancies take possession of them to such a degree that they become a petrified part of their professional creed.

The case has been concluded for Nos. 1, 2, and 3 Bills; and the Committee are now considering the separate case of Liverpool. They did not sit yesterday; but will be doing so to-day. The case should not take a great while, as so much has been disposed of in considering the original Bills. After that, the decision; and we look for justice being done to the promoters. That is all they ask for; it is all they expect. And in the Committee they have complete reliance. If the decision is as we fully hope it will be—an unconditional one as in the Lords—uniform gas testing will have received a big forward move.

Lessons from Königsberg.

THE full description of the Königsberg Gas-Works which has appeared in the last two numbers of the “JOURNAL,” and which is supplemented to-day by an account of the development of the Königsberg gas undertaking and of the methods of charging for gas supplied which have been adopted from time to time by it, contains some suggestive information for the consideration of English gas managers. On the Königsberg works, most types of gas-making plant have been tested on a fairly large working scale; and the more important results of the comparison of the different types of plant are collected in the table which appears on another page of to-day’s “JOURNAL.” This table is worth a few minutes’ careful study, though the particulars as to the cost of water gas relatively to coal gas are naturally not complete as given. At Königsberg, water-gas plant has been erected more than once with the object of staving off the time when an extension of existing carbonizing plant would have to be carried out; and in this respect it has proved a valuable auxiliary to the latter. It undoubtedly possesses the advantage that in the summer months it can be completely shut down, as it was on the occasion of our representative’s visit to the Königsberg works a fortnight ago, and the capital and ground space so rendered idle for the time being are less than with coal-gas plant of corresponding productive capacity. At Königsberg no serious difficulty has apparently been experienced by consumers from the supply at one time of neat coal gas, and at another of coal gas mixed with a large proportion of either simple or carburetted water gas.

The rates of charge for gas in Königsberg seem to have been the subject of continual alteration since the earliest days of the gas undertaking, when it was open to consumers to take a supply either by meter or at a fixed charge per burner for a specified number of hours’ use per diem. Differential prices were introduced in 1886, and a supply for heat-

ing or power purposes could thereafter be had through a separate meter for 3s. 5d. per 1000 cubic feet, as compared with 4s. 6d. for the ordinary lighting service. But as years went by, this arrangement proved unsatisfactory; and it was found necessary to allow at first one and then two lighting burners on each heating gas supply. This arrangement, however, reduced the consumption of gas at the higher rate charged for lighting purposes; and it was found that a large number of the lighting supply meters were merely retained to give a reserve supply of light in case of failure of the electric light. The rents of the larger meters were accordingly increased, with the result that more and more of the consumers were driven to take only the heating gas supply. Permission was then granted to such consumers to use more than two lighting burners on that supply, provided a small supplementary payment was made in respect of each additional lighting burner. The general result of these arrangements has been that (as is shown in a diagram on another page of to-day’s “JOURNAL”) the consumption of gas in Königsberg has increased latterly at about the same, or a rather greater, rate than the consumption in Berlin, where a uniform price of 3s. 6d. per 1000 feet has been charged since 1901 for gas supplied for all purposes.

Reviewing the whole course of procedure in Königsberg since differential prices were introduced in 1886, it seems hard to believe that any adequate compensation has been secured by the gas undertaking or the consumers for the complications involved in the system of dual supplies of gas for different purposes, with the subsequent modifications introduced so as to avoid such re-duplication of services and meters in a majority of the tenements supplied. So far as we can judge from the account of the changes which have been rung from time to time, however, it would appear that at first gas was supplied for heating purposes at an unremunerative rate, and that it would have been impossible at the time to have sold the whole output of gas at that rate. It was then sought to maintain the lower rate for the bulk of the consumption, while reducing the duplication of services as far as possible. It is open to question, however, whether better results and greater economy of administration would not have ensued if the whole of the gas had always been supplied at a uniform price slightly above that charged for gas supplied through a special meter for heating purposes, and considerably below that charged for gas for lighting purposes. No substantial advantage appears to have been secured by the varied Königsberg methods which would not have been obtained, in at least corresponding measure, by the simple English practice of a uniform price, which, since its adoption in Berlin, has proved equally successful there.

Sulphate of Ammonia Production in Gas-Works.

THE report of the Chief Inspector under the Alkali Works Regulation Act for 1909, which was noticed in the “JOURNAL” last week, is the last that Mr. R. Forbes Carpenter will sign as the Chief of the Department. While very hearty welcome and good wishes are accorded his successor, Mr. Carpenter’s retirement is a matter of regret to not only those who have been brought into contact with him in his official capacity, but to all technically engaged in the gas industry. In the exercise of his duties, his office has been kept so largely in the background, that he has been looked upon as a “guide, philosopher, and friend,” and not as one whose duties it has been to see that the law is complied with in the particular directions that come within the scope of the Act.

There may be an early opportunity of looking a little deeper into the report in connection with the studies as to the interaction of methane and ammonia in the presence of carbon. Meantime, however, there is rather an interesting point regarding the production of sulphate of ammonia in this country. The figures that we published earlier in the year from the reports of Messrs. Bradbury and Hirsch are largely estimates; the figures that are published in the annual report of the Chief Inspector are obtained direct from the manufacturers. In regard to the total as to production, it is remarkable how close Messrs. Bradbury and Hirsch get their figures; but in the constituent items of the total for 1909, according to those now before us, they over-estimated, by between 6000 and 7000 tons, the production of gas-works (171,000 tons), and were nearly the same amount short in their estimate of the production of coke-ovens, producer-gas plants, &c. (101,000 tons). The more definite figures of the Chief Inspector show a total recovery

and production of sulphate of ammonia during the year of 349,143 tons, as compared with 325,228 tons in 1908, or an increase of 23,915 tons, as compared with an increase of 11,947 tons in 1908 upon 1907. But we have this fact to face, that the whole of the large increase of nearly 24,000 tons in 1909 came from sources other than gas-works—divided between coke-oven works, 18,659 tons; shale-works 3420 tons; iron-works 2097 tons; and producer-gas and carbonizing works, 681 tons. To set against these advances, there was an actual decline from gas-works of 942 tons—164,276 tons, against 165,218—compared with 1908; and, to show that this decline was not a mere accidental or temporary circumstance of the year, it may be mentioned that the figures for 1909 are short of those for 1907 by 1198 tons. This may appear to some rather singular, seeing that the volume of gas sold continues to ascend. The chief and most probable explanation must be the smaller quantity of coal that is now required, under new methods of carbonization, for a larger output of gas. If this be the cause, there is no need for regret at the shrinkage of the contribution of gas-works to the output of sulphate of ammonia.

On the whole, during the year, sulphate of ammonia works maintained a good reputation. There were two or three complaints; and they were subject to remedy. There is no need for slovenliness, negligence, or nuisance in connection with sulphate of ammonia plant; and it is a pity that the inspectors should have any ground of complaint, when a little supervision and attention would obviate such occurrences. The use of oxide heaps is increasing for arresting the sulphuretted hydrogen; but in relation to them, inattention in certain cases has resulted in complaint; and yet the steps were not difficult that transferred official dissatisfaction to satisfaction. This makes the offence all the worse.

Through Coalite Glasses.

The British Coalite Company, Limited, have distributed a circular, regarding an issue of £300,000 of 5 per cent. "participating" first mortgage debentures. On paper, never was so certain and lucrative an investment offered to the public; so certain and lucrative is it that the Company are dangling before the eyes of the recipients of the circular a maximum interest of 10 per cent. Ten per cent. on debentures! The debentures are to receive a fixed interest of 5 per cent., payable half-yearly; and they are also to participate up to an additional 5 per cent. in the profits of the Company *after* the ordinary shareholders have received 5 per cent. The offer of this magnificent interest on debentures is sufficient to make the careful investor shy, and inquire why the Company find it necessary to angle with such a big interest. It is airily stated that it will only require £125,000 per annum to pay this amount. Is it going to be any easier in the future than in the past to earn profits instead of deficits? The ordinary shareholders hope it is; but they have already had to swallow, with negative effect, some rather big doses of Coalite prognostications and capital expenditure.

Past and Future.

It is seen that the Company have spent in erecting existing works £194,000, apart from the purchase of land, which has cost about £165,000. We take it that the former sum includes all the rebuilding work that has been proceeding, at periodical intervals after experience, from the very inception of the Company. In view of this reconstruction work, it would be interesting to know what is meant by "the battery has passed the severest tests *over a long period*." It is also observed that the battery has proved itself capable of transforming daily 50 tons of coal, cost about 13s. per ton, into 225,000 cubic feet of gas of 18-candle power, 38 tons of coalite, and over £20 worth of bye-products. If there is no mistake about these figures, the gas product works out to an average of only 4500 cubic feet per ton, which is not economical working for gas-supply purposes, seeing that 12,000 cubic feet is nearer the mark to-day. Coalite, too, it is declared "has always found a very ready market at 22s. per ton net." We should like to know whether there is any unsold coalite at Hythe; and, if so, why? Also, if there is, whether this is not the case despite the fact that the plant has been, or was arranged to be, shut down for the summer months? While replying to these questions, it would add to our interest to be informed whether there is any undisposed-of coalite at Plymouth. It is also noticed that the actual

cost of erecting a battery for 50 tons' daily carbonization, and a gas production of 225,000 cubic feet, is about £5000; and it is asserted the annual depreciation is "very small." Presumably this means that it is hoped the annual depreciation will be very small. But with the reconstruction work that has been going on, we fail to see how fair judgment can yet have been made. However, imagination must have reached the utmost possible point when it is said "each battery *should* pay for itself within one year, and produce subsequent annual profits of at least £5000. To the fact that the Company have not been able to make satisfactory arrangements with gas companies, is ascribed the reason for the absence in the past of "large dividends." The Directors now allege, however, that they have demonstrated to gas companies that it is profitable for them to co-operate; and "negotiations are now going on with over forty companies who are willing to treat on the basis of a working arrangement which will give them a handsome profit, and give to this Company a minimum profit of £5000 per annum per battery." We shall see. But people are getting accustomed to the Company's "negotiations;" more so than to their positive contracts.

Gas in Industry.

In the gas industry we are nothing more than shopkeepers said the (late) President of the Institution of Gas Engineers (Mr. James W. Helps) in his address to the members less than a month since; and the week following this utterance, Dr. E. Schilling, in a paper contributed to the proceedings at the annual meeting of the German Association, made use of a very similar remark, when he said that gas suppliers are compelled, like other tradesmen, to work-up their business. He was dealing in his paper with the extensive field that industrial operations offer for the use of gas for heating; and the paper (an abstract of which was published last week) will be found to be very suggestive of the numerous fields that are open for development. In turning attention to the cultivation of the industrial side of his business, it is essential for the gas engineer to make himself acquainted with the trades—large and small—followed in his district, in order to be in a position to recommend suitable contrivances for heating purposes. Success in one instance is bound to be followed by development in the same branch of trade in other quarters. There is no question that the possibilities for increasing the uses of gas for industrial purposes are wide; and electricians have their eyes on the same business. Week by week, devices are seen that electrical inventors produce for, they hope, inducing new business in heating; but they labour under the disadvantage of low efficiency in heating power, and therefore of uneconomy. As Dr. Schilling points out, electric energy is the dearest of all heating agents; and it must again and again be brought to the notice of the public that 1000 cubic feet of gas contain about 560,000 B.Th.U., whereas a unit of electricity can, in the most favourable case, develop only 3428 B.Th.U. Taking the local price of the 1000 cubic feet of gas and of the unit of electricity, it is easy to calculate the thermal value to be realized for any given expenditure.

A Gross Falsehood.

The "Metalite" lamp has been having it all its own way again this last week in the advertising pages of the daily papers; and it can only be imagined that the whole of this grandiloquent writing, with its sprinkling of untruth, is going to be crowned by a prospectus. Though this may be so, certain of the statements must not go unheeded by the gas industry. Page advertisements last week were headed: "Gas Superseded by Electricity: Forty Hours' Brilliant Light for One Penny." The public is not in a position to judge that the "brilliant light" cannot possibly exceed 8 candles (we have misgivings as to whether it would reach that figure), and that the price taken for current is only 3d. per unit. An 8-candle power light is of precious little use for practical purposes. There is, however, ground for a refutation of the deliberate untruth that is contained in these advertisements when it is said that "to thoroughly appreciate the value of this ['Metalite'] lamp invention, it is only necessary to point out that it has reduced the cost of electricity to a figure much below that of gas; and before the latter could compete with that figure, it would have to be supplied at 7½d. per 1000 cubic feet." This is about as bad a falsehood as we have ever seen, even in the many wild flights of our electrical competitors. If gas were at 7½d. per

1000 cubic feet, i.e. would purchase 133 cubic feet. Forty hours' lighting by an 8-candle power "Metalite" lamp is equivalent to 320 candle-hours (if the lamp has an efficiency of 1 candle per watt). So that the "Metalite" lamp people are insinuating that, with incandescent gas lighting, an efficiency of only $2\frac{1}{2}$ candles per cubic foot of gas per hour can be obtained. Whereas if 133 cubic feet of gas could be purchased for 1d., with an efficiency of 20 candles per cubic foot (using the bijou or other inverted lamp), the result would be a total of 2660 candle-hours for 1d. At a cost of 2s. 6d. per 1000 cubic feet, can a 20-candle power light be maintained for 33 hours on a consumption of a pennyworth of gas, or, reducing to the 8-candle power basis, for the penny can 82 hours' lighting be obtained? If there are any of our electrical contemporaries in favour of honesty and truth in commercial advertising, they will surely protest against this flagrant instance of distortion. We hope that, if the gas industry is not prepared to immediately unitedly move counteractively in the publicity campaign, that some of the loyal concerns of the gas industry will take sharp action in putting the facts plainly before the public.

The Humorous Side of Jealousy.

Jealousy has its humorous side; and some municipal electrical managements stand in peril of being heartily laughed at for their childish and jealous behaviour towards gas. Some time ago, the Croydon Gas Company advertised on the Corporation tramway tickets; but the Company were not allowed to continue their contribution to the revenue of the Corporation in this way, on the ground that it was against the interests of one of the Corporation departments. Much the same thing has now happened at Ilford. The Ratepayers' Association publish each month a little paper called "The Ratepayer." In its pages, the Council have for some time advertised the virtues—true and fancied—of electricity. The Gas Company have lately entered the paper as advertisers; and it is reported that the courageous and generous Council have withdrawn their advertisement "now that an opponent has been admitted to the advertising pages." What folly! If the Council are not careful, this kind of thing will grow on them; and then it will not be long before they will refuse to allow their cables to continue in the same roads as gas-mains. The ratepayers had better look to it that they get representatives with a little more balance than men who will descend to such an absurdity as withdrawing from a periodical an advertisement because a competitor is permitted to have, as a matter of business, its announcements in the same columns.

Separate Management.

The advertisement in last week's "JOURNAL" for an Engineer and Manager of the Leicester Corporation Gas Department, and the report in our news columns as to the separation of the management of that department from the electrical, raise the question as to the advisability or otherwise of running the two undertakings under one management, as in the days of the late Mr. Alfred Colson. Leicester has nothing to regret in having placed the two undertakings under the charge of their late Gas and Electrical Engineer. He worked with an eye to economy and efficiency, as well as with impartiality. But we do know that his private feelings were not long since that, if he had had the Gas Department only to deal with, and had not had to adopt the impartial attitude that his dual responsibility imposed on him, he could have done better still for the interests of the Gas Department. On the other hand, severance will not assist economical administration; and certain it is there will arise, if not on the surface, below it, a fairly sharp competition between the separated departments. According to Alderman Smith, the Chairman of the Gas and Electric Lighting Committee, it has been alleged that the electricity undertaking has not had a fair chance in competition with gas for lighting purposes; and it is contended by those who so allege that, under separate management, it could do much better. With the allegation we do not agree; and with separate management the keen competition will not be all on the side of electricity. But on the whole perhaps severance is the better way to ensure impartiality at all times. We do not think we should feel disposed to applaud the Leicester Corporation if they put a trained Electrical Engineer in charge of both the gas and electrical undertakings.

The Organization of Labour.

Some interesting details with regard to financial resources were given at the eleventh annual general council meeting of the General Federation of Trade Unions, which was held last week at Swansea. The proceedings included an address by the President, Alderman Allen Gee, who, in the course of his remarks, explained that during the past year six Societies had been added to, and two withdrawn from, the Federation; the net gain for the twelve months being thus four Societies, with 5153 members. Comparing the number of Societies affiliated at the end of the first year with the number to-day, they found that there had been an increase of 102 Societies. The reserve fund at the end of the first year was £1284; and this increased, until in 1908 the fund amounted to £162,210. In 1909, the reserve was drawn upon to meet calls for large disputes, including one on the north-east coast and one in the cotton trade. But he was glad to say that at the end of March this year the reserve fund in hand was close on £100,000; and at the end of June the Treasurer reported to the Executive that it was over £104,000. One branch of the work of the Federation, according to the President, has been to help to mould public opinion and shape legislation for the benefit of the large mass of the workers of the country. A share is claimed in the movement which resulted in the formation of the Labour Exchanges; but as "everybody now knows" these "only mean the registering of the unemployed," the Federation are not likely to rest satisfied with this achievement. In fact, the President already urges that it is clearly the duty of the State to do something further with regard to finding work. "The right to work" is put down by him as being the most pressing subject for legislation, after the Government's present proposals to go a step further on the lines of insurance for the unemployed have come to fruition. Another matter to which the Federation are devoting their energies is the overcoming of the difficulty (for Labour Members of Parliament) created by the decision that no Trade Union funds can, under the present law, be utilized for political purposes. The Federation, like other labour organization bodies, find that there is now no lack of subjects to discuss, and one cannot suppose that there ever will be.

In London Suburbs.

Mr. Charles Carpenter, in February last year, was telling the proprietors of the South Metropolitan Gas Company of the migratory habits of residents in Suburbia; and of how at that time the Company had no less than 18,000 services laid representing capital expended, but producing no revenue, through empty property. In some of the suburban districts, development has been going on apace during the last decade; for in that period 80,000 houses have been built in twenty of the principal London suburbs outside the county, and 32,000 in Wandsworth, Woolwich, and Lewisham. Wandsworth takes the lead with 20,000 houses. The largest amount of building in the outer suburbs took place in Croydon, where 13,000 houses were erected; and in Ilford the progress has been, on an average, 1000 houses a year. Willesden has added 8000 houses in the ten years, West Ham 7000, Lewisham 8000, Leyton 7000, Ealing 6000, Wimbledon 4400, Woolwich 4300. A decline, however, set in in 1907; and builders are beginning to hope that, after three years' depression, there will be a revival. Building booms generally run in cycles of seven years. Development of the kind, however, does not mean all grist to the gas companies, as the new houses attract the people from the old; and the new houses mean fresh capital expenditure.

Sir J. J. Thomson, F.R.S., Cavendish Professor of Experimental Physics in the University of Cambridge, has been elected President of the Junior Institution of Engineers, in succession to Sir Henry J. Oram, K.C.B., Engineer-in-Chief of the Fleet.

The pavilion of the Belgian Association of Gas Managers at the Brussels Exhibition contains some framed particulars in regard to the gas supply of Belgium. There are 190 communes served by 70 gas-works, the annual consumption of coal in which is 840,000 tons, producing rather more than 9000 million cubic feet. The population lighted is 3,054,000; the supply per head being, in round numbers, 3000 cubic feet.

There has just been completed at the Coatbridge Gas-Works by the Whessoe Foundry Company, Limited, a set of four 30 feet square purifiers. From the date of commencement of erection until the last box was working, only eleven weeks elapsed. The plant is to replace the purifiers destroyed by an explosion which occurred on the 10th of February last, photographs of the wreckage of which appeared at the time in the "JOURNAL."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 139.)

ONCE again the American Market with its enormous operations has been the controlling factor. Prices wildly and widely oscillated, according as bull or bear rumours (more or less fabulous) gained credence; but the fair weather prophets had the best of it at the close. All this sort of thing had a disturbing influence, and even the most staid and respectable lines felt it. Business was, of course, at low pressure; and the counter-charms of Henley and Lord's were responsible for several absentees. The opening day was very fair. The gilt-edged class were firm, Railways were cheerful, and the Foreign Market calm. Tuesday began well; but another bad fall in Americans took the rosy colour out. Consols fell $\frac{1}{8}$, and the tendency generally was weaker. Wednesday was dull and heavy, still oppressed by the American incubus. Consols fell another $\frac{1}{8}$; and most of the gilt-edged division and Rails were lower. On Thursday, obedient to promptings from New York, a better tone was set. A recovery was made in the lines which had given way the day before; Consols rising $\frac{1}{8}$. Friday was a quiet day; and, with an upward movement in Americans, most departments were pretty firm. But on Saturday a dull tone was imparted by a bad move in New York. This, after some see-sawing, was quite dispelled, but too late to help the general markets. Consols fell another $\frac{1}{8}$. The Money Market was most irregular. Rates were at first fairly easy, but hardened later on, and then eased away again at the close. Business in the Gas Market was about on a level with the previous week in point of aggregate volume, but it was better distributed through the list. The tendency was good; the bigger issues being especially conspicuous for their firmness. In Gaslight and Coke, the ordinary was not very active but was very strong. One bargain was done at 104 $\frac{1}{4}$, but almost the next was at 105, to be followed later on by a mark of 105 $\frac{1}{4}$ —a rise of $\frac{1}{2}$. In the secured issues, the preference changed hands at from 104 to 104 $\frac{3}{4}$, and the debenture at from 80 $\frac{1}{2}$ to 81 $\frac{1}{4}$. South Metropolitan was dealt in at close figures—within the limits of 121 $\frac{1}{2}$ and 122. The debenture marked from 80 $\frac{1}{2}$ to 81 $\frac{1}{4}$. In Commercial, the 4 per cent. realized 108 $\frac{1}{2}$ and 108 $\frac{3}{4}$, and the 3 $\frac{1}{2}$ per cent. 103 $\frac{1}{2}$ and 105. Among the Suburban and Provincial group, Alliance and Dublin was done at 81 $\frac{1}{2}$, Bournemouth "B" at 16 $\frac{3}{8}$, British at from 44 to 45, Brentford old at 25 $\frac{1}{4}$, ditto new at 189 and 190, ditto debenture at 99 $\frac{1}{2}$, South Suburban at 121 $\frac{1}{4}$, Tottenham "A" at 133, and ditto "B" at 113 $\frac{1}{2}$. On the local Exchanges, Liverpool "A" was dealt in at 219 $\frac{3}{4}$ and 220, ditto "B" at 164 $\frac{1}{2}$, and Newcastle at 103 $\frac{1}{2}$ —a rise of $\frac{1}{2}$. In the Continental companies, Imperial marked 179 $\frac{1}{4}$ and 180, Union 94 (a fall of 1), European fully-paid 24 $\frac{1}{2}$, and Tuscan 9 $\frac{1}{2}$. Among the undertakings of the remoter world, Bombay changed hands at 6 $\frac{1}{4}$, Cape Town mortgage at 49 $\frac{1}{2}$ and 49 $\frac{3}{4}$, Oriental at 139 $\frac{1}{4}$, Primitiva at from 7 $\frac{1}{4}$ to 7 $\frac{1}{2}$, ditto preference at from 5 $\frac{1}{4}$ to 5 $\frac{1}{2}$, ditto debenture at 97 $\frac{1}{2}$, River Plate debenture at 98, and San Paulo at 15 $\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

The New Factory Regulations—Safety and Ignorance—Electricity Users and Expert Advice—Exposed Instructions for Treatment of Shock Victims—Non-Fatal and Fatal Accidents—A Magneto-Ignition Fatality—Toppin's Plan—Wiring Scheme Experience.

A THOROUGH examination of electrical installations in factories and workshops discloses a surprising amount of defective work. This, applying to one class of installation, would certainly do so to other classes; for one class of work would hardly have been picked out for so much blundering and so many inherent weaknesses as have been discovered in factories and workshops—necessitating the new regulations applying to such premises that came into force on July 1 last year. One has only to read the section of the annual report under the Factories and Workshops Act for which the Electrical Inspector of Factories (Mr. G. Scott Ram) is responsible, to see that there has been found to exist an almost general deficiency from the standard set up by the new regulations—a standard that experience suggested should, for safety, be higher than was previously the case. Much time was spent during the year over the coming into force of the regulations; and there has been an evident desire on the part of Mr. Ram and his staff to render as much aid as possible in the way of advice. A number of visits were paid to factories, at the request of the owners, respecting the application of the regulations to the premises; and much time was also devoted to considering and discussing with manufacturers new designs and methods that would conform to requirements.

There is an unspoken reflection in all this upon that much abused characteristic of electric supply—safety. We had almost written "danger." It is said in the report that "owing to its highly technical nature, electricity is a subject that is not easily understood by the ordinary person." We firmly believed this long before the statement came from the pen of the Electrical Inspector of Factories. But, in order to render instruction, Mr. Ram some time since issued an extensive memorandum dealing with each regulation, which, it is hoped, will be of great use for the guidance not only of occupiers, but also of inspectors. Seeing that explanations of the explanatory statements have been

asked for, it would seem that the memorandum has not been altogether successful in its mission. With all the regulations, and with all the instruction as to their meanings, it is observed that Mr. Scott Ram still finds "much ignorance" is prevalent among "small users who do not employ electrical engineers on their premises." No doubt it is preferable—electricity being of "such a highly technical nature"—that small users should keep an electrical engineer on their premises permanently standing guard; but if they cannot afford to do this, then the small users, who have not the necessary technical knowledge and experience, should undoubtedly adopt the counsel of the Electrical Inspector, and seek proper expert advice, and not rely merely on a bell-hanger or house decorator. But it is not only among ignorant users that expert advice is required, but among men who are supposed to be qualified electricians. Numerous accidents are reported; and of them thirteen were due to short-circuits by men engaged in working on live switchboards at low or medium pressure, and in several cases the resulting injuries were extremely severe. Most of these accidents appear to have been due to the want of elementary precautions. One was due to the "electrician" taking measurements of the switchboard with a steel rule. There is a stinging rebuke by Mr. Ram in his comment: "People who make this particular variety of accident would probably also look for a gas escape with a match." If there is such carelessness on the part of electrically-trained men in one place, it is pretty certain that similar carelessness will be found in other places where factory and workshop inspectors do not penetrate, and where there is no real supervising authority.

Further regarding the question of "safety," it is advised that printed notices should be prominent where danger may lurk. But these should not be relied upon solely for protection. It is a singular thing that electricians do not like warnings of any kind to be seen in connection with electricity, although it is classed as a "dangerous trade." When the new regulations were being considered in draft form, objection was even taken to the exhibition, though highly essential, of illustrated cards in factories, showing the method of treating persons suffering from electric shock, on the ground that this would unnecessarily frighten work-people, and retard the use of electricity. Mr. Ram has found no evidence to support the contention. On the contrary, he has seen notices exhibited by conscientious employers; but some of them carry warning a bit too far. In one case, for example, Mr. Ram found a skull and cross-bones above the words "Sudden Death." It is not pleasant to be for ever reminded that "in the midst of life we are in death." Such a constant reminder does not assist to make a joy of one's occupation. Besides, it is unnecessary. It is quite sufficient to have a prominent warning at danger-points; and illustrated directions as to treatment for shock should be regarded as indispensable in all factories in which electricity is employed.

Although the new regulations came into force on July 1 last year, and consequently there must earlier in the year have been much work going forward to bring about compliance with them, there is no noticeable difference in the number of electrical accidents recorded in the report for the whole year. Omitting the non-electrical accidents, and taking only the electrical ones at generating-stations and sub-stations, it is seen that at company and local authority stations there were 54 non-fatal accidents and 4 fatal ones; while at privately owned stations, there were 32. The total number of accidents is practically identical with that of the previous year, though somewhat fewer occurred in public stations, and more in private ones. Against the four fatalities of the year, only two were recorded the preceding year. When we turn to the statistics as to reported electrical accidents in factories, engineering works, &c., other than electrical generating-stations and sub-stations, it is seen that there were no less than 249 (27 more than in 1908) non-fatal electrical accidents and 8 fatal ones (4 less). Of the accidents with portable apparatus, 23 were due to burns from short-circuits or shock when handling flexible wires, which are frequently insufficiently protected against damage, to which they are particularly liable in factories and engineering works. Twelve were due to short-circuits at connectors when plugging in or out; the operator getting his hand severely burned. Three accidents were due to shocks from portable lamps—one being fatal, and this on a 250-volt alternating current! The danger from shock to men when working at heights is illustrated by a non-fatal one, in which serious injuries occurred to the victim by falling from an iron platform 13 feet from the floor. In this case the pressure was 105 volts only. A similar accident was due to a portable breast drill. The accidents from unprotected conductors include six fatalities. One of these occurred on a 230-volt single-phase alternating system. A lighting wire, having no protection beyond the ordinary covering of insulating material, was attached to a wooden beam. A sling had been put round the beam, and a block and tackle were suspended therefrom for lifting an iron plate weighing $\frac{1}{2}$ ton. The chain cut through the insulating material of the wire, and the whole tackle and iron plate became alive. Two men received shocks—one being killed. The danger to workers from electric light extinction is exemplified by the case, in the Bristol district, of a man falling down a ship's hold, through the sudden collapse of the electric light. The point is well worth consideration by employers, many of whom who use electrical energy know something about the trouble caused by machine and works stoppage through cessation of the supply of energy from the town service.

There is one fatal accident not classified as electrical, but in

which electricity was concerned, which will be particularly interesting to gas engineers. It occurred in connection with the magneto-ignition of a gas-engine. The engine had stopped through the failure of the ignition. The attendant was slackening the bolts of the ignition plug, in order to withdraw it for examination, and had partially removed it when, accidentally, he knocked against the lever of the magneto machine, causing a spark at the plug, and the ignition of the explosive charge in the cylinder, which, finding a vent round the partially removed plug, severely burned him. The obvious precaution of disconnecting the wire between the magneto and the plug before slackening the bolts had been neglected.

Turning to matters of another character, we have that, for station engineers, perennially interesting question of the charges for electric supply brought before us in an article (published by the "Electrical Review") by Mr. W. A. Toppin, headed "Systems of Charging and Metal Filament Lamps." The first sentence of the article is pristine in the matter of its intelligence. "Electricity supply authorities have universally felt the advent of the metallic filament lamp." No one has said they have not; no one is better aware of the fact than electricity supply authorities themselves; and they do not want to be publicly reminded of the fact. Considering the causes of the metallic lamp effect, it is pointed out that the electricity supplier sells energy and not light; and therefore, unless a consumer trebles or quadruples the amount of light he obtained with carbon lamps, the quantity of energy he uses will be decreased by using the new lamps. The small lighting consumer becomes hardly worth supplying, owing to his modest consumption of energy. The low loads at which his meter normally works are more difficult to measure accurately than the higher loads demanded by the larger consumer. To get over this difficulty, several towns have dispensed with meters for this class of consumer. To bring up the revenue, station engineers are obliged to rely on increasing the number of the consumers; and this means increased expenditure on services and cables. The capital charges on the undertaking are thus increased. From this indication of points in the article, it is clear that Mr. Toppin thinks the situation is not altogether a rosy one. But he has a plan for giving relief, not only to the station engineer, but to the British lamp manufacturer, and so away with metallic filaments of German production. The plan seems to be this, that the carbon filament lamp costs less than the metallic filament, and has a long life; and as the high voltage metallic filament lamp does not burn equally well in any position, and does not stand frequent handling and much vibration, the consumer will prefer the carbon lamp that has not these defects. Mr. Toppin wants to make it a matter of indifference to the consumer whether he uses carbon filament or metallic filament lamps, so as to encourage the use of the former. He thinks this is to be effected by the system of a fixed annual or quarterly charge, and 1d. per unit for all electricity used. We do not follow the argument as to how this will cultivate favour for carbon filament lamps; but Mr. Toppin seems to think it will, so that it must be all right.

Of the making of plans to stimulate consumption, there is no end. A report on a scheme has just come from Poplar; but it does not read as though there is any great enthusiasm over the matter, or over the experience on which certain recommendations are based. It is evident that the experience does not support the Electricity Committee in striking out boldly in the same direction, but only to make further tentative efforts. In March, 1909, the Council approved the wiring of 25 houses, at a tariff of 12½ per cent. on the cost of installation to cover interest, depreciation, and repairs, with a further charge of £4 per annum per kilowatt in respect of the capacity of the lamps connected, and £1 per kilowatt for heating, &c., plus ½d. a unit in each case for all current consumed—lighting in cellars, lavatories, &c., not extensively used at the time of maximum load, being charged at the same rate as for heating. The Electricity Committee report that the results "appear" to have been satisfactory; and they are of opinion that this class of installation may be usefully extended. Appear! Are the Committee so uncertain that they cannot speak a little more definitely? It is suggested that a similar system of charging should be adopted in respect of lighting business premises; but in these cases, while the charge for consumed current will remain the same, it is proposed to fix the rate per kilowatt installed at £13 for inside lighting and £6 10s. for outside arc lighting—the latter demand coming only partially on the peak of the load. With regard to power consumers, it is intended to establish a general rate of £4 per kilowatt demanded, plus ½d. per unit for all current consumed (discarding the rate of £3 per kilowatt and 8d. per unit), and to offer rebates to large consumers. The Committee only recommend that authority be given to wire a certain number of premises, not exceeding 50, for domestic and business supplies, on the terms and conditions here stated, at a cost not exceeding £20 for any one installation; also that the proposed rate for direct-current power be £4 per kilowatt demanded, with ½d. per unit for the current supplied, subject to rebates. The Council ought not to concur in any such proposal until the Committee can use a more definite word than "appear."

A banquet is to be given early in November, at the Savoy Hotel, to the five Past-Presidents of the Chemical Society (Professor William Odling, Sir Henry E. Roscoe, Sir William Crookes, Dr. Hugo Müller, and Dr. A. G. Vernon Harcourt), who have now attained their jubilee as Fellows of the Society.

NOTES FROM WESTMINSTER.

THE great feature of the week has been the fight over the Standard Burners Bills, about which more in succeeding paragraphs. The Liverpool Gas Company, who have now, through their exceptional circumstances, a Bill all to themselves, commenced their innings on Friday afternoon. There is not much more contested Private Bill work of any kind to receive attention; and if there were, there would be very little time to give to it, seeing that talk in the lobbies is as to it being almost certain now that the House of Commons will rise some time the last week of this month for a holiday period, and will reassemble for an "autumn" session early in November.

Standard Burner Bills. By the time these "Notes" are published, we shall be at the final stage of the Standard Burner Bills, which will be historic in the struggle of the gas industry for fair and open treatment in the conduct and the control of their business. There is only the special case of the Liverpool Gas Company to be considered now (with it a start was made on Friday); and then the Committee will give their decision on the whole of the measures. Though the number of opponents had decreased considerably, there was no lessening of the mass of evidence to which Sir Henry Kimber and his colleagues had to listen; and though to those who have followed the struggle from the beginning, there was nothing really new in the several features of the case *pro* and *con*, one could not help feeling, throughout the proceedings from Monday morning to Friday afternoon, that there was something important at stake, and interest was kept at high level the whole while. The manner in which the case was conducted for the promoters was worthy the big cause; and let it here be said that the organization of the case by Messrs. R. W. Cooper and Sons, and their watchful care from the very introduction of the Bills to the present time, deserve the highest praise. They and all associated in the promoters' case have worked hard and persistently for victory, believing fully in the justice of what they have asked for; and we hope next week to record that the laurels are completely theirs. The Hon. J. D. Fitzgerald, K.C., Mr. Honoratus Lloyd, Mr. C. C. Hutchinson, and Mr. A. M. Paddon were Counsel for the Bill. On the opposing side, representing various bodies, were Mr. Balfour Browne, K.C. (Mersey Docks and Harbour Board), Mr. Ram, K.C., Mr. Talbot, K.C., and Mr. Courthope Munroe. The legal forces were strong; and not less so the expert representation that had been chosen on behalf of the promoters. Naming them in the order in which they were called, there were Mr. Charles Carpenter, Professor Vivian B. Lewes, Mr. W. J. A. Butterfield, Mr. Corbet Woodall, Mr. Alex. Wilson, Mr. H. E. Jones, Mr. William Cash, Mr. W. C. Young, Mr. C. E. Botley, and Mr. Robert Beynon. Mr. Carpenter, Mr. Butterfield, and Mr. E. H. Stevenson were in close consultative attendance on Counsel. The opposing bodies called Mr. T. S. Berry, Mr. Benjamin F. Meadows, Mr. A. G. Smith, Professor Percy Frankland, Mr. Isaac Carr, and Mr. J. G. Newbigging, upon the three latter of whom fell the full force of the promoters' resistance.

We heard once more of the injustice of the old burner to those gas undertakings supplying grades of gas other than 16 candles; we re-traversed the history of gas supply from the time when Parliament gave gas suppliers the right to a burner that should show the maximum illuminating power of the gas; we heard how Parliament had consistently maintained that principle in all their dealings with gas suppliers; we heard, too, how the old burner distorted the differences between readings by it and by the No. 2 burner through its unsuitability with gases other than that for which it was made; and there was only one dissentient—Mr. Isaac Carr—to the No. 2 being the most accurate burner for obtaining relative results with all grades of gas. But there was the "contract" between gas suppliers and consumers, in which the opponents would insert the test-burner as a fixed condition, only subject to revision by giving compensation to flat-flame laggards. For their sake, and theirs alone, gas companies must be tied hand and foot, to ensure them this compensation, while the gas consumers of local authorities who adopt the burner must take their chance of getting something, unless Parliament positively commands that any profits are utilized for the benefit of the undertaking and of the consumers. Little, however, was said about the imposition of a calorific power test. So we went on over the ground that has been traversed again and again, and in every particular, but a few weeks since in the Lords. We will not attempt to review it all here. Comment is made in our editorial columns on the opposition case; and touching that case, Professor Frankland, Mr. Carr, and Mr. Newbigging will not soon forget the trenchant cross-examination that they underwent at the hands of Mr. Honoratus Lloyd, whose powerful speech, in reply on Bills Nos. 1, 2, and 3 stands as an unanswerable case in favour of the new standard burner. It will be found fully reported in our "Parliamentary Intelligence;" and it should be read by all gas men. The desire of the Committee to thoroughly understand the use of the burners led them on Thursday night to the Craven Street testing-room of the London County Council, accompanied (among others) by Mr. Charles Carpenter, Mr. Isaac Carr, and junior Counsel (Mr. Hutchinson and Mr. Courthope Munroe).

Trading Liberty for Glasgow.

As was mentioned last week in the concluding paragraph of the "Notes" referring to the proceedings on the Glasgow Bill, the Corporation Gas Department are thoroughly satisfied with their Bill as it now stands. Its position has been, between the House of Commons and the House of Lords, materially altered, to the commercial advantage of both gas undertaking and consumers. There is no grief on the part of the Gas Department, and we think it may be said of the major part of the Corporation, that there has been a withdrawal of the (almost unexercised) liberty to take from the profits of the gas undertaking and distribute them among the ratepayers, who, *quâ* ratepayers, have never been asked for a penny-piece in support of the concern. But there is rejoicing that the rigidity in regard to charges that existed as the Bill passed from the House of Commons has given place to greater flexibility, as this affords the department trading freedom that must contribute to the maintenance of business. As was stated in the "JOURNAL" at the time of the Commons Committee's decision, we regarded the price limitations put upon the department as exceeding the bounds of fairness and propriety in relation to a trading concern in competition with other commodities. However, we are sure that the Glasgow Corporation are now glad they did not sacrifice the measure as it left the Commons; for they have to-day a Bill under which they can conduct the gas undertaking in the best interests of the consumers. The general terms of the decision in the House of Lords were published last week. When clauses were considered on Monday, the only two matters of importance to claim the attention of the Committee were the provisions as to discounts up to 10 per cent. for prompt payment and 15 per cent. for large consumption, and regarding the formation of a reserve fund. A little supplement was made to the discounts clause at the instance of Lord Robert Cecil, K.C., whose point was concurred in by Mr. Balfour Browne, K.C., for the promoters. It arose thus: A previous clause enacts that there should be an equal rate of charge for public lighting purposes; and this conflicted with the discounts clause, inasmuch as there was an opening for a reduction to the large local authorities which would not be shared by the small local authorities. Obviously, it would not have been fair for the local authorities to be treated differently. Lord Robert's suggestion was that the discounts clause should be prefaced by the words, "Subject to the provisions of sub-section 4 of section 26 of this Act." This was agreed to; and in this simple way was effected the re-establishment of equality. The terms of the reserve fund were also agreed to; the Corporation being allowed to accumulate such a fund up to 10 per cent. of the borrowed moneys outstanding, by appropriations of $\frac{1}{2}$ per cent. per annum upon the money outstanding for the time being.

Out-District Prices.

The Swansea Gas Company and the Swansea Rural District Council were in a friendly frame of mind last Tuesday when the Confirmation Bill which includes the Company's Order came before Lord Donoughmore's Committee. The sole point in dispute was the territorial boundary in respect of gas prices; and the Committee were informed at once that the parties had arrived at terms of peace, so that their Lordships would not be troubled, beyond bestowing their approval. The agreement provides for the price of gas within a mile of the existing borough boundary being the same as that charged within the borough. Outside the mile limit, the price is not to exceed the borough price by more than 4d. per 1000 cubic feet, except Oystermouth, with which the parties were not concerned. Omission to extend the gas-mains to Birchgrove within a year of the confirmation of the Order is to give the Council liberty to put into force their electric lighting powers there. Other extensions of mains into the outside districts are arranged for. On Wednesday, there was ratification by the Committee of the proposals, and approval of the Confirmation Bill.

"Black" Smoke and Gas-Works.

The London County Council have failed in inducing the Local Legislation Committee to strengthen their hands, in administering the law as to the emission of smoke from factories, by expunging from existing enactment the word "black" now appearing before smoke, and so exposing manufacturers to attack in the matter of nuisance where they have hitherto been free from it. The case of the County Council lacked evidence as to the existence of nuisance that would justify the Committee in making the change proposed. The Committee, as a matter of fact, did not find that, in the case of the gas companies, there had been any testimony pointing to nuisance that would justify them in laying the Companies open to any more rigorous supervision or frequency of attack than at present. Mr. Fitzgerald, K.C., had, indeed, to admit that the South Metropolitan Gas Company had never been proceeded against at all during the past forty years; but what would happen if they had not the protection of some term defining and giving a character to the smoke, can hardly be said. There would no doubt in future have been a magnificent display of energy, and a grand conflict of testimony, had the Committee accepted the proposal for the excision of the defining word "black." The Committee have declined to interfere with the *status quo*; and "black" smoke remains the evidence of a violation of the law.

Cambridge Water.

In the "Notes" published on April 19, reference was made to the proceedings in the House of Lords on the Cambridge Water Company's Bill. The Corporation did not gain any notable laurels then as the result of their opposition, as it was apparent to all that the Water Company have been doing (and their present plans are directed

to the same end) all possible to serve Cambridge well. The best expert testimony that could be procured by the Company confirmed their actions. But the Corporation appear to have been exerting themselves to, in some way, get the Company into a net through the medium of the Bill. When before Sir Luke White's Committee recently, they asked for a suspensory clause, to pave the way for a Purchase Bill of their own. They could not have gone to work in a better manner than they have done in an endeavour to depreciate the value of the Company's property; and the suggestion as to a suspensory clause, if it had been adopted, could only have interfered with the progress of the Company in their service to the town. The Committee would not agree to the insertion of such a clause. It was evident the Committee saw that the Water Company had fulfilled their obligations in the past, and that their new works scheme purposed putting them in a position to do the same in the future; and therefore the only thing the Committee did was to put certain limits on the Company's financial proposals. Back-dividends were restricted to six years; a provision as to charges for high service was deleted; and regarding proposed increases in the scale of water charges, the Company were ordered to put in the Bill certain terms as to the date from which the rates should be chargeable—the Committee considering that, after the Company had expended £25,000 of the extra capital, they should be entitled to charge the whole of the increased rates. As to new capital, £200,000 was allowed; the Company's suggestion being £213,000. Regarding debentures, the Committee were of opinion that none should be issued bearing more than 4 per cent. interest without being put up to auction.

LOST DIVIDEND WARRANTS.

By H. D. ELLIS.

THE case of "Thairwall v. Great Northern Railway Company," recently decided in the King's Bench Division, on appeal by the defendants from a judgment in the Clerkenwell County Court, should possess interest for all Directors and Secretaries.

In brief, the case was as follows: The plaintiff was a holder of certain stocks of the defendants, the dividends upon which are from time to time paid by warrants in the usual manner. With the sanction of the shareholders, these warrants are sent to them through the post, addressed to them at their registered addresses. In pursuance of this practice, such a warrant was addressed to the plaintiff last February. It failed to reach him, and has not been found since. After an interval of three months, the plaintiff applied to the defendants for a duplicate warrant. The defendants demanded an indemnity from the plaintiff, as a condition precedent to their issuing such duplicate. The plaintiff refused to give the indemnity; and the defendants thereupon refused to issue the duplicate. The plaintiff thereupon brought an action in the County Court to recover the amount of the dividend. The County Court judge decided in favour of the plaintiff; and the defendants appealed.

In delivering judgment in favour of the defendants, the Appeal Court (as reported in "The Times Law Report," June 20) held

(a) That the warrant was a cheque within the meaning of the Bills of Exchange Act, 1882.

(b) That in accordance with the principle laid down in "Norman v. Ricketts" (3 "The Times Law Reports," 182), the sending of the warrant by post was payment. The only obligation on the Company was to send plaintiff a dividend warrant, and, having done this, they became discharged.

The dictum of the Court in paragraph (b) may perhaps be imperfectly reported. For if the posting was "payment," and the Company were "discharged," then the Company were under no liability whatever to the plaintiff; and they would not be justified in paying him the amount of the dividend whether in consideration of an indemnity or otherwise.

The dividend warrant bore upon the face of it the usual notice to this or the like effect: "This warrant will not be honoured after three months from date of issue unless specially endorsed for payment by the Secretary." The three months had elapsed prior to the plaintiff bringing his action; and the warrant was dead. The notice upon the face of it was the Company's own warranty that it was dead. A banker who honoured it after the expiration of the three months would be liable to make good the amount. In demanding an indemnity from the plaintiff, the Company were asking to be guaranteed against a liability which could only be created by their own *laches*—viz., the revival by their own act of a dead "chase in action." The shareholder had not been guilty of any *laches*, and he was absolutely powerless in the matter—powerless even to prevent the Company wrongfully or negligently reviving the warrant.

There is little likelihood of the case being carried to a higher Court—though Lord Halsbury's judgment in the House of Lords on appeal might be interesting reading. But anyhow, as the matter stands, Boards of Directors may extract one wholesome admonition from it; and that is, that they should not harass shareholders with needless and irritating red-tape. By-laws and regulations, in addition to being in harmony with Public and Private Acts, should be equitable and reasonable, and not oppressive and vexatious. It is to be feared a good many companies—some very old and very respectable—cling to antiquated prescriptions which should long ago have been swept aside.

THE QUALITY OF LONDON GAS.

WE have given from time to time in the "JOURNAL" reviews of the results of the testings made by the Gas Examiners appointed by the London County Council on the gas supplied by the three Metropolitan Gas Companies. The last of these reviews appeared in the issue dated Oct. 12, and carried the information as to these testings down to the end of the third quarter of 1909. In view of the references made, in the course of the evidence given last week before the Committee of the House of Commons on the Standard Burner Bills, to the calorific power of the gas supplied to London, it seems a fitting opportunity to carry down to a recent date the information given in the "JOURNAL" on the results of the Metropolitan gas testings. In this article, allusion will be made to the fourth quarter of last year, and the results obtained compared with those for the corresponding quarter of the two preceding years. In next week's issue, similar information will be published for the complete years (1907-1909) and in regard to the first half of the current year.

The testings of illuminating power for the fourth quarter of the last three years have given results of which the average is shown for each of the three Metropolitan Gas Companies in the appended table. (Table I.) The precise period to which the 1909 figures refer is the fourteen weeks ending Jan. 1, 1910; while the figures for 1907 and 1908 are for thirteen weeks ending Dec. 28 and 26 respectively:—

TABLE I.—Averages of all Testings of Illuminating Power for the Fourth Quarter of the Year [Candles].

Burner	No. 2 Metropolitan Argand.			Flat-Flame.		
	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	16.70	16.96	15.82	11.50	12.00	10.10
South Metropolitan Gas Company	16.45	16.71	16.12	10.96	11.32	10.38
Commercial Gas Company	15.01	14.85	14.57	8.58	8.90	8.75

The minimum results of any one day's testings with the argand burner in the fourth quarter of 1909 were, for the Gaslight and Coke Company 14.03 candles, for the South Metropolitan Gas Company 13.93 candles, and for the Commercial Gas Company 13.00 candles. These results are of importance, because the Companies are liable to incur forfeitures if the illuminating power of the gas, on the average of three consecutive days' testings, is found to be more than half-a-candle below the prescribed illuminating power. The latter was in the quarter to which these results refer, 14 candles for the South Metropolitan and Commercial Gas Companies, and 16 candles for the Gaslight and Coke Company; but actually the last-named Company were, by agreement with the London County Council, working to a 14-candle standard of illuminating power by way of anticipation of the drop from a 16 to a 14 candle standard which the Company's Act of 1909 sanctioned, with effect from Jan. 1, 1910.

TABLE II.—Summary of Testings of Calorific Power (Net) for the Fourth Quarter of the Year [Calories per Cubic Foot].

	Average.			Maximum.			Minimum.		
	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	132.7	132.0	125.5	143.4	158.4	139.6	122.6	118.3	116.0*
South Metropolitan Gas Company	133.0	133.9	132.1	152.2	151.3	152.7	127.1	127.2	122.0
Commercial Gas Company	127.3	124.1	125.0	138.6	135.4	133.9	116.2	116.7	116.2

* There is a doubt as to whether this is the minimum result for the quarter, as is pointed out in the text of this article.

The average maximum and minimum results of the testings made for calorific power are shown in Table II. for each of the three Companies for the fourth quarter of the three years. The figures refer to the net calorific power stated in calories per cubic foot. They may be converted into British thermal units per cubic foot by multiplying by 4 (if great exactness is required, by 3.968); and the gross calorific power, which has not been stated in the returns published by the London County Council prior to the last few weeks of 1908, may be found approximately by adding 15 to 17 calories to the net calorific power. In the fourth quarter of the year 1909, the average gross calorific power returned was, for the Gaslight and Coke Company 15.4 calories per cubic foot higher than the average net calorific power, and for the South Metropolitan and Commercial Gas Companies 16.6 and 15.4 calories higher respectively. The minimum return of gross calorific power for the Gaslight and Coke Company for the same quarter was 129.9 calories. In regard to this and the minimum net calorific power of 116.0 calories recorded in Table II., it should be pointed out that for one week of the quarter the London County Council omitted to report any minimum figures for the calorimetric testings—an omission which may be taken to imply that an improbably

low result had been reported from one testing-place, and the Council did not feel justified in publishing it. The minimum returns of gross calorific power for the South Metropolitan and Commercial Companies were 137.7 and 132.3 calories per cubic foot respectively.

TABLE III.—Summary of Testings of the Sulphur in London Gas for the Fourth Quarter of the Year [Grains per 100 Cubic Feet].

	Average.			Maximum.		
	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke Company	41.5	36.3	33.4	81.6	52.2	58.7
South Metropolitan Gas Company	46.5	47.2	38.6	84.0	98.7	75.7
Commercial Gas Company	30.6	30.4	30.6	47.6	47.3	49.9

The results of the testings for sulphur other than in the form of sulphuretted hydrogen are summarized in Table III. They are interesting, as showing that the somewhat high returns which characterized the years immediately following the abolition of lime purification in London were due to temporary causes. Even the South Metropolitan Gas Company, who have not the benefit in this respect which is obtained by the admixture of carburetted water gas with coal gas, were able during the fourth quarter of 1909 to work to as low an average as 38.6 grains of sulphur per 100 cubic feet of gas.

We will reserve further comment on this and other figures quoted in this article until the similar figures for the whole year and for the last six months are given in next week's issue.

FLOODING OF THE GAS-WORKS AND INTERRUPTION OF THE GAS SUPPLY AT ZÜRICH.

It was mentioned in the "JOURNAL" for the 21st ult., that the gas lighting of parts of the City of Zürich had been affected by the floods which visited Switzerland last month. The damage and inconvenience appear, however, to have been considerably greater than was then indicated, since the whole of the gas-works was flooded on June 15, and work could not be resumed fully until the 18th of that month. The following details of the catastrophe are taken from a report in the current number of the "Journal für Gasbeleuchtung."

The ground level of the Schlieren Works at Zürich was raised, at the time of their erection, about 32 inches above that of the surrounding land, in order to diminish the danger through the flooding of the Limmat Valley, which occurs when the water rises in the River Limmat and the Lake of Zürich. The gas-works, it will be remembered, from the description which is published as a brochure from the office of the "JOURNAL," and an account of the extensions given recently in our columns (see "JOURNAL," Vol. CX., pp. 371, 426, 490), is situated between the dam which was constructed to confine the river to a definite course and the raised roadway known as "Industrie Strasse." The bank on which this roadway runs is a solid construction without tunnels or culverts for the passage of water from one side of it to the other.

It appears that on the 15th of June the water overflowed from the River Limmat above the end of the confining dam already mentioned, and swept down the valley between the roadway and the river dam. Had there been culverts by which it could escape under the roadway, the damage done would have been considerably less serious. It was noticed about ten o'clock on the morning of June 15 that the water in the river was rising to an abnormal height; but no serious flooding was then anticipated. By 12.30, however, the whole of the gas-works site was flooded to a depth of about 12½ inches, and the cellars and underground channels containing works' plant were filled with water—in some cases to a depth of 68 inches. The channels in which the coal conveyors were situated were flooded, and the water entered the main flue of the retort-furnaces and caused the fires to be nearly extinguished. It also blocked the flues from the boilers, and, by so cutting off the supply of steam, interrupted the working of the works' power station for some time. When the flood occurred, there was about 2,140,000 cubic feet of gas in the holders.

The cellars on the gas-works are, as far as possible, connected with the drainage system of the works; and it will be remembered that special provision has been made for pumping the drainage water into the river. In the extensions of the works which were described in the "JOURNAL" recently, reference was made to the fact that a new pumping-station had been established, with a Sulzer's dirty-water pump of 9 inches bore and a capacity of 1320 gallons per minute, for pumping out the drainage system in times of flood of the river, so as to avoid the flooding of the gas-works which had occurred on two occasions since their construction. It was believed that this provision had met all risk of further flooding of the works. But the floods last month were caused not by the return of water from the river through the drainage

system or by the rise in the level of the underground water, but by the overflow of water from the river above the point at which the confining dam terminates. The interruption of the working of the power station naturally prevented the water being pumped out quickly after the flood had occurred. Moreover, the flood water, coming down in such amount and in this manner, carried with it quantities of mud and *débris*, which blocked all the channels and the suction of the pumping plant. The following day, however, locomotives and hand pumps were put to work and rapidly emptied the water from the boiler and engine house, and the main flue of the retort-settings. By mid-day, it was hoped that the retort-furnaces could be re-started; but it was found that the mud had partially blocked the flue, and the latter had to be cleaned before the furnaces could be recharged with safety. As soon as the flue was cleared, the retorts were charged; the coal being brought into the bunkers over the settings by hand, as it was not till mid-day on June 17 that a portion of the coal-conveying plant could be again brought into action.

Thanks to the large store of gas in the holders at the time of the catastrophe, the supply to the town was not affected on the 15th ult., though on the evening of that day only one-third of the public lamps were lighted by way of economizing the store of gas, and the supply was cut off to the outlying suburbs. Notices were circulated the same day from house to house asking consumers to curtail or stop their consumption of gas; but apparently they had little effect. The next day notices were circulated warning consumers to shut off their gas-taps, as the supply of gas would be interrupted. The public gas-lamps throughout the town could not be lighted on the nights of the 16th and 17th ult. On the evening of the 17th, however, the gasholders had been so far re-filled that the distribution could have been resumed; but it appeared unadvisable to resume the supply at night-time, and the interruption consequently continued until eight o'clock the following morning. Consumers were then warned that gas would again be supplied to the central districts of the town, and by eleven o'clock to the suburbs. Thanks to the warnings issued, no accidents from escaping gas have been reported. The actual duration of the interruption of supply to the town was about 36 hours. The damage done on the gas-works by the flood is estimated at about £2000.

The question of the extension of the dam of the river further up stream, so as to avoid a repetition of the occurrence, is being considered by the Municipal Council; and the work will no doubt shortly be put in hand.

GAS ASSOCIATION AFFAIRS IN AMERICA.

[COMMUNICATED BY AN ENGINEER IN THE STATES.]

NEVER have the Association activities of the gas men in America seemed as great as now. The gas journals are filled with notices of meetings to come and accounts of meetings that have been. So prolific are these meetings that what little time the average American gas engineer devotes to writing is occupied in the preparation of a paper for some meeting. Men who have a mission to perform, such as the education of the gas fraternity to the value of calorimetry (now the self-imposed task of Mr. J. B. Klump) or to the importance of proper illumination, and how well the new forms of gas-lamps lend themselves to this end (a subject to which Mr. Norman Macbeth has been devoting himself for some time)—men of this class can almost spend all their days in journeying from State to State, from one convention to another.

Now, in addition to these Local Associations meeting once a year, the gas men are beginning to follow the example of their electric and their illuminating engineering *confrères* in organizing Local Sections with monthly meetings. One reason for the quite phenomenal growth of the Illuminating Engineering Society has been its division into Local Sections. These sections (located in New York, Philadelphia, Chicago, and Boston) have in their monthly meetings been more typical of the Society's life and work than have been the annual conventions. The healthy rivalry between the sections, and the continuity of interest maintained by the monthly meetings, have paved the way each year for a rousing annual meeting. The section plan is also in successful operation in the National Electric Light Association; and it is their idea of forming "Company Sections" that is now being adopted by the National Commercial Gas Association. Under this scheme, the employees of a gas company assemble and form the "..... Company Section of the National Commercial Gas Association," draw up a set of bye-laws (which must be at once approved by the Parent Association), and proceed to hold (usually) monthly meetings. Experience, apparently, shows that these Local Sections benefit the company by sharpening the wits, and thereby increasing the value, of its employees, through mutual association, and benefit the Association by increasing the number of men interested in its work. Also, that the idea of belonging to some large Association is more attractive to the average man than just being a member of a club of company employees. I say "apparently," for the Local or Company Section has not been in existence long enough to speak with any certainty about its permanency. However, there seems no reason to doubt that by the organization of these Company Sections, the National Commercial Gas Association will be greatly aided in maintaining

its membership at the high level of numbers and interest evinced by the New York meeting last December.

Just what effect this rapid development of the Commercial Gas Association into a strong national society will have upon the growth of the American Gas Institute, remains to be seen. It would appear quite probable that certain commercial men and traders belonging already to a District Association would not care to be in two national organizations, and would choose the Commercial Association in preference to the Institute. There is a disposition in some quarters to find great fault with the Institute—claiming that it has not justified its existence; and there are those who would like to see the Commercial Gas Association assume the primacy in American affairs. However, a careful comparison of the work done by the three Associations from whose merger the Institute was formed, with that put out by the Institute itself, will show convincingly that the latter has earned fully the right to live. Undoubtedly, it has not done all that was hoped or all that was easily possible. Its neglect of commercial subjects gave ample justification for the formation of the Commercial Association. The Institute has suffered a little from the high quality of work it has done. Such reports as those made by the Committees on uniform methods of taking candle power, on electrolysis, on units of light, on calorimetry, on revision of the "Question Box," on the "Bureau of Information," involve so much sacrifice on the part of the little band of willing workers to which the Institute owes so much, that it is not strange that such reports are not forthcoming every year. On the other hand, the preparation of an interesting commercial programme does not entail any original research or long experiments, but merely a description of methods found successful in managing an office or selling gas. The average commercial man feels better able to make a contribution to his meeting than does the Institute member, for the more knowledge the latter really has, the more modest he is, and the less inclined to talk in the presence of the leaders of his profession. Of course, this is a mistake which militates against the young engineers as well as against the general interest taken in the Institute's meeting. More and more, the latter's work is getting to be the product of some engineer who has been able to utilize the technical staff of a large company or a syndicate of companies. Such work affords, free of charge to each member of the Institute, information otherwise expensive to obtain. And yet there are members who do not think that the Institute is benefiting them to the extent of their annual dues of \$10. Such members apparently forget the "Bureau of Information," which stands ready to answer their questions; and, undoubtedly, many mistakes are made daily costing ten times the membership dues, because of the failure to ask these questions.

A feature of the Commercial Association is their monthly "Bulletin" of sixteen pages, to which all members are asked to contribute. This is supposed to be "getting something for your money;" and some persons think that a similar publication by the Institute would be welcomed by its members. It would appear as if the gas journals rendered such a bulletin unnecessary. But possibly human nature is such that getting something for nothing would be pleasing to the average member, even though that something could be obtained from the gas journal at more frequent intervals, and without extra expense to him; for, of course, a gas man who does not read a gas journal is barred from any consideration whatever.

As to the further relations of the Institute and the Commercial Association, it seems now that any close union of the latter with the former is not at present possible. This being the case, the powers that be, in both Associations, should attempt to delimit the activities of each, in order to prevent duplication of work. The Institute should cease devoting any time to commercial matters, while the Association should take care that, in discussing the sale of residuals (and it is doubtful whether any phase of residuals is within its scope), it does not trench on the Institute's technical field, covering the preparation of residuals for the market. Also the meetings of the two societies should be held in the same city the same week. The present cost of separate meetings involves unnecessary waste of time and energy on the part of those gas men whose positions make it necessary for them to attend the meetings of both organizations. It is rather strange that the syndicates, who, by paying the dues and meeting expenses of their employees, largely make possible the existence of the societies, do not take active steps towards joint meetings.

To conclude, it begins to look now as if we in America would have two National Gas Associations, just as was the case in England during the days of the Gas Institute and the Institution, without, however, let us hope, the duplication involved in your case. The writer for his own part hopes that later on your example of amalgamation will be followed by the separate organizations this side.

The Professorship of Coal Gas and Fuel Industries at Leeds.—The Council of the Institution of Gas Engineers have issued a circular announcing that arrangements are now completed for the establishment of the Professorship of Coal Gas and Fuel Industries at the University of Leeds, as a memorial to the late Sir George Livesey; upwards of £10,500 having been subscribed to the fund initiated for the purpose by the Institution. The Council point out that, in connection with the work to be carried out by the Professor, an Advisory Committee has been formed; and the names of the members are given.

THE NEW HOBOKEN GAS-WORKS AT ANTWERP.



General View of the New Works from the River Scheldt.

Photographs by P. DE GEYTER.

CONTINENTAL countries have been well to the fore of late years in the building of new gas-works of considerable magnitude and of more than passing interest in their engineering features. Prominent among them are what will henceforth be known as the Hoboken works, at Antwerp, of the Imperial Continental Gas Association. These have recently been brought into action; and therefore we take the opportunity (afforded in courteous compliance with a request) to present readers with a description of them, together with the reproductions of some excellent photographs.

THE SITE AND INITIAL WORK.

The new works are situated on the banks of the River Scheldt, about 5 miles above Antwerp, on a site originally occupied by a shipbuilding and engineering firm, known as "La Vulcain Belge." The site—of some 55 acres—was acquired, together with the buildings, cranes, and electric-generating station, all in comparatively new condition. This fact accounts for the appearance of various buildings which have been adapted to the requirements of a gas-works, but which obviously were not erected for that purpose. The fact that there existed a large electricity generating station in full working order had considerable influence on the arrangement of the works, as it was felt to be unnecessary to provide steam plant; and therefore alternative gas-engine and electrical driving of the machinery has been adopted throughout.

One of the first works undertaken was the reclamation of the foreshore, and the construction of a pier in the tideway, at which

steamers of at least 2000 tons might lie at low water. This was a work of great difficulty; and an immense amount of piling and filling-in had to be done. For the filling-in, the material excavated from the gasholder tanks, reservoirs, foundations, &c., was available; and the whole of the river front has now been made-up to the mean gas-works level. The water front consists of timber camp-sheathing, with a long projecting jetty for loading barges along part of its length.

ARRANGEMENTS FOR THE TRANSPORT OF MATERIAL.

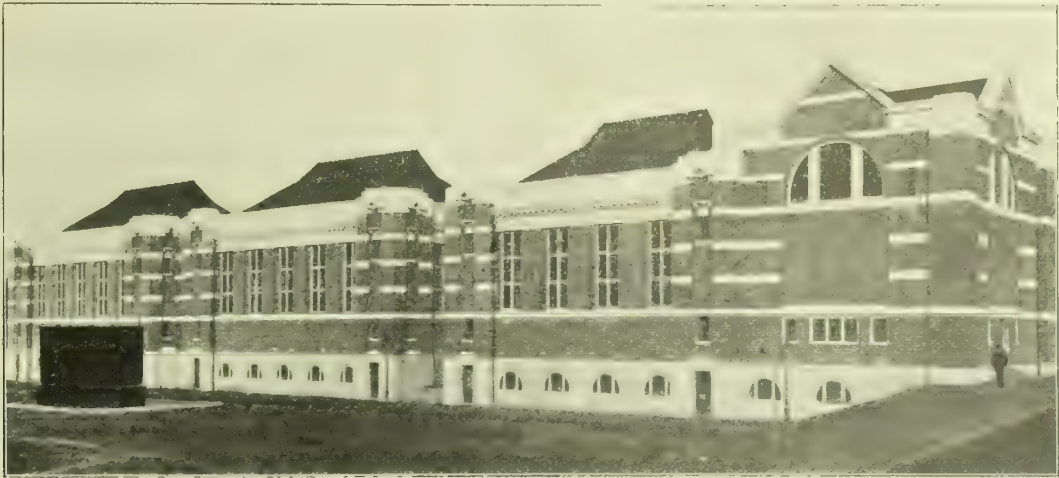
Interest is claimed right away from the start. For the transport of coal from the steamer to the store an aerial ropeway system was decided upon; and this work has been carried out by Messrs. Adolf Bleichert and Co., of Leipzig. Two transporter cranes have been erected on the pier. These take the coal from the steamer by means of grabs holding about 30 cwt., and deposit it in a hopper at the rear of each crane. The ropeway runs from the pier; and the suspended buckets pass round a loop under the hoppers to be loaded. The buckets are weighed, and counted automatically, after which they are pushed on to the main line by hand, and are automatically gripped to the hauling rope, from which they are not released till they return to the loading-station after making a circuit of the coal-store, and being tipped on the way. The cranes and ropeway can discharge coal at the rate of 100 tons per hour. The coal-store (which is placed parallel with the river at the far end of the retort-house) is traversed by the ropeway four times, so that the coal can be well distributed over the area. Without trimming, the store holds about 8000 tons; and the buckets can be tipped at any point.



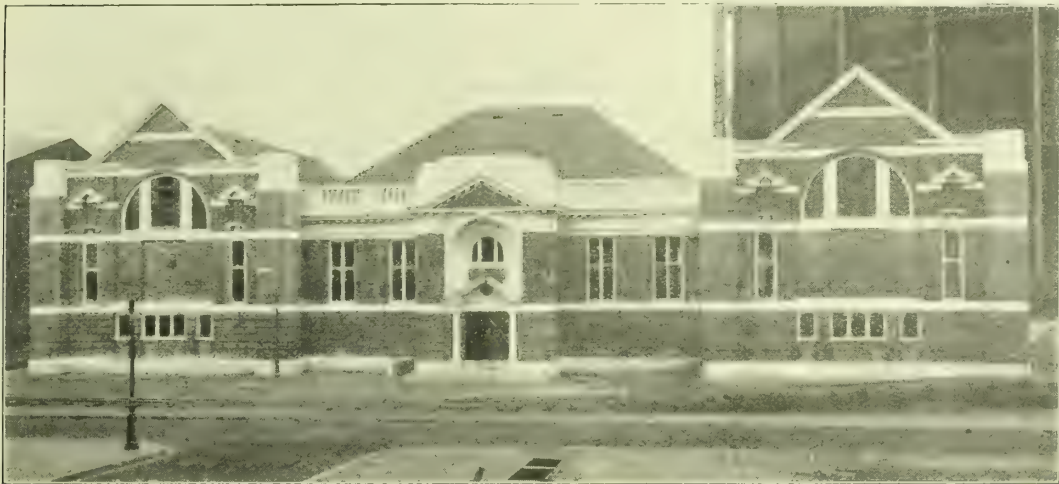
Retort-House and Men's Mess-Rooms.



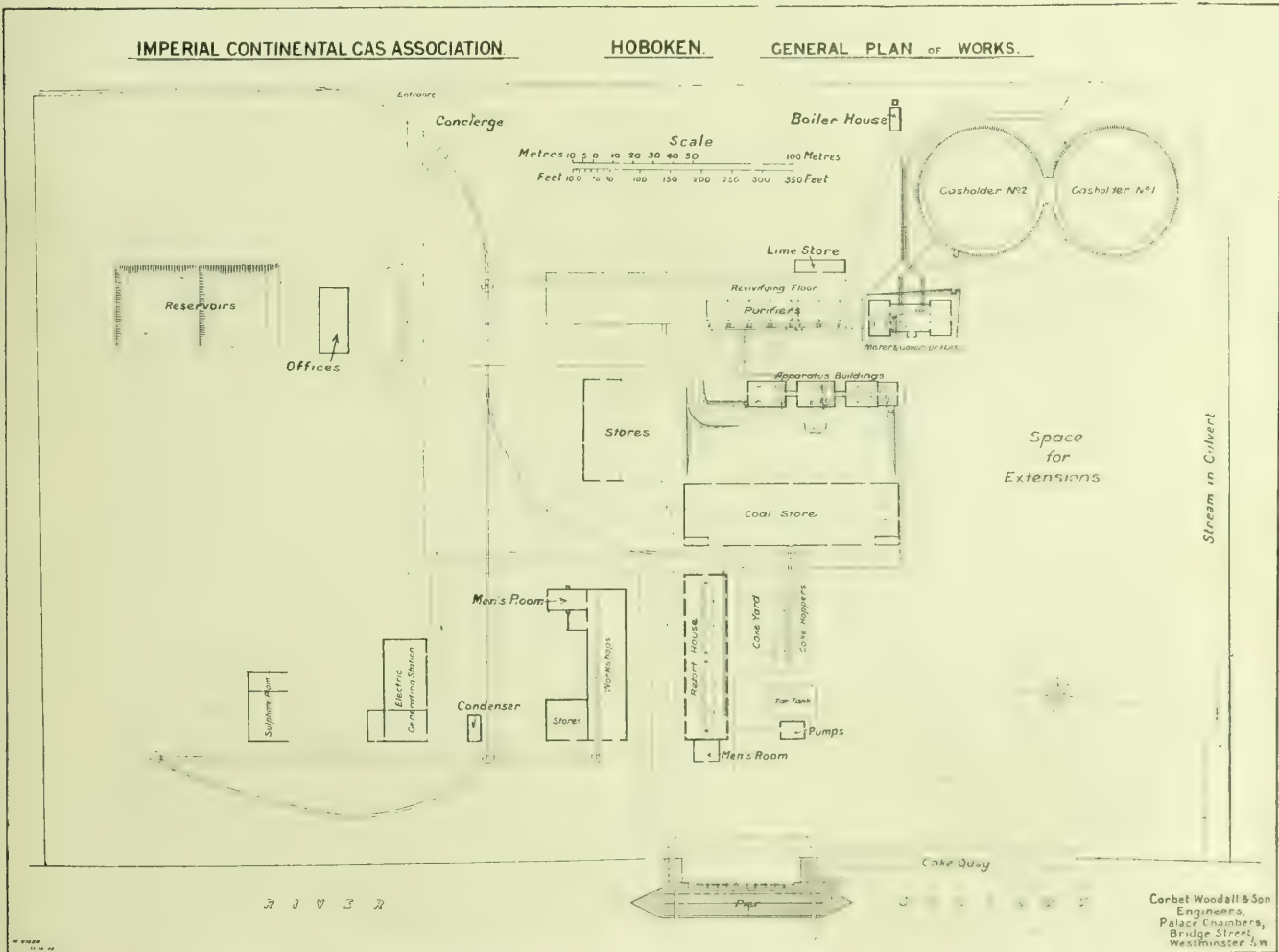
Spacious Coal-Stores.



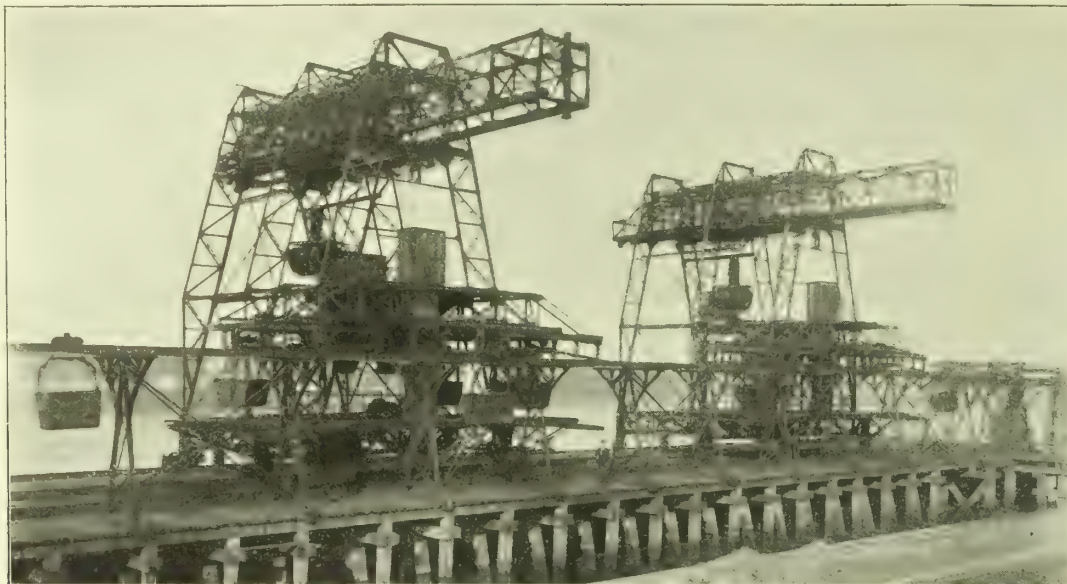
The Apparatus Buildings.



Meter and Governor Houses.



General Plan of the Hoboken Antwerp Gas-Works.



Electrical Coaling Cranes and Runway.

The retort-house is placed between the coal-store and the river—an arrangement adopted with a view to the disposal of coke, the bulk of which will be conveyed away by water. A railway siding is brought in between the retort-house and the coal-store; and this will be available both for bringing coal in and for taking coke away by rail.

The coal is taken from the coal-store to the retort-house by the usual series of coal breaker and elevator, and push-plate conveyors. The only feature to be noted specially is a band conveyor, running in a subway lengthways under the coal-store. The band can be loaded through hinged doors in the floor-plates covering the subway; and it delivers the coal to the hopper over the coal-breaker. The capacity of this part of the plant is about 40 tons per hour. The subway and breaker-pit are lined with glazed tiles, and both are lighted by electricity.

IN THE RETORT-HOUSE.

The retort-house and coal-store are both of bold design, and have a substantial appearance. In the former are two benches, each containing nine arches of nine horizontal through retorts, 23 in. by 16 in. by 20 feet long, of \square shape; and the charging and discharging are effected by a Fiddes-Aldridge machine. As far as possible, everything has been arranged for efficiency and convenience, and the comfort of the men. There are two retort governors to each bench; and stages are provided for giving access to them, to the valves and dip-pipes on the hydraulic

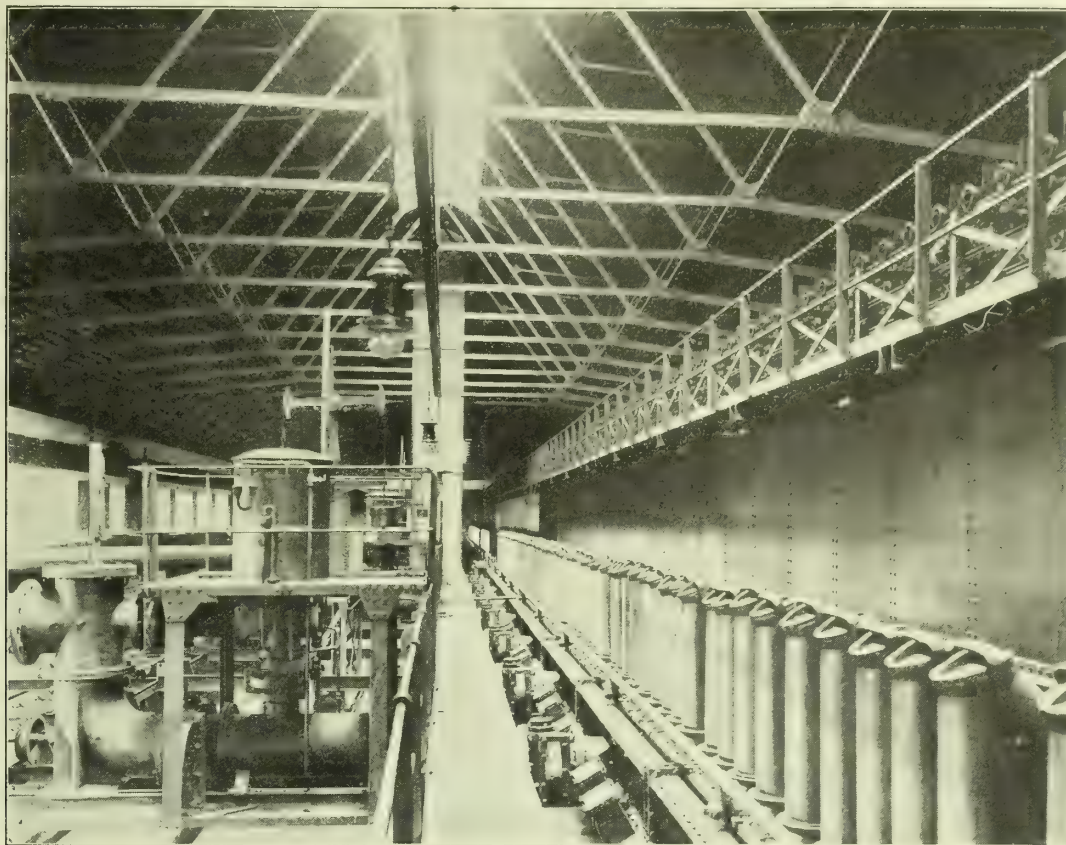
mains, to the tops of the ascension-pipes, and to the coal-conveyors. The gas is taken off from one end only of the retorts through 8-inch diameter steel ascension-pipes. The retort-benches and coal breaking, elevating, and conveying machinery were all supplied by Messrs. Gibbons Bros.

THE COKE-HANDLING PLANT.

The coke is discharged on to De Brouwer conveyors, running in a trough in the floor of the house, and is delivered on to an inclined tray conveyor, by which it is taken either up to the "night hopper," or to the main storage hopper, where it is broken and sorted. The night hopper is intended to hold all the coke produced during a twelve-hour shift; so that, during that time, it is not necessary to work the coke-breaker and Zimmer conveyor screen. The coke stored in the night hopper will nearly all be sent away unbroken. The outlet doors of the hopper are therefore arranged to deliver the coke on to screens for removing the breeze; and these, in turn, deliver the coke into side-tipping waggons, by which it is taken away to be stored or loaded into barges as the case may be. At the main hoppers, the coke is first broken, and then sorted by means of Zimmer screen conveyors into five different sizes. Three of the hoppers have a capacity of 100 tons each; two of them, 60 tons; and there is another of similar size for the breeze. The coke from the hoppers can be discharged either into railway waggons, side-tipping cars, carts, or bags. When the hoppers are nearly full, the coke then being



Retort-Charging Stage, with Fiddes-Aldridge Machine.



The Equipment at the Top of the Retort-Bench.

produced can be discharged into waggons running on elevated lines over the coke yard, so that there also the different sizes of coke can be kept separate. The hoppers were constructed by Les Grandes Chaudronneries de l'Escaut; and the elevator and conveyors by Messrs. W. J. Jenkins and Co.

TAR AND LIQUOR ARRANGEMENTS.

Near the coke-hoppers is the pump-house, and an underground tar and liquor tank. The pump-house contains three pairs of double-acting vertical pumps (by Tangyes) for tar, liquor, and water. The tar and liquor pumps can work as duplicates one to the other. All the pumps are driven alternatively by electric-motor or gas-engine, by means of belts from a line of shafting. Over the pump-house is a cast-iron tank for tar, liquor, and water. The underground tank has a capacity of 320,000 gallons

CONDENSING, EXHAUSTING, TAR-EXTRACTING, AND WASHING PLANT.

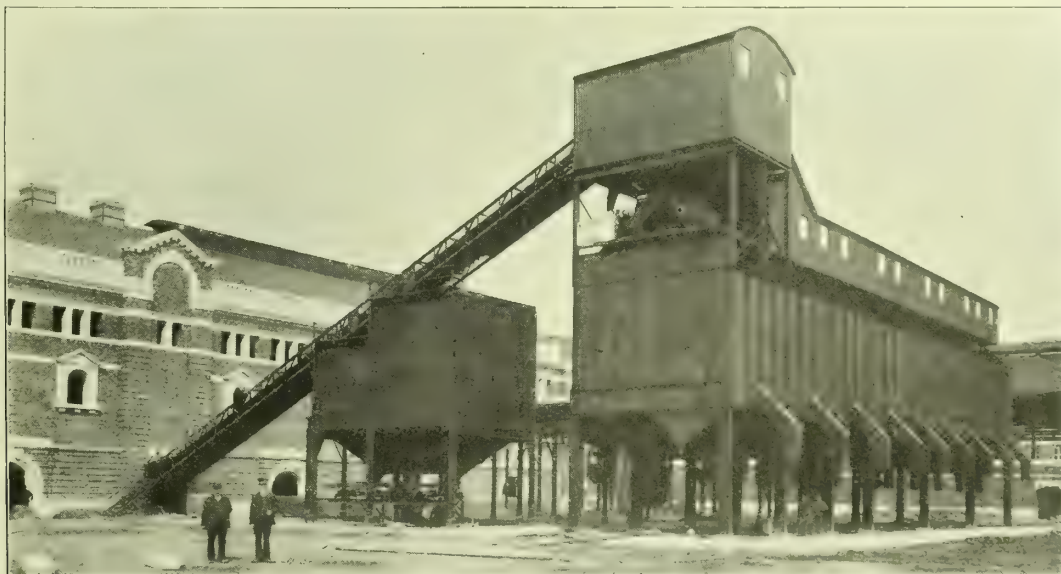
Following the course of the gas, we come to the range of apparatus buildings, which are a distinctive feature of the works, and which extend along one side of the central avenue. There are three separate buildings connected with each other by covered ways. The first contains the condensers and exhausters; the next, the tar extractors and naphthalene washers; and the third, the ammonia washers. Advantage has been taken of the natural slope of the ground to form cellars of ample depth under each building for the mains and valves. Under one of the covered

ways, a heating chamber has been constructed for the hot-water apparatus used in warming this block of buildings; there being no steam-pipes for exhauster or washer engines to do this duty more or less effectively.

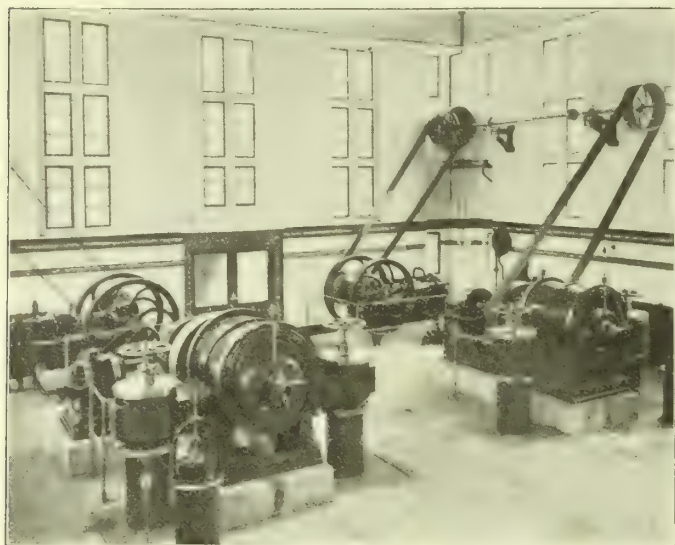
The apparatus in these buildings is arranged for dealing with the gas from two retort-houses; and, generally, the various parts are disposed in two parallel lines from end to end. Most of the apparatus for the two sections has been installed; and for the present it will be available as reserve plant for the one section now at work.

The condensers are of the water-cooled Reutter type, and were made by Messrs. Clapham Bros. Three of the four columns have been erected; and each condenser has a capacity of $1\frac{1}{2}$ million cubic feet per diem.

The exhausting plant has been supplied by the Bryan Donkin Company, Limited. There are at present in position two exhausters of 125,000 cubic feet per hour capacity, driven by 25-horse power shunt-wound motors by means of worm-gearing. In case of any serious interruption of the electric current, two gas-engines have been provided which would drive the exhausting plant by means of belts. Enough space has been left for two further exhausters of the same size. For regulating the speed, the usual type of hydraulic regulator has been employed; but, instead of controlling the throttle-valve of an engine, they make contacts for a pair of solenoids, which, in turn, move an arm over a series of contacts of a resistance in the armature circuit, so varying the speed of the motor.



Coke-Conveyor, with Night Hopper (Small) and Storage Hoppers for Sorted Coke.



Exhausters, Electrically Driven, with Gas-Engine Stand-by.

In the next house two Pelouze tar extractors, and two naphthalene rotary washers have been supplied by the Berlin Anhaltische Maschinenbau Actien-Gesellschaft. The foundation for a third extractor has been put in; and the connections are arranged so that this third one can be worked in place of either of the two now installed, while they are shut off for cleaning. The naphthalene washers are driven by an electric motor to each machine. As the speed reduction for these is so great, it has been effected in two stages—first by machine-cut, double-helical spur-wheels, and then by worm and worm-wheel to the shaft of the washer. All the gearing is totally enclosed, and makes a very neat and compact arrangement. Space has been left in this house for cyanogen washers; but at present this bye product is not being recovered. In the ammonia house, two rotary washer-scrubbers have also been supplied by the Berlin Anhaltische Maschinenbau Actien-Gesellschaft, and accommodation left for a third washer.

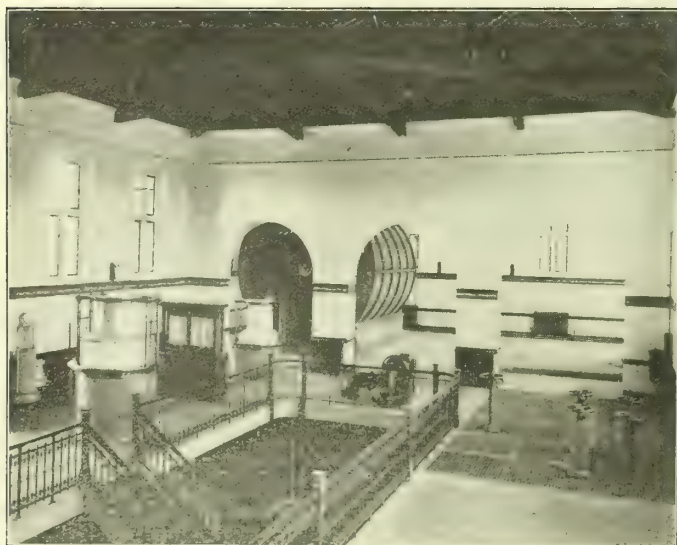
The buildings containing this plant are very commodious and light, and are finished in a style that is not only attractive, but is economical in its upkeep and cleaning. The walls are lined with white-glazed tiles up to the line of the windows, terminating with a coloured frieze. Above the tiles, the walls are plastered and distempered. The open roofs are of varnished pitch-pine; and the floors are laid with buff tiles. All these houses are lit by means of inverted gas-burners on brackets and pendants.

THE PURIFIER-BOXES.

Opposite the range of buildings just described (on the other side of the road) are the purifiers in one of the sheds already on the site. This shed is provided with two 5-ton electric travelling cranes; and, though not a thing of beauty, it answers its purpose. There are four oxide-boxes and two lime-boxes, all 34 ft. 6 in. square by 6 ft. 6 in. deep, with four luteless covers to each. The boxes are filled with "Standard" grids, and are worked by Milbourne valves. The covers are fitted with Milbourne fastenings, and Clapham rubber joints. All of this work was supplied by Messrs. C. & W. Walker. The travelling cranes are used both for lifting the covers, and for filling and emptying the boxes by means of skips.

METER AND GOVERNOR HOUSES.

Immediately after the purifiers, we come to the meter and governor houses. There are two meter-houses with a governor-room between them. The houses are connected right through by



Meter and Governor House, showing Well in Floor for Connections.

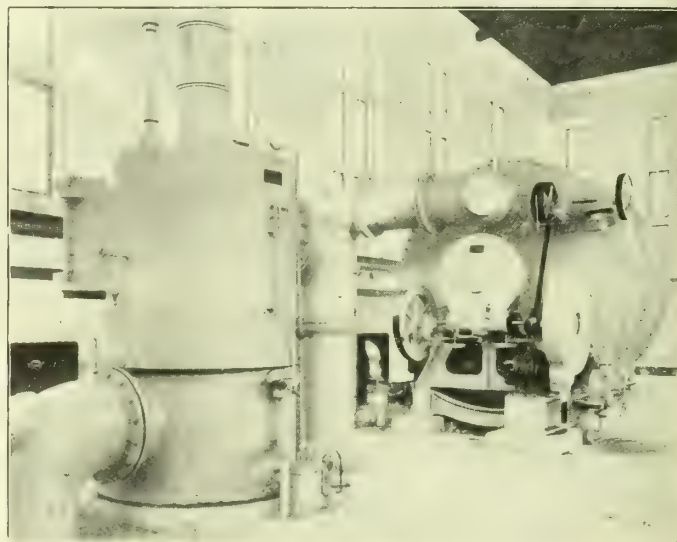
arched openings; and in the governor-room are grouped all the connections and valves (as seen in one of the photographs) for the control of the holders as well as the pressure-raising and "boosting" arrangements.

Each meter-house is designed for two meters of 125,000 cubic feet per hour capacity. One only has been erected at present; and it was supplied from the Imperial Continental Gas Association's own works at Berlin. The meter is in a circular case, as is the usual Continental practice.

The works are connected with the distribution system of Antwerp by means of a 36-inch main; and the pressure therein is controlled by a 30-inch Cowan governor of the deep-seal type. A 24-inch Cowan governor is also installed as a bye-pass, in case of the holder outlet-valves being accidentally shut. The connections to the governors are so arranged that, in time to come, pressure-raising fans can be put in either for supplying the gas at increased pressure, or for sending it direct by means of an independent main to the distributing holders at the older works in Antwerp. Only a small Sturtevant fan is installed at present; and this will ultimately be utilized for transferring gas from holder to holder as required.

The complicated connections which such a system involves are all exposed to view, and made accessible by means of a large open well in the centre of the governor-room—an arrangement which prevents an accumulation of gas such as might occur in an enclosed cellar. The well is surrounded with a handsome balustrade; and there is a staircase giving direct and easy access to the basement floor.

The interior of these houses is similar to that of the apparatus buildings; but the glazed tiling is somewhat more ornamental. On account of the Government regulations which prohibit naked



Tar Extractor and Naphthalene Washer.

lights in a building of this character, it was deemed advisable to light it with electric light.

THE GASHOLDERS.

Two gasholders have been constructed by Messrs. Clayton, Son, and Co., Limited. Each holder has three lifts, and a capacity of 2½ million cubic feet. They are in brick tanks, and have lattice guide-framing. No particular difficulty was met with in the construction of the tanks, as firm clay was found at the foundation level.

VARIED FOUNDATIONS AND THEIR TREATMENT.

Speaking of foundations, it is interesting to note that nearer the river, and in fact for the foundations of all the main buildings, occasional bad and treacherous ground was met with, due partly to an ancient watercourse, and partly to clay excavations at some remote period which had been filled-in with soft material. The top surface of fairly firm ground was not stable enough to support heavy buildings such as the retort-house and coal-store. As soon as this was penetrated, a thick bed was found formed of a mixture of mud, sand, and clay, thoroughly waterlogged, and so soft that it was frequently easier to excavate with a bucket than with a shovel.

After having much difficulty with the foundations of the retort-house and coal-store, a system of concrete cylinders was adopted for the remaining buildings. In many cases, these cylinders had to be sunk to a depth of more than 20 feet before firm clay was reached. The gasholder tanks and other buildings, together with the pier and wharfing, were all carried out by a well-known local contractor, M. G. Van Bergen, of Antwerp.

WORKSHOPS, STORES, &c.

Returning to the old buildings which have been retained near the river, the one next the retort-house has been adapted for workshops and stores. One end has been bricked-off to provide lavatory accommodation and mess-rooms for the yard men and mechanics. Here, again, white glazed tiles have been extensively



Gasholders, each of 2½ Million Cubic Feet Capacity.

used. Numerous wash-basins and showers, with both hot and cold water, have been fitted.

ELECTRICITY GENERATING PLANT.

Next to this building is the electric generating station, in which are two sets of triple expansion marine type engines of 550-horse power each, driving compound wound generators. These sets were part of the equipment of the shipbuilding works. A compound high-speed engine by Bellis and Morcom has since been added, driving a 200 kilowatt shunt-wound generator by the Compagnie Internationale d'Electricité de Liège. This latter set will generally be used for supplying electric power to the gas-works, while the larger units will only be employed when the coaling-crane is in action. Steam is supplied from four Lancashire type boilers, working at 150 lbs. pressure. As in most generating stations, the switchboard is a noticeable feature. There are eight marble panels in the distributing board, and seven for the engines and storage battery. Direct current is supplied at 440 volts. It should be mentioned that the electric generating station is under the direct supervision of Mr. J. W. W. Melhuish, M.I.C.E., of Berlin, who was also consulted as to the electrical work generally.

THE SULPHATE HOUSE.

Next to this plant is the sulphate of ammonia house, for which, again, an old building has been adapted. Two sets of apparatus

have been supplied by Messrs. C. & W. Walker; each set being capable of dealing with 50 tons of liquor per diem.

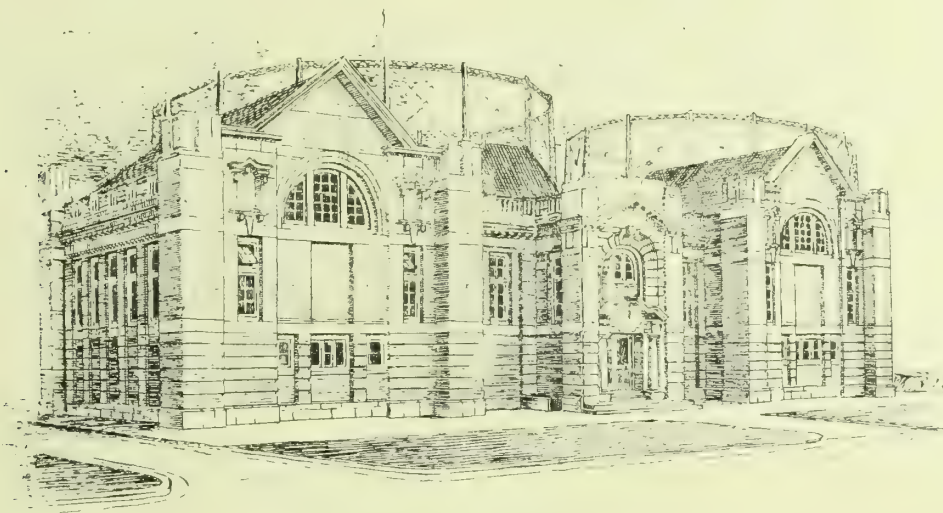
WATER RESERVOIRS, OFFICES, AND LIGHTING.

On the higher ground away from the river, two open reservoirs have been constructed to conserve the water from a stream which flows abundantly in the winter, but which in summer is often nearly dry. The reservoirs have a capacity of 1½ million gallons; and the works are largely dependent on them for the supply of water.

Between the reservoirs and the entrance road, an extensive wooden building has been adapted for offices; a commodious range of rooms being reconstructed on the ground floor.

The roads and general lighting of the works is by means of inverted Graetzin gas-lamps. The pressure employed is about 3 inches; and a good effect is produced.

The new works (which we have shown are of considerable extent, and contain many interesting features) have, in their entirety, been carried out to the design of Messrs. Corbet Woodall and Son, of Palace Chambers, Westminster, S.W. Mr. W. J. Brender à Brandis, the Association's Chief Engineer in Antwerp, shared with Messrs. Woodall and Son the responsibility for the works during construction; the more immediate supervision being undertaken by Mr. E. Ditte, who acted as Resident Engineer.



Hoboken Governor and Meter House.

Sketch by J. FISHER.

The Late Mr. Greville Williams.

The current number of "Nature" contains an appreciation of the late Mr. Greville Williams, F.R.S. (whose death was recorded in the "JOURNAL" for the 21st ult.), by a friend of nearly sixty years' standing. He states that Mr. Greville Williams commenced his professional career as First Assistant to Professor Anderson, of the Glasgow University. After some years spent in research work, he moved to Edinburgh, where he conducted a tutorial class under Dr. Lyon Playfair. From 1857 to 1859, he was Lecturer on Chemistry in the Normal College, Swansea. In 1859, he returned to Glasgow as Chemist in the works of Messrs. Miller, chemical manufacturers. He migrated to Greenford Green in 1863; remaining with Messrs. Perkin until 1868. About this year he entered into partnership with M. Edouard Thomas, at the Star Chemical Works, Brentford; the firm being makers of

coal-tar colours, and subsisting until 1877. Mr. Greville Williams then gave up his connection with manufacturing chemistry, and entered the service of the Gaslight and Coke Company, with whom he remained until 1901, when he retired into the country, and seldom saw any of his old friends and acquaintances. Though in reality a charming companion, with unusual conversational powers, and a keen appreciation of literary and artistic culture, he possessed a very modest and retiring disposition, and became, especially of late years, an almost complete recluse. This debarred him from the continuance of his scientific researches; but during his life he made many interesting discoveries, and has left a considerable record of thoroughly sound work. He contributed a number of papers to the Transactions of the Royal and Chemical Societies, in addition to his articles in the "JOURNAL" and other publications, and in Ure's and Watts's Dictionaries. His chief literary work was "A Handbook of Chemical Manipulation," published in 1857, a supplement to it being brought out in 1879.

THE LIST OF SUCCESSFUL CANDIDATES.

"Gas Engineering" and "Gas Supply" Examinations.

By perseverance and the kind assistance of the several Secretaries of the centres at which the examinations in "Gas Engineering" and "Gas Supply" were held, we have been enabled to get together a fairly complete list of the successful candidates. The acknowledgment should be made that though the City and Guilds of London Institute compelled us to take the circuitous and laborious course that has had to be followed to obtain this list (while they themselves could, as they have courteously hitherto done, have provided a much shorter way, and a way not liable to the same mishaps or deficiencies as is the one compulsorily pursued), Sir Philip Magnus himself kindly supplied the list of the names and addresses of the Secretaries of the centres, and furnished the names of the successful candidates who went direct through the department at Kensington. For such consideration we thank him. Accompanying this are also the names of the Secretaries of the various centres who (though some required stimulating by a second application) have kindly co-operated with

us in compiling the list of successes. The only ones who have not deigned to reply to our communications are the Secretaries at Weymouth and Alloa; and we presume the reason for their silence is that there were no candidates on this occasion in those quarters. Nor could we get from the department of the London County Council concerned in this matter (we regret this, and think it a great pity) a list of the successful candidates who entered the examinations under their auspices. The discouraging and anything but helpful view of the department seems to be that, if it is worth while to publish the names of the successful candidates, they should be supplied by the City and Guilds of London Institute. We agree that the Institute is the proper source of information; but unfortunately the Institute authorities hold other opinions. However, the views of the Institute and of the department of the London County Council do not coincide with those of the gas industry and particularly with those of the candidates themselves. Even now we will gladly supplement the present list with any missing names that the London County Council can supply, if they will do so. We have done our best, and cannot do more; but the absurdity of having to adopt such elaborate means to compile a list of successful candidates is the irritating feature.

In the following lists the number after the names refers to the centres at which the candidates were examined. See opposite page.

GAS ENGINEERING.

HONOURS GRADE.

First Class.

Aitken, Harry A. 334
Ashmole, Gordon. 170
Atley, W. Walker. 286
Ault, Walter S. 257
Barclay, Warren. 170
Batt, Frank. 303
Berry, Arthur G. V. 60
Billingsley, Harold H. 257
Blair, William. 337
Brewer, P. 384
Broadberry, Leonard. 170
Bulien, Arthur E. 36
Carmichael, Thomas. 337
Coombs, Harold A. 75
Cross, Douglas C. 170
Eastwood, Albert I. 123
Elcock, Frank. 257
Green, John. 295
Hartley, Dennis. 289
Hawkyard, W. 124
Hodder, Harry J. 210
Holland, Edward L. 257
Holt, J. E. 124
Jones, Harold. 257
Mackie, Alexander. 330
Mann, Harold C. 170
Marsh, Richard G. 257
Morley, Harry P. 257
Myers, Ernest. 297
Nice, Alma J. L. 60
Pond, H. G. 384
Ranft, John H. 257
Ritchie, Douglas. 210
Rudge, Charles A. 286
Ruthven, Robert H. 444
Scaife, Frank L. 200
Smallman, Spencer. 257
Taylor, George. 123
Webb, Francis S. 170
Whiting, William H. 257
Williams, Samuel J. D. 257
Willsmer, Norrie. 170
Winslow, George. 170

HONOURS GRADE.

Second Class.

Bamforth, Arthur S. 290
Bartlett, Oliver J. 57
Belton, C. M. D. 124
Bolton, Wilfred. 292
Brown, John W. 28
Bryan, William S. 60
Burton, William T. 444
Clarkson, Harry. 286
Fletcher, William. 123
Frisch, Geoffrey. 250
Haynes, George H. 123
Holdroyd, Guy. 272
Jenkins, Edward K. 60
Jones, Isaac J. 60
Kendall, George S. 257
Kimber, O. 384
Mansell, Harry L. 123
May, Harry V. 191
Messenger, Ernest. 290
Messenger, Samuel. 257
Millen, Ralph. 286
Norris, William. 123
Robinson, Albert E. 257
Robinson, Frank C. 257
Sawyer, George. 57
Shepherd, E. C. 384
Simmons, Alexander. 337
Skinner, Frederick. 123
Smith, Morris L. 58
Tayleur, Guy. 78
Waterfield, Edwin W. 170
Watson, Walter J. 123
Wellard, Leonard. 170
White, Osman. 288
Whitehead, Sidney E. 257

Wilkinson, Geoffrey. 113
Wright, Alexander. 337
Wyver, Clifford. 215

ORDINARY GRADE.

First Class.

Allbutt, Victor O. 257
Allen, Henry J. 70
Ames, Arthur F. 124
Arnold, Stanley H. 428
Baker, Harry. 225
Bearne, Paul O. 37
Beynon, Frederick H. 37
Binks, Joseph. 286
Birks, Douglas. 288
Brown, William. 170
Carpenter, George E. 170
Collings, William P. 37
Cook, Thomas R. 123
Craggs, Thomas A. 200
Croxford, Leslie J. 170
Dean, H. W. 124
Dickinson, Harold. 112
Dixon, J. W. 124
Donaldson, John H. 170
Dreaper, William H. 200
Duxbury, R. H. 124
England, Albert A. 170
English, Edgar. 152
Fisher, Jesse. 257
Floyd, C. S. 124
Gorwyn, Cecil L. 37
Grainger, James E. 60
Harding, G. 124
Herrick, H. D. 257
Hill, E. 124
Hilson, John G. 170
Hodgson, H. W. 123
Hole, George. 170
Holliday, James E. 292
Howard, Charles. 83
Howell, Albert. 123
Jeffrey, J. S. 124
Jeffreys, J. S. 170
Jones, Evan J. 70
Kennedy, F. J. 124
Keywood, William T. 250
Lacy, John. 78
Luxon, Reginald G. 31
M'Donald, Arthur T. 337
Newbery, H. A. 257
Newman, H. S. 124
Ostler, Peter. 334
Page, James L. 170
Parsons, B. F. 257
Partridge, Henry. 170
Pickford, G. W. 124
Poulson, T. H. 257
Priest, Francis R. 170
Rogerson, William. 124
Russell, Robert. 334
Savage, William J. 257
Shearer, Robert W. 337
Smith, J. H. 288
Stapleton, Frank W. 60
Triggs, John S. 123
Ward, Cyril G. 257
Weston, Ronald A. 191
Williams, George B. 444
Winslow, Alfred D. 170
Withers, George E. 60
Woolnough, Ernest. 58

ORDINARY GRADE.

Second Class.

Alford, Arthur N. 170
Bostock, Clifford. 124
Brown, John W. 200
Buckland, Charles. 60
Buckwell, David. 57
Buxton, Arthur T. 28
Caudwell, Frank. 170
Clark, William H. 170
Conn, Thomas. 371

Cox, Frank E. 257
Craig, John W. 337
Elsby, Ralph W. 210
Graty, J. L. 124
Green, Frederick. 124
Griffiths, Herbert. 124
Hearn, John. 334
Henn, Karl. 257
Hidderley, F. 124
Hodgson, John W. 372
Holcombe, W. E. 206
Holloway, Howard E. 78
Howard, William C. 170
Hughes, Tom. 206
Johnson, Stanley B. 291
Kearney, John. 123
King, Walter G. 176
Knowles, Alexander. 381
Larkin, Leslie. 170
Marshall, William J. 123
M'Donald, C. J. 124
Mitchell, Norman S. 372
Noden, Tom J. 215
Ordish, John W. 257
Parsons, Edward. 170
Peel, Fred. 288
Philpot, Herbert. 432
Prentis, Arthur E. 170
Price, Robert. 257
Proctor, William C. A. 176
Pykett, Frederick. 272
Richardson, Percy. 272
Rosser, Bert. 70
Ruggles, C. G. 2
Samuels, Edward. 37
Searle, John A. 78
Simmonds, Vernon. 176
Snook, Walter. 170
Taylor, Albert Cecil. 120
Whitney, Alfred C. 257
Wilkinson, Charles J. 291
Wright, Stuart P. 257
Wyman, Reginald L. 5

GAS SUPPLY.

HONOURS GRADE.

First Class.

Ablett, Ernest. 292
Ault, Walter S. 257
Briggs, F. C. 372
Cardwell, Frank. 170
Cross, Douglas C. 170
Eastwood, Albert I. 123
Elliott, George H. 291
Holdsworth, Charles E. 291
Jones, George B. 288
Lang, J. 288
Luxon, Reginald G. 31
Marsh, Richard G. 257
Nuttall, Lawrence W. 81
Pepper, G. J.
Ranft, John H. 257
Roper, J. W. 288
Rosevear, Charles E. 170
Simmons, Alexander. 337
Townsend, Charles V. 292
Townsend, jun., Harry. 292
Twist, George. 297
Winslow, George. 170

HONOURS GRADE.

Second Class.

Batty, T. E. 297
Berry, E. J.
Birks, Douglas. 288
Bridge, J. 124
Broadbent, A.
Bullen, Arthur E. 36
Chandler, Samuel B. 444
Chapman, Lambert. 34
Clarkson, Harry. 292
Cotton, John. 291
Dees, William J. 444
Elcock, Frank. 257

Franks, John W. 257
Frisch, Geoffrey. 250
Harding, Herbert J. 123
Harrison, Thomas W. 190
Helden, Robert. 444
Highmore, Joseph G. 444
Hill, Alfred. 257
Hodder, Harry J. 210
Hughes, George H. G. 27
Jackson, William. 81
Kennington, John. 291
Lea, H. W. 124
Lloyd, Alfred E. 27
Mansell, Harry L. 123
Noon, E. H.
Pawson, Geoffrey. 34
Roberts, Victor C. W. 413
Robson, David E. 34
Simmons, Samuel W. 123
Skinner, Frederick. 123
Smallman, Spencer. 257
Wheeler, Percival. 166
Whitehorne, Arthur G. 251
Williams, Samuel J. D. 257

ORDINARY GRADE.
First Class.

Allbut, Victor O. 257
Ardron, F. C. 290
Balmforth, J. 410
Berry, Arthur G. V. 60
Bridgland, Alfred H. 166
Chamberlain, John B. 190
Chant, Arthur G. 166
Conn, Thomas. 371
Cook, Thomas R. 123
Corfield, Horace V. 166
Crowther, George. 123
Dreaper, William H. 200
Duxbury, R. H. 124
Dyson, Thomas. 290
Farr, W.
Forbes, Edward. 337
Gedge, Harold C. 159
Godden, Theophilus. 123
Gorwyn, Cecil L. 37
Green, Frederick. 124
Harris, William E. 444
Heffernan, John. 444
Hill, E. 124
Jeffreys, J. S. 170
Jones, Evan J. 70
Kay, Archibald. 337
Kennedy, F. J. 124
Kent, Archibald. 191

King, Edgar. 81
Lockey, Alfred E. 200
M'Lean, Benjamin F. 23
Mercer, Thomas. 166
Morley, Harry P. 257
Munro, James R. 27
Ostler, Peter. 334
Parsons, Edward. 444
Poulson, Thomas H. 257
Pykett, Frederick. 272
Reed, William B. 444
Robertson, R. 206
Rodgers, George H. 444
Rogers, Robert E. 123
Schofield, T. 290
Shackleton, Edward. 190
Shearer, Robert W. 337
Sinclair, Robert E.
Southworth, John. 123
Taylor, G. L. 288
Tilson, Hedley V. 190
Turner, A. G.
Vaughan, Albert W. 444
Walters, Bert H. 444
Webb, Francis S. 170
Whiting, William H. 257
Willison, Harold. 166

ORDINARY GRADE.
Second Class.

Aitken, Moses N.
Alford, Richard T. 444
Ames, Arthur F. 124
Bartlett, H. J. 186
Bevis, James. 444
Blake, Alfred J. 152
Bradford, Alfred H. 444
Bullwinkle, G. R. 186
Campbell, Albert. 123
Chapman, W. A. 182
Clark, F. 206
Clubley, Charles. 291
Cogger, Sydney. 444
Coggin, Lionel H. 444
Cooke, Arthur. 291
Cooper, John A. R. 370
Cox, Frank E. 257
Crowther, Bertram. 123
Cullington, Alfred D. 90
Curtis, George. 3
Dixon, J. W. 124
Doidge, Percy J. 37
Dolan, William.
Fiddes, H. F. 206
Foster, John W. 37
Graty, J. L. 124

Hamer, Frederick M. 37
Hearn, John. 334
Henn, Karl. 257
Holliday, James E. 292
Holroyd, J. W. 290
Horne, Sidney. 291
James, William H. 37
Jennings, Alfred T. 444
Johnson, Oswald. 27
Johnson, Stanley B. 291
Kerridge, Herbert W. 233
Langford, Harold M. 444
Lloyd, Edward. 27
Loftus, Leonard. 27
Lucas, Arthur A. 272
Luck, James A. 444
M'Donald, C. J. 124
M'Gregor, Robert B. L. 444
Mansfield, C. F. 37
Marshall, William J. 123.
Miller, Alfred. 291
Moulder, James J. 444
Nicholson, William E. 444
Owen, Herbert. 27
Page, Edward I. 206
Peel, Fred. 288
Pierce, Edward J. J. 27
Pocock, James W. 444
Priest, William C. 166
Quelch, Stephen J. 444
Roberts, Albert. 27
Roberts, Arthur B. 444
Rosser, Bert. 70
Sanders, Charles F. 159
Sanderson, William. 272
Savage, William J. 257
Sawbridge, G. T. 297
Seyssert, Alfred M. 444
Smith, Albert S. 206
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444	Offices of the City and Guilds Department of Technology, Exhibition Road, Kensington, W.

Mr. T. E. Cumming, of Ilford, has been appointed to the position of Chief Clerk to the Cheltenham Gas Company, as recently advertised in our pages.

Mr. I. Hooper, who has resigned the position of Water Inspector to the Corporation of Dorchester, recently entertained the employees at supper. In the course of the subsequent proceedings, he was presented with an easy-chair, in token of the respect and esteem in which he was held; and he expressed his thanks in an appreciative response.

We are pleased to learn, from an announcement in the "London Gazette" last Friday, that His Majesty the King has appointed Sir William Crookes to the "Order of Merit." Sir William has on three occasions received the medals of the Royal Society, of which he is the Secretary, and has been President of the British Association and the Chemical Society. In collaboration with Sir James Dewar, he for some years made analyses of the water supplied to London by the late Water Companies; the results being published monthly.

EXAMINATION IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

[SECOND ARTICLE.]

6 (A). In practice, bunsen flames with luminous tips are met with. Give three cases, explaining in each the cause and the remedy to be applied.

(1) An upright incandescent burner flame with an insufficient supply of primary air will become luminous at the tips. The remedy is, therefore, to open the air-ports until the yellow tip disappears.

(2) When the gauze in an upright incandescent burner has become almost choked with particles of dust and fibre, the gas is impeded and its velocity diminished, with consequent reduction of suction on the primary air inlets. Then the flame burning with an insufficient supply of primary air is partly luminous. The remedy is to dismantle the burner and clean the gauze. A similar cause frequently produces a white flame above the bunsens of stand gas-irons.

(3) When an inverted burner has the products of combustion commingling with the primary air supply, the yellow tipped flame is very noticeable. The remedy is to fix a deflector to the burner in order that the products may be directed away from the primary air inlets.

6 (B). How is efficiency best secured in the construction and use of (a) top burners of gas-cookers, (b) gas-irons? State the proportion of primary air to gas in a well-constructed bunsen, and the essentials of a good flame.

(a) The mixing-tube should be of sufficient length to ensure thorough mixing of gas and air, smooth inside, and either straight in the bore or formed in two cones on the Venturi principle. The bunsen holes must be of a size and number to give the same length of flame from each hole. If the holes are too large, the flames will be different lengths. The primary-air inlets should be divided round the gas jet or jets to assist the mixing. The nipple must be drilled perfectly true with the axis of the bunsen tube, and tapered from inlet to outlet. It must also be placed concentric with the bunsen tube. The nipple perforation should be round, and have no abrasions on the edges. The bars over the burner should offer as little resistance as possible to the flames, and should be situated about $1\frac{1}{2}$ inches above the burner, unless the holes are drilled on the top. The burners should be kept clean by taking out, boiling frequently, and drying. As it is not absolutely necessary for the oven or top burners to be noiseless, it is preferable to admit a greater proportion of primary air than in incandescent burners; thus obtaining a shorter and hotter flame—the Venturi tube, mentioned above, being excellently devised to this end. It is also important that the flame, particularly the inner cone, should not come into contact with any cold surface. A cooling of the inner cone will produce carbon monoxide and an offensive odour. This should be tested by placing a kettle of water over the burners when the tap is full on.

(b) With a gas-iron the points enumerated above with regard to cleanliness of the burner also apply. A gas-iron is used almost continually under the nose of the user, and any offensive odours not only indicate incomplete combustion, but result in a mistaken condemnation of gas-irons. The bunsen flame should be at such an angle that the underside of the flame only just touches the metal bottom of the iron. The flame should not roar (denoting excess of primary air), or the to and fro motion of the ironing may cause back-firing. The handle should be protected by a metal shield brightly polished on the underside to reflect the heat, and thus keep the hand as cool as possible; and it should be composed of non-conducting material (usually hard wood). The flue outlet should be large enough to effectually carry off the whole of the products and prevent partial smothering of the flame inside. The secondary-air port should be sufficiently large to allow a slight excess of air to the flame, even at the risk of slightly diminishing the temperature of the combustion chamber. The flue outlet should be carried up a few inches and then bent over at right angles, and turned to the right side of the iron, so that the products are not checked in their outward progress by the to and fro motion, nor emitted into the face of a right-hand user.

The proportion of primary air in a bunsen flame is about 3 volumes of air to 1 of coal gas; the proportion being less when mixed with water gas. In a well-constructed bunsen burner, the gas and air must be adjusted so as to give a violet blue tint in the zones of the flame. The flame should be as solid and steady as possible, with a minimum of noise.

7 (A). State concisely the construction of ordinary types of (a) flat-flame, (b) argand, and (c) regenerative gas-burners.

(a) Ordinary flat-flame burners usually consist of a brass case with an enamel head; the shape of the enamel depending upon the type of burner. In a fishtail burner, the gas issues from two channels drilled in the enamel at an angle a little greater than 45 degrees, the size of these channels depending upon the quality of gas to be consumed. The two jets of gas impinge against each other, and when lit the flame spreads out in the form of a fishtail. Each burner is fitted internally with a muslin screen, which causes an even flow of gas.

The batwing burner (fig. 7), so named from the shape of the flame obtained, has a hollow dome-shaped enamel top. Across this a narrow slit is cut; the size depending upon the quality of gas to be consumed. This burner requires less pressure than the fishtail type. In other respects, the construction is similar.

(b) The "London" argand burner (fig. 8) consists of a chamber annular in form and made of steatite. It is provided with three



Fig. 7.



Fig. 8.



Fig. 9.

tubes, which communicate with the interior of the chamber and the gas supply. The top of the chamber is perforated with small holes, 24 in number, from which the gas issues, forming, when lit, a cylindrical sheet of flame. Supported on a gallery attached to the lower portion of the burner is a glass chimney, which surrounds both chamber and flame. This induces a supply of air on the surface of the flame, and protects it from air currents. A metal cone is placed between the chimney and the burner holes, to further deflect the air supply upon the surface of the flame. The burner is so constructed that the gas issues from the burner holes at less pressure than that at which it enters the burner. This is done by making the combined sectional area of the three supply tubes less than the combined area of the burner holes from which the gas issues. The air supply to an argand burner is usually regulated by the chimney.

(c) The principle of a regenerative burner is that the air and gas are heated by the products of combustion before reaching the point where they are burnt. The "Wenham" gas-lamp (fig. 9) is a good type. The air enters the lamp at A and passes through a series of channels F F and G G, around which the products of combustion are made to pass. Also, the gas-fed B passes through the chamber C, up which the products of combustion travel to the outlet. The glass bowl D is sealed perfectly tight at E, so that all air for combustion enters at A.

Regenerative lamps are used extensively as an aid to ventilation; thus making use of the fact that the combustion of gas induces an upward current of air. If the lamp is fixed in the centre of a perforated ceiling, large volumes of air will be drawn from the room into the ventilating shaft.

7 (B). In the maintenance of incandescent burners (inverted and upturned) what are the points to be observed to secure a low mantle account without sacrificing efficiency?

(1). Only good quality mantles should be purchased.

(2). A good type of burner with gas and air adjuster should be adopted.

(3). Periodical inspection of burners should take place.

(4). If burners are subject to any vibration, anti-vibrators should be attached.

(5). Suitable glassware, Jena quality, should be used to protect mantles from draughts.

(6). The flame should be adjusted to suit the quality and pressure of gas before the mantle is put on.

(7). In upturned burners correct size of rod should be used and be firmly fixed.

(8). Bye-passes should be so fixed as not to produce deposit of carbon on mantle.

(9). In outside shop or public lamps, the best type of wind-proof lantern should always be employed, with flashlight or else some auto-lighting arrangement.

8. Describe the operation of starting a gas-engine, including the regulation of gas into the cylinder after the engine has been "overhauled." Which form of ignition tube do you consider most satisfactory, and why?

[Do not attempt to start a gas-engine when it is connected to a load, unless it has a powerful starter.]

First light the bunsen, which heats the ignition tube. If electric ignition, disconnect the wire and try sparking. Then oil the engine, thoroughly filling every cup, and open the oil-cups which cannot be reached when engine is running.

The starting cam should then be set to start, or else the relief cock opened, as the case may be. The gas-valve is opened one-third the opening used when running, usually at a point on the gas-valve dial marked "start." The fly-wheel is then turned in the running direction until the engine takes up the cycle—i.e., until an explosion is obtained. Then the operator should immediately take hold of the gas-valve handle and open gradually to the running position as the engine increases in speed. If the valve is opened too quickly, too rich a mixture will be obtained, with failure to produce ignition, and consequent stoppage of the engine. While the gas-valve is being opened, the relief cock should be closed, or the starting levers thrown into the running position. When the engine has reached full speed, the load may be coupled, the remaining oil cups opened, and the water supply started to the water jacket.

To obtain proper regulation of the mixture into cylinder, an indicator diagram should be taken. This will show whether a weak mixture is being obtained or not, in which case the gas-valve should be adjusted accordingly.

The best form of ignition tube is made of nickel alloy. These will last, with ordinary care, from 6 to 18 months, according to the amount of work the engine has to perform; but they are expensive in the first instance. Porcelain tubes are much cheaper, and with care will last a few weeks.

9. Describe the following: (a) Anti-pulsator; (b) adjustable die stock; (c) service-cleanser; (d) expansion gas-main joint (with sketch); and (e) the operation of making a gas-main joint with lead wool.

(a) An anti-pulsator (fig. 10) is a flexible bag fixed between a gas-engine and the meter which supplies same. It consists of a sheet of india-rubber $\frac{1}{8}$ -inch thick, B, secured to a cast-iron frame A A. To the centre of B is attached a rod C, which is slotted as shown. D is the outlet to the engine, and E the inlet from the meter. The gas enters at E and passes through the slot in C; thus causing the diaphragm to expand, carrying with it the rod C until the enlarged portion F at the end closes the gas-way G. When the engine draws gas at D, the diaphragm collapses, and opens G to the gas supply.

The object of the anti-pulsator is to guard against pulsations of the engine causing fluctua-

tions of pressure in the main with jumping lights and unequal supplies to other consumers.

(b) An adjustable die stock consists of an outer frame into which dies in halves may be inserted on triangular projections fixed on the frame. The dies are secured, as shown in fig. 11, by a screw A.

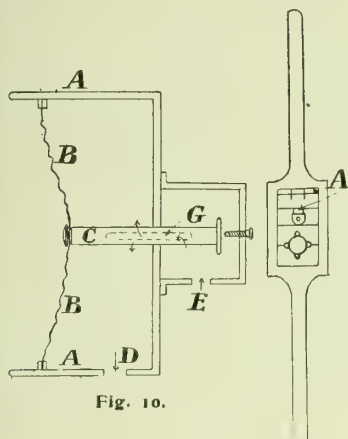


Fig. 10.

Fig. 11.

into the socket. Yarn is then inserted into the aperture between the two, and driven in with a yarning iron. The lead wool is now inserted in lengths of about the same diameter as the pipe, each being well caulked up with suitable setts and caulking tools. In this way, a sound joint is made.

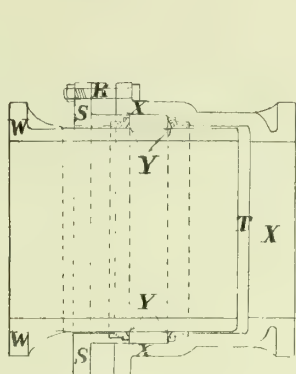


Fig. 12.

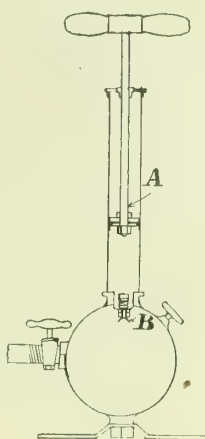


Fig. 13.

(c) One form of service-cleanser is shown in the sketch. The plunger A works in a cylindrical case, and consists chiefly of a leather cup, rod, and handle. The cup is so constructed as to permit air to easily pass it as the plunger is withdrawn, but is pressed tightly against the sides when the rod is forced downwards. The compression chamber is kept tight by the valve B opening in a downward direction, as shown. The plug in the compression chamber may be withdrawn, if desired, for the purpose of inserting a solvent for clearing out deposits of naphthalene.

(d) Piggott's expansion joint is a good type. X is a flange and socket piece, in which the movement owing to expansion or contraction takes place. W is a flange and spigot piece, which slides into the socket X. The packing rings Y are used to make the joint gas-tight. An angular collar S fits loosely on the spigot piece W, sliding easily into the socket piece. The bolts R are tightened up; thus bringing pressure upon the packing rings and making a good joint. A space T must be left between the socket and spigot, to allow for any movement of the pipes.

(e) A lead-wool joint is made as follows: The socket and spigot of the two pipes are first of all well cleaned, and the spigot driven home

It is important to caulk up the lead wool in sections, and not first of all fill the joint before caulking.

10. What are the common difficulties encountered in fixing brackets for outside shop suspension lamps, and the conditions which govern the position of such lamps? Describe, with the aid of sketch or sketches, the operation of attaching a shop suspension lamp to the masonry above a window casement, and state the tools and fittings required to complete the work.

The common difficulties encountered are:

- (1). Shop sun blinds being in the way.
- (2). Condition of wall, masonry, &c., to which it is to be attached.
- (3). Name board of shop may be in the way.
- (4). Iron beams or joists.
- (5). Position of supply pipe to feed lamp.
- (6). Sometimes difficult to get lamp at required height above pavement.

The conditions governing the position are as follows:—

- (1). Type of shop to be illuminated.
- (2). Position, shape, and number of windows to be illuminated.

(3). Lamps must be neat, and fixed to attain their object without being injurious to the eyes of customers or unduly attracting notice.

(4). They must conform in height from the ground, &c., to bye-laws of local authority.

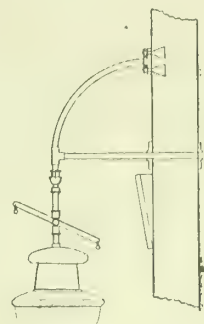


Fig. 14.

To fix a lamp, two square holes, from 2 to 3 inches deep, must be cut in the masonry above the shop casement; the holes being cut out rather larger inside than at the front, the latter being just large enough to admit the ends of two rag or Lewis bolts. It is better to use Lewis bolts, because, in the event of the lamp being removed, they are easier to take out. But, on the other hand, more skill is required in cutting the holes. The bolts are inserted, the opening covered with clay, and molten lead run in until the space is filled. The lead is caulked up, and all superfluous pieces chipped off. An iron plate, with two holes provided for bolts and a socket-piece projected from the centre, is fitted over the bolts and secured with nuts. A bend to the required shape is made out of steam tube and screwed into the socket on an iron plate. A tee is attached to the bottom of this; one branch receiving the gas-supply pipe, and the other outlet being connected to the lamp with cup-and-ball joint. The gas-supply pipe is brought through the wall to the tee, and secured with back-nuts or plates screwed to the woodwork. In addition to supplying the lamp with gas, this acts as a stiffener in the supporting arrangement.

The tools and fittings required will be the following. Tools: footprints, hammer, chisels, drill, ladle, pan, and furnace for melting lead, pipe wrenches, brace and bit (probably), caulking tools, white lead. Fittings: steam tubing, tees, connector, cup-and-ball joint, iron plate, rag or Lewis bolts and nuts, lead bend (as in sketch), and back-nuts.

THE EXTRACTION OF NAPHTHALENE BY WATER GAS TAR.

By G. M. GILL.

THIS article is written, not with the idea of putting forward any new method of extracting naphthalene from gas, but merely to record a few facts experienced in the removal of this impurity by the use of carburetted water gas tar. It is now eighteen months since the writer first adopted this method of extraction; and he is indebted to Mr. H. O. Carr, the Chief Engineer of the Wandsworth and Putney Gaslight and Coke Company, for suggesting its use and for supplying various details.

For some years past a number of gas engineers, to judge from data published in the Technical Press, have obtained by this means relief from this fickle hydrocarbon; the only difference in the method of its use being that some wash the gas while still hot and others when cold. But in any case, whether used hot or cold, it has in all cases given a good account of itself, though the few grains left in the gas after washing have been the cause of inducing some to use further solvent to extract the remainder of the naphthalene from the gas.

CAUSE OF DEPOSITION.

It is undoubtedly a fact that, in districts where a mixture of coal gas and carburetted water gas is supplied, the trouble from the deposition of naphthalene is not nearly so acute as in districts where the former only is supplied. It is, too, well known that under certain conditions naphthalene is very readily deposited; sudden cooling of the gas being one which is specially conducive to such deposition. It would probably be impossible to find another district situated similarly to that supplied by the Wapping Gas-Works, which is itself built on an island, and must perforce supply gas in mains either over or under water. In this case the trunk mains, of which there are three, are laid under waterways,

in which position the effect caused by sudden cooling is given the fullest play.

CLEARANCE OF MAINS.

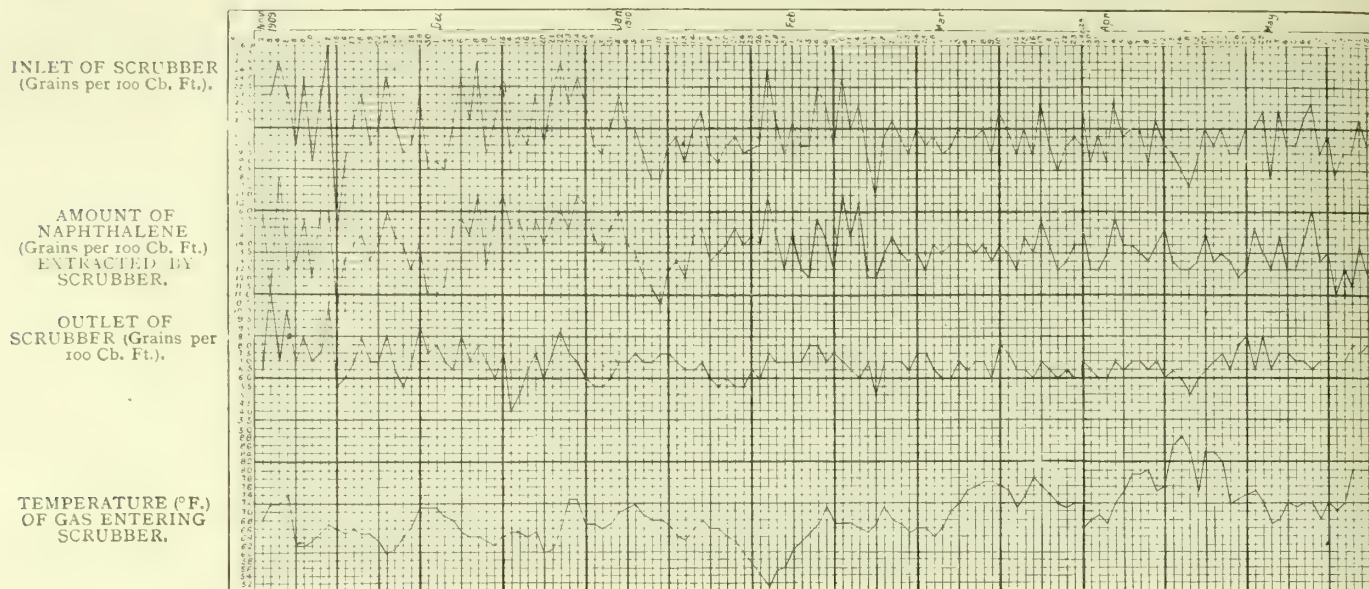
The result of this peculiarly unfortunate position (as regards deposition of naphthalene) was that considerable quantities of this deposit had every few months to be removed by some means. An excellent temporary method was to steam the main thoroughly (steam being supplied by a portable boiler), at the same time vaporizing a quantity of spirit—the two being forced into the main under pressure for a number of hours. After this process, the main would continue to supply the required quantity of gas until again blocked.

Before proceeding further, it will be advisable to describe a method by which a quantity of naphthalene was easily removed from two mains which were partially choked. A syphon cart was filled with gas oil (as used for carburetted water gas manufacture), which was then raised to a high temperature by means of a steam-pipe submerged in the tank. The hot gas oil was then run through a 2-inch hose pipe into the main at the highest point of the part to be cleared, and was pumped out saturated with naphthalene as soon as it appeared at the syphon. At first it would take quite 24 hours to run down; but the process was continued until the oil flowed down almost as quickly as one could walk. This proved that the main was, to all intents and purposes, quite clear.

METHOD OF EXTRACTION.

To extract the naphthalene from the gas, an ordinary tower scrubber, 35 feet high by 20 feet in diameter, filled with coke and fourth in a series of five (two of which are split) is used. A quantity of about 700 gallons of tar is kept in circulation by an Evans "Reliable" pump. This quantity of tar is used for seven days without change, to wash about 17 million cubic feet of coal gas, after which time the tar shows signs of throwing off into the gas naphthalene that was already extracted. The speed of the pump is automatically regulated by a steam-valve operated by a rod attached to a float in the suction-tank. This was fitted owing to a difficulty in properly adjusting the pump.

For many months only one naphthalene test was taken daily,



and that on the outlet of the scrubber. The tests showed that the gas on the outlet contained naphthalene amounting to from 4 to 11 grains per 100 cubic feet. Since November of last year it has been our practice to test the gas for naphthalene both on the inlet and outlet; and these tests support the statement that water-gas tar is fairly efficient when used for this purpose.

EFFICIENCY OF THE SCRUBBER.

To deal in some detail with the above diagram it will be noticed that about two-thirds of the naphthalene has been consistently extracted. It will also be observed that on days when more naphthalene was found present in the gas more was extracted by the tar than on days when there was a less quantity. For instance, on all the occasions when 22·5 grains or more per 1000 cubic feet were found on the inlet, an average of 15·9 grains were extracted; while on the days when 19·5 grains or less were present, an average of 12·5 grains only was removed by the tar. If the two top lines of the diagram are closely compared, it will be seen that the naphthalene on the inlet and the naphthalene extracted invariably fluctuate concurrently with each other. So, too, does the naphthalene in the gas on the outlet, though to a much smaller extent.

EFFECT OF TEMPERATURE.

It would appear that the temperature of the gas on the inlet to the extractor, as shown in the bottom line of the diagram, has no bearing on the efficiency of the washing process. It will be seen that the temperature varied from a minimum of 52° Fahr. to a maximum of 88° Fahr. without the gas on the outlet or the amount extracted showing any great variation. Thus it would be inferred that the question of temperature might be safely ignored. But the writer cannot go so far as to make such a statement, as during last summer it was found that as the temperature of the gas rose above 70° Fahr., so did the naphthalene in the gas on the outlet. It is evident that, to account for this discrepancy, there must be some difference in the conditions under which the gas was extracted last summer and during the past few months, as in both cases the temperature of the gas has not exceeded 89° Fahr.

That the efficiency of the washer was reduced when the temperature of the gas on the inlet rose above 70° Fahr. may be due to the fact that above this temperature considerable condensation takes place in the washer—diluting the tar with ammoniacal liquor, and reducing its efficiency. Lately it has been our practice to separate this liquor, and run it off regularly—thus maintaining the tar in its proper state. Last summer this point had not been discovered; and it is to this fact that the writer attributes the recent non-variation of the naphthalene on the outlet in face of considerable variations in the temperature.

CONDITIONS FOR MAXIMUM EFFICIENCY.

As to the efficiency of water-gas tar as a naphthalene extractor, it is quite conceivable that under the best conditions a larger proportion than two-thirds of the naphthalene might be removed. It is obvious that many factors would cause variation in the efficiency, such as the washing area and its condition, the capacity of the pump circulating the tar, the state of the tar as regards freedom from liquor, the quality of the tar, and the aforementioned question of temperature. All these details need confirmation by experience before definite statements can be made. It is in any case obvious that the washing area, and the circulation of tar per 1000 cubic feet of gas should be as great as possible, and that the tar should be practically free from liquor. It is quite probable that the conditions under which the writer has carried out the extraction may not be as favourable as is required for maximum efficiency.

One of the chief advantages in using water-gas tar (in works making carburetted water gas) lies in the fact that the extraction is really carried out at next to no cost. It is only necessary to

set aside part of the washing or scrubbing plant, which in our case is about one-fourth of the whole. If this cannot be spared it does, of course, entail some expenditure on new plant. The cost of working it is, however, infinitesimal; for the amount of labour involved may be disregarded, and the raw material is at hand ready for use. Its adoption for this purpose not only does not cost anything, but the naphthalene extracted actually increases the quantity of tar, and is sold as such.

RESULT OF EXTRACTION.

Ever since the naphthalene was first extracted, various parts of the plant, and especially the inlet and outlets of the meters, have been kept entirely free from this deposit; whereas before it was a daily task to clear certain parts.

The effect on the district mains has been a gradual disappearance of the naphthalene. Mains which before were partially choked have become quite free from it, and those situated in the worst positions (under docks) have not required any attention whatever since the gas has been washed. The effect on the services has not been so satisfactory as that on the mains, although there has been some improvement. The writer attributes this to the fact that the gas containing so small a quantity of naphthalene has absorbed some of that lying in the mains, and has carried it on to deposit it in some service. That the gas has absorbed much of the naphthalene from the mains is certain, as otherwise where has the naphthalene disappeared to, and what could be more probable than that the gas passing into a service pipe, situated in a colder position than the main supplying it, would here deposit part of that which was absorbed. For this reason, it is quite probable that where naphthalene is extracted for the first time at least two years may elapse before the district mains and services become wholly free from its presence.

[In a future article, the writer proposes to deal more fully with some of the details involved in the extraction of naphthalene by this means.]

The Life of a Gas-Meter.—The question is sometimes raised as to the life of an ordinary meter. Messrs. Thomas Glover and Co. have just had returned to them for examination a meter which has been in constant use since 1869 (a period of 41 years), and has been tested and stamped "correct" by the Middlesex County Council. This meter has never been repaired during the long period named.

Society of Chemical Industry.—At the annual meeting of the Society, held in Glasgow last Wednesday, Mr. Thomas Tyrer, the Hon. Treasurer, was presented with the Society's medal, in recognition of his distinguished services to chemical industry. The General Secretary (Mr. C. G. Cresswell) submitted the Council's report, which showed that the number of members on the register was 4299. The new President is Mr. Walter F. Reid.

Waste Gases.—It is interesting to note (says the "Journal of the Society of Arts") the progress that is being made in Germany with regard to the proposal to supply the towns with the waste gases from coke-ovens. The Essen Town Council are discussing the advisability of accepting the offer of the Rhenish Westphalian Electrical Company to supply them with gas. A similar offer has been made to the Municipalities of Solingen, Wald, Grafrath, Pemscheid, and Lennep; and a Special Committee is to be appointed from the Councils of these towns to go into the matter. The gas will be derived from the coke-ovens in connection with the Stinnes mines, and supplied at 2½ pf. per cubic metre (say 9d. per 1000 cubic feet). Barmen and Mülheim-on-Ruhr have already entered into a similar agreement with Thyssen and Co.; and Bochum has accepted proposals from the Krupp Company.

KÖNIGSBERG GAS-WORKS.

(Concluded from p. 32.)

Comparison of the Different Methods of Making Gas.

THE descriptive account of the development of the Königsberg Gas-Works, which was presented to the members of the German Association of Gas and Water Engineers on the occasion of the annual meeting at Königsberg last month, contains a table showing the comparative cost in capital expenditure, labour, fuel consumption, and area of land occupied, of the different types of gas-making plant which have been tried at the Königsberg Gas-Works. This table is here reproduced, subject to the conversion of the metric measures, &c., into English.

The remainder of the descriptive account is chiefly devoted to figures relating to the industrial development of the gas undertaking. This is divided into two periods—viz., from the construction of the first gas-works in 1852 to the construction of the new gas-works in 1902, and from 1902 to the end of last year. At first the gas undertaking was credited with 10,000 thalers for the gas supplied for public lighting; but since 1862 the gas has been supplied for public lighting gratis. In addition to this free supply of gas, the Corporation have benefited from the gas undertaking by surpluses which have varied from year to year. In 1869, a reserve fund was created; and in 1878 to 1881, 20 per cent. of the profit of the undertaking was placed to reserve. The site of the old gas-works was disposed of about 1902 for building purposes at a considerable profit, which was applied in part-payment of the cost of construction of the new works. Since 1902, when the new

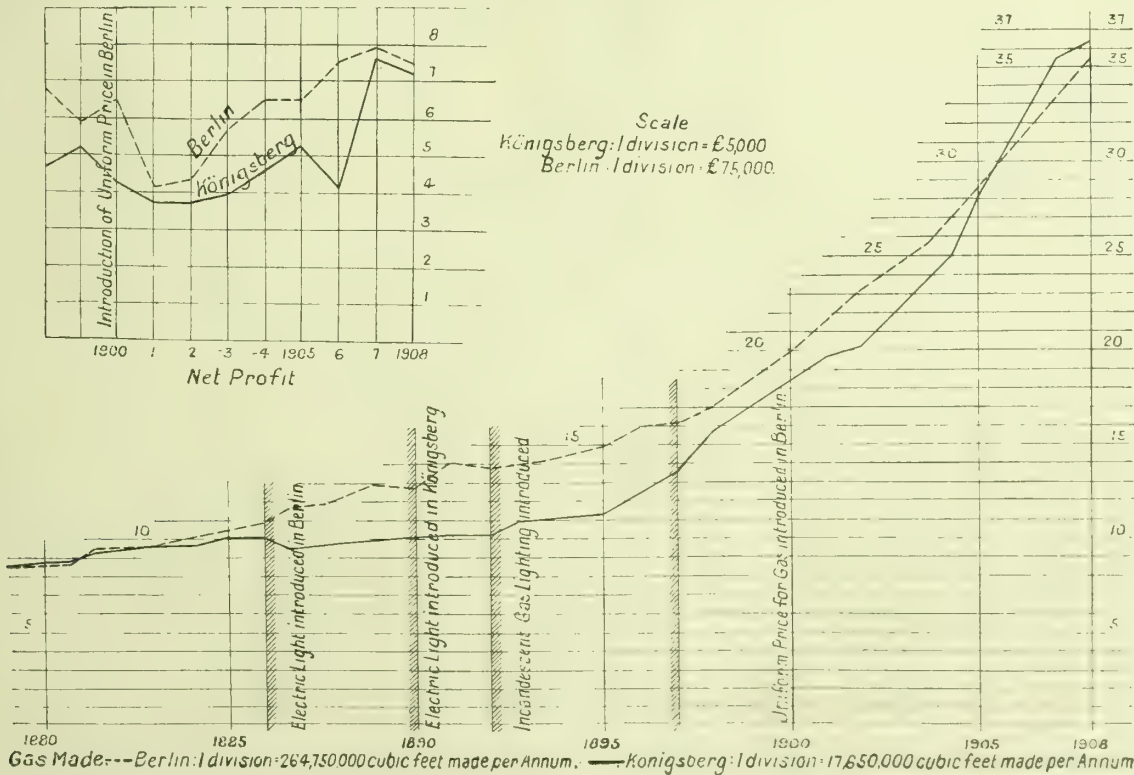
COMPARATIVE FIGURES FOR DIFFERENT TYPES OF GAS-MAKING PLANT.

	Direct-Fired Settings of Seven Horizontal Retorts (1902).	Settings of Nine Inclined Retorts (1902).	Settings of Four Large Inclined Chambers (1908-9).	Water-Gas Plant (1898).	Water-Gas Plant (1906).	
					Simple Water Gas.	Carburetted Water Gas.
Number of units	32 settings	24 settings	6 settings	2 generators	2 generators	1 generator
Make per 24 hours (cubic feet)	1,356,000	2,119,000	1,589,000	466,000	777,000	706,000
Make per 24 hours per 100 square feet of area of ground covered by buildings and plant (cubic feet)	10,827	12,102*	19,174	27,340	100,248	90,245
Number of shifts per day and duration	Two (eight hours)	Three (eight hours)	One (nine hours)	Three (eight hours)	Three (eight hours)	Three (eight hours)
Make of gas per man employed, including charging, coke removal, clinkering and charging producers, cleaning ascension pipes, &c. (cubic feet)	21,190	50,502	264,870	155,390	258,972	235,416
Cost of plant per 1000 cubic feet of gas made per diem	£18 8s. 1d.	£22 7s. 1d.	£18 8s. 1d.†	£16 3s. 4d.	£8 7s. 4d.	£7 11s. 6d.
Fuel consumption per 1000 cubic feet of gas made, as used according to the works' records, not in special trial runs (lbs.)	47'4 (Coke containing moderate pro- portion of moisture.)	40'6 (Red hot coke.)	37'4 (Coke containing exceptionally high proportion of moisture.)		43'7 (Coke containing moderate proportion of moisture.)	

* This figure is lower than it should be, owing to the house having been erected of large dimensions, with a view to the subsequent installation of longer retorts.
† Including coke-bunkers and coke-conveyors to the producers.

works came into operation, only comparatively small sums have been taken from the gas-works' profits for the relief of rates; but large amounts have been written off for depreciation, and gas has continued to be supplied gratis for public lighting. It is pointed out in regard to the industrial development of the gas undertaking, that it is largely dependent on the general industrial position of the population. The prosperity of Königsberg is dependent on agriculture, on the export traffic by way of the Baltic Sea, and on the trade with Russia by means of the trunk railways through Eydtkuhnen and Prostken. The industrial undertakings of Königsberg and the rest of East Prussia are, therefore, far more at the mercy of political and legislative influences than are those of the rest of Germany. Hence from time to time there have been fluctuations in the prosperity of the gas undertaking. The population of Königsberg amounted in 1858 to

87,207, and the consumption of gas per head to 612 cubic feet. By 1895 the population had grown to 172,796, and the consumption of gas per head to 1147 cubic feet. Thenceforward the increase in the consumption of gas proceeded at a far greater rate than did the increase in the population. In 1908, the population was 236,486, and the consumption per head had risen to 2720 cubic feet. Apart from the industrial condition of the town and the improvement in the social status of the inhabitants, the increased consumption of gas was largely due to the technical development of the gas industry and of the burners and apparatus used for lighting and heating by gas. It is interesting to notice that when gas supply started in Königsberg in 1852, the unit of measurement was the English cubic foot. In 1855, the Prussian measures were introduced, and the Prussian cubic foot, which was to the English cubic foot as 1 : 0·916, came into use. This



necessitated alteration of the meters in use. Considerably later the change was made from the old system of measures to the metric system. Until 1885 there was a uniform price for gas for all purposes, with a percentage rebate to large consumers; but in 1886 it was decided to introduce differential prices, and charge for gas for lighting purposes 4s. 6d. per 1000 cubic feet, and for gas for other purposes 3s. 5d. per 1000 cubic feet, and do away with the rebate system.

The electricity works were erected at Königsberg in 1890. This, and the introduction of the incandescent gas-burner somewhat later, caused a reduction in the output of gas for lighting purposes; but the total gas consumption increased year by year in at least as great a proportion as the increase of population. The use of gas for cooking ceased to be a luxury, and began to equalize the loss in consumption for lighting purposes. In 1898, it was decided that one lighting burner should be allowed on gas supplies at the lower price charged for heating or power purposes when either gas was in constant use for cooking and heating or for the driving of engines. In 1900, a decision was made to increase the price of gas used for gas-engines which were employed for producing electric light to the price charged for gas for lighting purposes. In 1902, however, in deference to the altered conditions of lighting and heating, it was decided to modernize the conditions of supply. After that year, no minimum consumption was stipulated for. Moderate meter rents were charged—e.g., 7d. per quarter for a three-light meter—and two lighting burners were allowed on supplies at the lower charge made for gas for heating and cooking purposes. Accounts were rendered at intervals of six weeks or, if desired by consumers, at shorter intervals. No deposit was required from users of prepayment meters, for which the same rent was charged as for ordinary meters. These new conditions of supply have been fully justified by the results. In Königsberg it has been found that, contrary to English views, the economical value of the prepayment meter lies in the method of keeping accounts. Since 1902, the gas consumer can have either a prepayment or an ordinary meter according to his desire, and in both cases buys his gas at the same price. The fact that he is able through the prepayment meter to pay as he goes along has been a great inducement to the poor man to adopt gas as fuel. In Königsberg at the present time gas has in the general opinion become the fuel of the lower classes. The smallest houses now are fitted with gas supplies. Some particulars in regard to the consumption of gas through prepayment meters were given in the abstract translation of a paper by Herr Kobbert, which was published in the "JOURNAL" a few months ago (see "JOURNAL," Vol. CVIII., p. 470).

In 1905, the price of gas used for lighting staircases, landings, and courtyards was reduced to that charged for gas for heating purposes. The cost of current had in the meantime continually been reduced, and the amount of gas sold at the higher price charged for gas for lighting purposes began to fall off, and numerous large meters were kept only to provide a reserve supply of light. To meet the latter cases, the rents for the larger sized meters were considerably increased in 1908. It was also arranged that more than two lighting burners could be used on a supply for which the charge was made at the lower price adopted for gas supplied for heating purposes, provided a monthly supplement of 3½d. was paid for each lighting burner after the first two, irrespective either of the gas consumption or the time of year. In this manner, the diminution in the receipts of the gas undertaking, which was at one time threatened, was checked, and the adoption of a uniform price of gas for the smaller consumers was practically secured. The development in the consumption of gas has taken place at substantially the same rate as that of the gas consumption from the municipal works of Berlin, though the area supplied by the latter is a considerably more productive one. The comparison of the rate of increase in gas consumption in Königsberg and Berlin is shown in the diagram on p. 111, in which the dates at which changes were made in the rates charged for gas and the conditions of supply are indicated.

The new tariff had the effect of making the difference between the smallest day's consumption in the summer and the heaviest day's consumption in the winter less than formerly. Consequently, the ratio of the gasholder capacity required to the annual output of gas had become smaller, and all the works' apparatus was considerably better utilized throughout the year than previously. Notwithstanding the great increase in the make of gas, the coke produced was disposed of without difficulty, the price obtained varying not only according to the price of coal, but according as the winter was mild or severe. Latterly, however, the effect of the weather conditions on the sale of coke has been less marked, owing to the growing preference of the public for coke on account of its cleanliness, and to the increase in the number of central heating plants, the consumption of which varies considerably less with the weather than does that of a number of separate stoves. The convenience of central heating installations has improved the standard of heating demanded by the public, and this has reacted on the sale of gas for heating purposes. The advantages afforded by gas for heating purposes in readiness of control of the temperature and in the avoidance of any store of fuel on the premises, have resulted in a big extension of the consumption of gas for heating purposes. On a large scale gas has been introduced in Königsberg for the heating of two churches, and also the large banquet hall of the Thiergarten (in which the inaugural reception and the banquet of the recent meeting of the German Association were held). The facts that the greater proportion of

the gas used for heating purposes is consumed in the daytime or on Sundays, and that the maximum hours' consumption has been almost unaffected by the increased use of gas for heating, led the administration of the Königsberg gas undertaking last year to revise the conditions of sale of gas in the following manner: A 20 per cent. rebate is allowed off the ordinary price of gas for heating purposes for gas used solely for heating rooms. In cases where gas for both cooking and heating is registered through one meter 20 per cent. rebate is allowed in the winter months on gas consumed in excess of 5250 cubic feet per month.

The description of the Königsberg Gas-Works concludes with a review of the names of the consulting and constructing engineers who have been engaged from time to time in the extensions. Since 1902, a chemist has been employed on the works to supervise the working of the chemical processes. From 1902 to 1906, the chemist was Dr. Wolfram, who read a paper on "Development in Gas Purification" at the recent meeting of the German Association; and from 1906 onwards, the chemist has been Dr. Hurdelbrink, who read a paper at the same meeting on "The Washing of Ammonia and Sulphuretted Hydrogen from Coal Gas." Abstract translations of these two papers were given in the "JOURNAL" June 28, p. 959. The position of Manager of the gas undertaking has been held by Herr Kobbert since 1902.

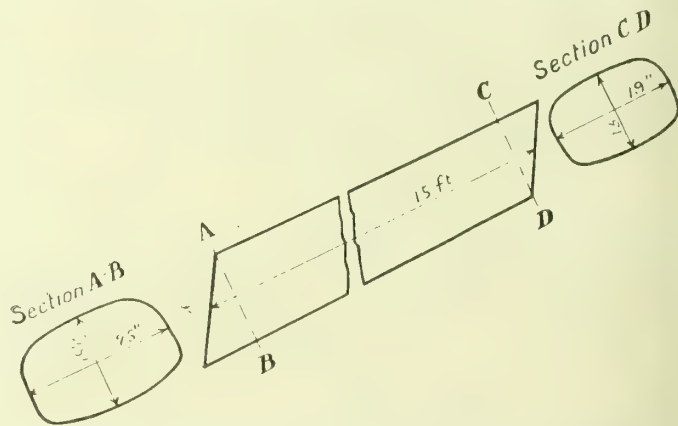
BRUSSELS MUNICIPAL GAS-WORKS.

As mentioned in a previous issue of the "JOURNAL," the programme for the recent gathering of gas engineers in Brussels included a visit to the gas-works of the Municipality, of which M. Aerts is the General Manager. For the convenience of the visitors, a descriptive pamphlet had been prepared, from which we extract the following particulars.

The City of Brussels has been lighted by gas since Aug. 24, 1819. The first concession was granted to the Société Meeus, who carried on the service until 1844, when it was taken over by the Imperial Continental Gas Association. The works were situated in the Rue des Echelles, near the centre of the city. When, in 1873, the Communal Administration had under consideration the renewal of the concession, they decided on removing the works, and subsequently on having the gas supply carried on under their control. This arrangement came into operation on Sept. 1, 1875. For some years, however, the supply of the city has been entirely in their hands.

The works are situated at Schaerbeek, on the banks of the Willebroeck Canal; and they are connected with the neighbouring railway line, which has a station at the above-named place. They have been gradually enlarged in order to meet the increasing demands made on them, and now occupy an area of 50 acres; and their productive capacity can be raised to 14 million cubic feet of gas per day. They consist of two complete gas-works—one erected in 1875, and the other brought into use in 1900—plant for the manufacture of carburetted water gas, a tar distillery and sulphate of ammonia plant, compressed fuel plant, and gasholders.

The four retort-houses in the old works contain six benches of twelve settings of horizontal retorts, and two benches of ten settings of inclined retorts on the Coze system. In the new works are four benches of inclined retorts. In No. 1 bench there are eight settings of nine inclined conical retorts 15 feet long, on the system devised by M. Gennotte, the Chief Engineer of the works.



These retorts, which, as shown by the above diagram, are tapered at both sides and at the bottom, the roof being inclined at an angle of 33°, are charged with 390 kilos. (858 lbs.) of coal, which remains in them for 7½ hours. The quantity of coal carbonized per 24 hours is 1291 kilos. (2840 lbs.), or 286 kilos. per metre run, compared with 240 kilos. in the cylindrical inclined retorts. The difference in favour of the conical retorts is 211 kilos. per 24 hours. The yield of gas is 30.25 cubic metres (1068 cubic feet) per 100 kilos. (220 lbs.) of coal; its illuminating power being 95 litres (3.35 cubic feet) per carcel (9.6 candles), compared with the Paris standard of 105 litres (3.7 cubic feet), and the calorific power is 613 B.Th.U. per cubic foot. Carbonization is quite easy with these retorts, as, owing to their shape, the coke comes out without any

"tickling" or poking; and it is much larger and harder than that produced in cylindrical retorts. The supply of primary air for heating these retorts is controlled by a regulator devised and patented by M. Bromham, the Second Engineer, who is Manager of the tar-works. By the use of this appliance, economy of fuel is effected, there is regular temperature during the whole period between two clinkerings, the life of the refractory material is prolonged, and there is greater regularity in the production of gas. The coals come principally from Westphalia, the Pas de Calais, Durham, and Yorkshire. Coals arriving by boat are discharged by two cranes operated by electricity, each of a capacity of 50 metric tons an hour. They are conveyed to the store in electrically worked trucks of special make, which discharge their contents without stopping. The trucks carry 1200 kilos. of coal, the motor is 3-H.P., and the speed is 12 kilometres (7·2 miles) per hour. The current used in conveying a ton of coal from the boat to the point of discharge in the store is 1 kilowatt-hour. The stores will contain 25,000 tons, which is sufficient for about 45 winter days' consumption.

The condensing plant consists of cast-iron vertical pipe condensers, and sheet-iron water-cooled condensers, the design of M. Aerts. It is stated that, though they have not been cleaned for seven years, they do not contain any thick tar or naphthalene. The washers are Kirkham's; and the exhausters are of the pump and rotary types. Four sets of multitubular boilers furnish the steam required on the works. Each of the purifier boxes contains 10 tons of oxide of iron. They are movable, and are raised and emptied by means of travelling cranes worked by electric motors. The purified gas is measured by seven station meters, each of 1½ million cubic feet capacity, before it passes into the holders, of which there are eight, ranging from 350,000 to 2,000,000 cubic feet capacity, in metal tanks.

In 1894, plant on the Humphreys and Glasgow system, of a capacity of 3½ million cubic feet per day, was installed for the production of carburetted water gas. The oil used comes from the Northern States of America, and 34 kilos. of it are needed per 100 cubic metres (3530 cubic feet) of gas; the yield of gas per 100 kilos. of oil being 294 cubic metres (10,382 cubic feet). The production of gas per apparatus in 24 hours is 20,000 cubic metres (777,000 cubic feet). Buildings to contain tar-distilling plant equal to dealing with 12,000 tons of tar per annum have been constructed, and apparatus for about half this quantity has been put in. The tar is conveyed by tank-waggons into reservoirs having a total capacity of 2000 tons. It is afterwards filled into stills of 12 tons capacity; and distillation is effected, on an average, in 15 hours. The products are light oils, carbolic acid oils, creosote, anthracene, green oils, naphthalene, and pitch. Here there is in use M. Bromham's patent centrifugal machine for drying naphthalene and sulphate of ammonia, which he brought under the notice of his French colleagues in a paper read at the meeting of the Société Technique.* The basket, or drum, of the machine is about 6 ft. 6 in. in diameter, and works at the rate of 750 kilos. (about 15 cwt.) of dried naphthalene per hour.

The coke is broken, classified, and put into sacks or waggons. There are on the works two coke-breakers, equal to dealing with 27,500 bushels per day. There is also a clinker-washing plant, in which the unburnt coke is mechanically separated from the clinkers and ashes coming from the retort-furnaces. The ammoniacal liquor is utilized in the manufacture of sulphate by the Solvay process. The breeze is used for the production of compressed fuel, something like 10,000 tons of which are made yearly, and employed in the heating of the generator furnaces. Almost all the ashes and clinker are sold to be crushed for the manufacture of mortar and the maintenance of roads.

There are employed on the works seven locomotives, 41 steam-engines, 16 gas-engines, and 36 electric motors. The current is delivered from the city central station at a pressure of 5000 volts, and it is brought down to 250 volts by transformers.

The gas is conveyed into the city by one 34-inch and two 40-inch mains. Brussels is a city of different levels; and, to regulate the pressure, one governor, with return pipe, is employed for the lower portion, and seven special governors for the higher parts. The total length of mains is 123 miles. The increase which has taken place in the consumption of gas during the past 23 years is shown in a tabulated statement in the pamphlet from which most of the particulars here given have been obtained. In 1886, the quantity of gas sold to 173,123 inhabitants was 517½ million cubic feet, or at the rate of 3000 cubic feet per inhabitant. Last year the quantity sold to 194,310 inhabitants was 1422¼ millions, or at the rate of 7310 cubic feet per head.

The staff of the works consists of three engineers, who have thirty assistants (inspectors, supervisors, clerks, &c.); and the workmen employed number 650 in winter. The usual provisions are made for their comfort and cleanliness; and they have the benefit of provident and pension funds—the latter being in connection with the State fund. A franc per month is retained from their pay, and the State contributes twice this sum. A workman 65 years of age, or invalided, has the right to a minimum pension of 365 frs., with an addition of 15 frs. per annum in the event of more than 25 years' service, up to from 547 or 550 frs. Eleven dwelling-houses have been constructed for the use of the employees; and workmen can have two, three, or four rooms at a rent of 10 to 13 frs. a month. The children receive instruction up to ten years of age in a school attached to their dwellings.

THE FOREST (BRUSSELS) GAS-WORKS.

(Concluded from p. 25.)

EXHAUSTERS, WASHERS, AND PURIFIERS.

THE gas produced in each of the two benches of inclined and vertical retorts first passes through foul mains, which, as a rule, are of riveted wrought iron, 24 inches diameter, provided with valves arranged so that the length traversed by the gas can be modified in accordance with the outside temperature. The two currents of gas unite on entering the first condensers, which are placed in the washer-house. These condensers, of which there are two, are cooled with water, and each has a total cooling surface of 281 square metres, of which 34 square metres are cooled by air. They are of rectangular section, which allows of economy in space. The gas then passes through three Beale two-blade exhausters, each connected with a steam-engine, and each having a capacity of 1700 cubic metres per hour. As a rule, two of these exhausters are in use. Here, as elsewhere, their speed is kept proportional to the make of gas. To do this, the steam regulator is controlled by the action of the gas pressure through a bell which is placed on the suction main of the exhausters. This is done, however, in the case of one only; the other being worked at a constant speed.

The gas proceeds along a main (provided with electric indicators of any abnormal pressure) to the washer-house, through which it passes in the following order: Pelouze and Audouin condensers, naphthalene washers, second condensers, and ammonia washers. The house contains three sets of plant, each capable of dealing with 50,000 cubic metres of gas per day. The Pelouze condenser is completely enclosed, and has a circular drum. In order to regulate the pressure, all that is necessary is to remove the upper cover and load or lighten the bell. The level of liquid can then be seen from the outside by means of a sight-glass inserted in the outside wall. The naphthalene washer (made by Holmes) is of the rotary type, and similar to the "Standard," except that the wooden blades are replaced by brushes (of piassava fibre) which rotate against the fixed parts, breaking up the gas, which is thus compelled to pass through them. It is then brought into intimate contact with the washing liquid—in this case anthracene oil. This washer is of the four-cell type.

The tank in which the raw oil is stored is under the washers, into which the oil is pumped by a small steam-pump. The oil, saturated with naphthalene, then passes away to the tar-tanks. The second condensers reduce the gas to 15° C. (60° Fahr.), and are similar to the first. Two of them are used in series. The ammonia washers are also of the Holmes type, and are built to be used later as cyanide washers. They contain seven cells. The whole of the necessary motive power for these washers is provided by a 10-H.P. steam-engine. A similar engine is kept in reserve; and, as an additional safeguard, the mains are provided with a number of hydraulic valves. In the washer-house there is also a small ventilating turbine, of 0·5-H.P., and an air-motor for blowing air into the mains, in order to effect continuous regeneration in the purifier boxes.

The purifier-house is built with two floors, occupies a site 26 metres by 34 metres in extent, and is 11·05 metres high to the springing of the roof. The purifiers are placed on the upper floor. They are six in number, and are arranged in two series—one of four purifiers placed in a square in the farther part of the house, and the two others forming the second series. All are similar in type and of the same dimensions—viz., 9·144 metres square and 1·65 metres in depth. They have four layers of "Bamag" grids; the gas being at present divided into two streams on entering the box. One of the inlets is above, and the other below; while the outlet is in the middle. Those of the same series are connected by a central distribution, by which any particular box of the series can be cut out, the others continuing to be used; while any purifier can be placed first in the series, the general direction of the gas in the others remaining the same. This combination allows of economical working, since the purifying material can be completely utilized. Each distributor is provided with a bye-pass sealed by a hydraulic valve. The lower floor, which is on the ground level of the works, is used for revivification—an arrangement which allows of charging and discharging the purifiers with very little manual labour.

The purifiers are provided on the lower side with two shoots, down which the spent oxide is shovelled, and falls into small trucks that convey it to any part of the floor. When re-charging the purifiers, the oxide is loaded into a small truck which is raised to the upper floor by a hydraulic lift. The truck passes directly from the elevator platform along a gangway running by the sides of the boxes, and can be brought to any given point, after which it returns by lift to the lower floor. A small platform placed on the charging-floor allows of each rise and fall of the lift being utilized, so that charging is done very rapidly. Though a single purifier contains 80,000 kilos. of oxide, it requires little more than eight hours to fill. The maximum speed of the gas through the oxide is 4·7 mm. per second in winter. On passing from the purifier-house, the gas enters the station meters, of which there are two, each of a capacity of 40,000 cubic metres per hour.

GASHOLDERS.

There are three gasholders, of 5825, 13,600, and 35,000 cubic metres capacity respectively. The first two, owing to their small

*An abstract translation of the paper appears in another column.—Ed. J.G.L.

size and pressure, can be used only during the times of limited consumption. The third, which is a three-lift holder with a wrought-iron tank, was built in 1899; the maximum pressure it can give is 220 mm. This holder stands on a foundation of slightly reinforced concrete. The total storage capacity of the works, as shown above, is 54,425 cubic metres; but as this is insufficient for the present output, a new holder is to be erected capable of containing 100,000 cubic metres of gas. The foundations, which, from the nature of the ground, have to be partly laid on piles, are now being proceeded with. The tank will be constructed and tested towards the end of the present year; while the holder itself will be erected in 1911, so that all will be in working order during the winter of 1911-12.

WATER-GAS PLANT.

Before describing the distributing system, reference should be made to the installation of plant for the production of carburetted water gas. This was constructed in 1900 by Messrs. Humphreys and Glasgow, and includes two sets, each producing 15,000 cubic metres of gas per 24 hours. Manipulation of the raw materials—the coke and oil—is done very simply. The coke reaches the entrance of the works in trucks, and is stacked on the ground. Thence it is taken by trucks, which are raised to the working floor by a hydraulic lift. The oil is stored in a tank of 900 cubic metres (about 200,000 gallons) capacity, which is filled as follows: On its arrival in the railway tank-waggons, the oil flows into an old boiler which is buried in the ground, and is connected with a pump supplying compressed air. Under the pressure of the air, the oil is forced into the tank above, which is surrounded by a large circular trench, in order to avoid the consequences of a possible fire. From the tank it is forced into the apparatus by a small "Duplex" steam-pump. The plant for the supply of compressed air for the manufacture of water gas includes two installations, each consisting of a high-speed Westinghouse engine and a centrifugal machine running at 2200 revolutions per minute. Each group is equal to the supply of two batteries. The gas produced, after having traversed the hydraulic washer, the tubular condenser, and the scrubber, passes into the gasholder. This is an old one of 5825 cubic metres capacity, and is used for storing a reserve of gas as well as for supplying the daily make. At the holder outlet the gas is drawn off by an exhaustor of 1700 cubic metres capacity per hour, similar to those already described, placed alongside another of similar construction which is kept in reserve for both water and coal gas. It is then forced through a Pelouze and Audouin condenser of 30,000 cubic metres capacity per 24 hours; and afterwards it traverses the purifiers, of which there are six, each measuring 4'5 by 4'5 by 1'5 metres. These are at present fitted with four ordinary grids; but they are to be arranged on the "Bamag" system. After purification, the gas can either be sent into the mains leading to the holders, or into the main at the outlet of the exhaustors, in order to dissolve the naphthalene which would tend to deposit in the purifiers. This happens occasionally, in spite of treatment of the gas with anthracene oil. The mixture of the two gases is thus complete.

THE GOVERNOR-HOUSE.

This house consists, as usual, of a basement and one floor. The basement contains a tubular receptacle of square section (side measurement 80 cm.), in which, with the necessary valves, the outlet mains from gasholders 2, 3, and 4, as well as the inlets and bye-pass of the outlet governors, are joined up. Two of the latter (they number five in all) are 10 inches in diameter, two others are 20 inches, and the last 30 inches. The smaller mains are those used for supplying the more distant parts of the system; among them being Cortenberg, which is 25·5 kilometres from the works. The governors are Cowan's. Changes of pressure are produced by water. The vessel in the basement is connected with the works' main, by means of an enclosed regulator. The regulator opens only when, owing to some mistake in manipulation, all the outlets from the gasholders are closed.

MOTIVE POWER.

Up to last year, when the vertical retorts were installed, steam was the only motive power employed. It was generated by four boilers, three of the Cornwall-Galloway type with Fox tubes of 74 square metres heating surface, and a fourth of 120 square metres on the Piedboeuf system. The latter consists of a short Cornwall-Galloway boiler, with two furnaces surmounted by a large cylindrical multiple-tube boiler. Each of these two parts can be fed separately; but, as a rule, the lower portion is fed by the overflow from the upper. As regards the steam formed in the lower chamber, it traverses the upper one by means of a tube, and joins the steam formed in the latter. The advantage of this boiler is in the small amount of floor space it occupies relatively to its large heating surface. The boilers are all provided with the Bennis mechanical stoking system, which exactly imitates in its action the effect of a stoker with his shovel. The furnace forming part of the plant is provided with a forced draught, which allows of cheap fuel, such as coke dust, being utilized. A motor of about 1-H.P. is used for the mechanical stoking. These boilers supply the steam for the exhaustors, and for the engines working the inclined retorts, the rotary washers, pumps, water-gas plant, and hydraulic accumulator. The consumption of steam by most of these engines is considerable, largely on account of the distances from the supply. The oldest and farthest are being replaced by electric motors. In addition to the first installation of steam-

generating plant, there is a second, erected last year, to provide the motive power for the vertical retorts and the compression of the gas. These boilers, three in number, are on the Galloway system, with Fox tubes. The heating surface is 80 square metres per boiler. The steam-pipes of the whole installation are constructed in duplicate; and they allow of saturated or superheated steam being distributed either simultaneously and independently one of the other or in admixture. Like the boilers previously described, these latter are provided with machine stoking, operated by an electric motor, or steam as a reserve. This installation supplies the steam for the repair shop, as well as for the washers, vertical retorts, compressing plant, and electric station.

The electric plant produces an alternating three-phase current of 220 volts and 50 periods. This system was chosen as all the electric installations are intended to be united in the near future to an electricity distributing system which will be installed in some districts, and will take the form of the supply of a high-tension three-phase current. The station is now in course of construction. Transformers will also be installed at the gas-works, in order to bring down the tension to 220 volts. The generating plant now to be described includes two alternating turbines of 112 K.V.A., each having a turbine, an alternator, and a discharger, all on the same foundation and along the same axis. There is room to put down a third alternating turbine. The turbine is of "Electra" compound type, with two falls in pressure, each of which receives two falls in speed. It is of the same power, and, except for the regulator, similar to those which are employed for compression. Used as condensing turbines, these machines have given, for 167-H.P. effective, a consumption of 8·2 kilos. of steam per effective horse power for a pressure of 8·4 kilos., and 214° of superheating. The energy required to work the condenser is not included in these figures. The normal speed is 3000 revolutions, and is adjusted by a regulator fixed on the shaft of the turbine. In addition to this regulator, a disconnecting accessory is fitted, which cuts off the steam as soon as the speed exceeds 3000 revolutions. The number of periods being 50, and the speed 3000, the alternator is provided with only two poles. It is completely enclosed in a cast-iron frame communicating below with the terminal connections. The exciting current is supplied by a shunt apparatus of the four-pole type; excitation of the latter and of the alternator being secured by rheostats. Each installation is provided with an injector-condenser of the Westinghouse-Leblanc type, operated by an electric motor at a speed of 960 revolutions per minute. This condenser draws the water from a reservoir connected with the River Senne; the supply being filtered through gratings and finely perforated plates. The condenser discharges into another reservoir, which can be isolated from the Senne and emptied by means of a centrifugal pump in case of flood. The nearness of the Senne allows of the necessary water supply for the boilers being obtained at comparatively small cost. The water for the washers and condensers is pumped from a well, at a depth of 60 metres, by the air-lift process. The water reaches the condensers at a temperature of 12° to 14° C., and passes from the outlet into a tank, whence it is used for the boilers.

RESIDUAL PRODUCTS.

The residual products—ammoniacal liquor, saturated anthracene oil, and tar—are collected in three brick tanks having a total capacity of about 88,000 gallons. The tar and liquor separate, and are pumped respectively to the tar distillery and the sulphate plant. Beside these brick tanks, there is one of cast iron, with a reinforced concrete cover, which holds 1,400,000 kilos. In this is stored only the tar bought outside, and treated in the distillery with the tar deposited in the other tanks. There is still another tank, in which is collected the tar coming from the water-gas plant. It consists of two cylindrical vats of wrought iron, sunk in the ground, and capable of containing about 30 tons.

SULPHATE PLANT.

Before the ammoniacal liquor is distilled, it is passed into a coke-tower, by which the tar is retained. The plant consists of three "Bamag" columns, which work continuously. One distils 250 hectolitres per 24 hours; the second, 150 hectolitres; and the third, 100 hectolitres. Each apparatus is provided with a heater, which is kept warm by the waste liquid escaping from the apparatus. The ammoniacal liquor, therefore, first passes through the heater, where it is raised to a considerable temperature, with the result that the distillation proceeds more readily. The fixed ammonia in the liquor is liberated by injecting lime into the lower part of the apparatus by means of a cataract pump; the quantity being regulated according to the quality of the liquor. Each purifier is provided with two saturators, which allow of distillation proceeding without intermission; the ammonia vapour being conducted into the second as soon as the first saturator is charged with sulphate. On its removal from the saturators, the sulphate is drained; and it is then dried by means of a turbine. The steam necessary for the distillation of the tar and the manufacture of sulphate is provided by two Galloway boilers, each of 60 square metres heating surface. The liquors are conveyed by steam-pumps, or by force-pumps working with compressed air.

TAR DISTILLERY.

The tar from the works, mixed with that from other sources, is pumped into a reservoir holding 60 tons. It is there left to stand for the ammoniacal liquor to separate. The tar is then run off into four stills, each of a capacity of about 6 tons. The products

of distillation, which is done over a naked fire, are: (1) Ammoniacal liquor, which is taken to the sulphate works. (2) Light oils, which are sold in the crude state or are partly rectified for sale. (3) Naphthalene and creosote, which are allowed to cool, the naphthalene being drained and sent to the refinery, while the creosote oil is used for creosoting timber. (4) Anthracene oil, which is pumped into different reservoirs, and there left to cool, afterwards passing into a vertical hydraulic press. The cakes of anthracene thus produced are sold to dye-works; the green oil which filters off being used as a lubricant. (5) Pitch, which is allowed to flow off into a tank, and is sold for the manufacture of briquettes.

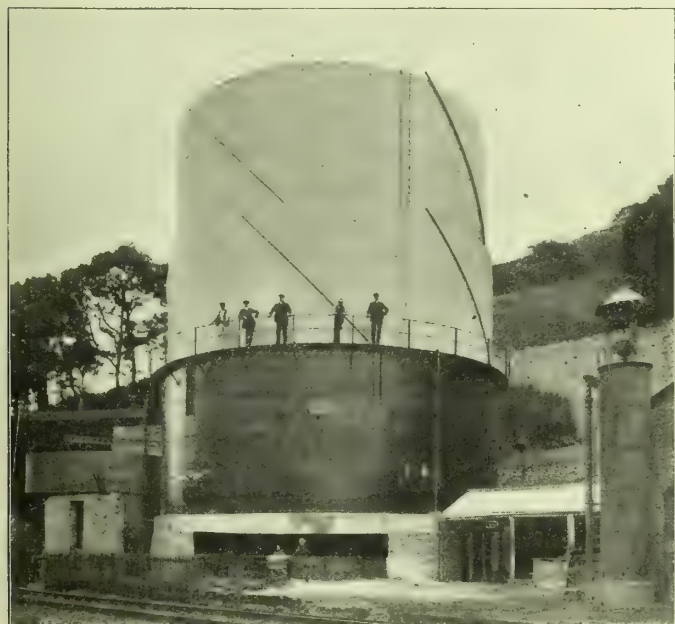
LABORATORY.

The laboratory stands away from the other buildings, and is well lighted and ventilated. The laboratory proper is on the ground floor, as are also the balance-room and the office. On the first floor is the photometer-room, into which pipes from all parts of the works, and even those which supply the different districts, are conducted. The gas from any given place can thus be tested for illuminating and calorific power. The photometers employed are the Dumas and Regnault, which are used for the gas supplied; the Sugg, which is arranged for water gas; and the Weber, which is reserved for the examination of different gases and mixtures, and also for the measurement of the lighting power of incandescent mantles. The other room on the first floor is used for gas analysis, and is fitted with the Orsat and Bunte apparatus. The Junkers calorimeter is employed for testing for calorific power, and the Lux balance for the specific gravity of the gas. Sulphur is estimated with the Drehschmidt apparatus, naphthalene by Dr. Colman's method, and cyanides by the Feld process. There are also appliances for testing meters.

A PROSPEROUS CORNISH GAS COMPANY.

Interesting Features of Construction.

STARTING in 1865 with a capital of £2000, of which sum £1830 was subscribed on the first application, the Looe Gas and Coke Consumers' Company, Limited, made steady progress, and for upwards of forty years paid a dividend of 5 per cent. Since 1907, however, the growth of the Company has been phenomenal; and there are probably few gas undertakings in the United Kingdom which have grown proportionately to such an extent in the same period. In order to go with the times, the Directors three years ago increased the capital of the Company, which now stands at £6000 in ordinary shares and £3000 in debentures carrying 4 per cent. guaranteed interest. That this action was justified may be gathered from the fact that, whereas in 1907 the output of gas was 2,716,000 cubic feet, in 1908 it was 4,304,500 cubic feet, and last year 6,708,320 cubic feet; while at the present time the new works are



producing up to 8 millions. During the past two years, nearly eight miles of new mains have been laid. In 1907, there were 136 consumers, in 1908 there were 289, last year 404, and at the present time 450; and 300 cookers are in use. The revenue from the sale of gas in 1909 was £1237, compared with £576 two years previous.

The alterations and additions made to the works, involving an outlay of nearly £8000, have been in some respects quite unique from a gas engineer's point of view. For instance, two benches of generators by Messrs. Gibbons Bros., Limited, of Dudley, one containing five and the other six retorts, have their fires below the high-water level of the River Looe. But the most important feature is the erection of the new gasholder, raised 8 feet above the surrounding country. It is one of Messrs. R. & J. Dempster's;

and the tank is built on a raised foundation of reinforced concrete over the tank of the former gasholder and meter-house. Considerable outlay has been saved by utilizing this part of the old works; for the tank, which has a capacity of 280 tons, will serve for the storage of ammoniacal liquor. As will be seen from the illustration, which is a reproduction of a photograph taken by Mr. E. Coath, of Looe, the new holder (of 50,000 cubic feet capacity) is on the Gadd and Mason system; and it rises 65 feet above the ground.

The other additions include a new shed capable of storing 1000 tons of coal near a siding from the adjoining railway, a new set of condensers, two new gas-engines, a couple of new exhausters, and a new Livesey washer and tower scrubber by Messrs. George Waller and Son, of Stroud, and new purifiers by Messrs. Clayton, Son, and Co., of Leeds. The Company's land extends a quarter-of-a-mile along the River Looe; and a charming residence has been built for the Manager, Mr. John Alderman, jun., who is only twenty-one years of age, and is probably the youngest gas manager in the United Kingdom. Having served his apprenticeship with the former Manager, he has shown the greatest aptitude, and throughout the extensions has had the entire confidence of the Directors.

Mr. R. A. Peter is the Chairman of the Company, and Mr. Wesley Martin the Managing-Director. He has personally superintended the extensions, and is to be congratulated on their completion in so satisfactory a manner, and with a minimum of inconvenience to the Company's customers and the general public. The whole of the masonry has been done by Mr. John Alderman, the father of the Manager.

TURBINE FOR THE CONTINUOUS TREATMENT OF SULPHATE.

By M. BROMHAM, of Brussels.

[A Paper read before the Société Technique du Gaz.]

IN treating sulphate of ammonia in a turbine of the vertical axis type, working intermittently, it is necessary to drain the sulphate first, otherwise the mother liquor and the salt find their way into the mechanism, which in this type of machine is placed in the lower part. Previous draining of the sulphate thus means double labour; and if the salt is drained for too long a time, it cakes on the table, and has then to be broken up with the pick in order to charge the turbine. Then, again, the sulphate being cold, it is less friable, and does not "turbine" so well; the product being one which the buyer has to break up fine before he can distribute it on the land in the most effective condition. The buyer will always prefer sulphate in a fine state, free from lumps and regular in tint. In the case of the turbine of the vertical-axis type, the removal of the salt gives some trouble, especially in the summer, when the sulphate is "turbiné" warm. Finally, the constant interruption of the action of the turbine when it is charging and removing the product causes loss of time and motive power; the turbine not doing its full duty until it has attained its maximum speed.

These facts led the author to improve the process, with the object of producing sulphate of better quality and richer in nitrogen, reducing the cost of maintenance, manual labour, and motive power, and relieving the workman of the heavy operations which the process entails. In the method which has been devised, the turbine is built with its axis horizontal; the drum moving in a vertical plane. It turns in a crank-case lined on the inside with lead. The bearings are outside the crank-case, and consequently can be inspected while the turbine is running. They can also be looked at when it is not at work, without dismantling the turbine. The chief advantages of this apparatus over the type of turbine in which the axis is vertical are that the machine is kept constantly running; the charging with sulphate and the removal of the product being done without a stop. The system allows of the sulphate being introduced as a liquor almost as it comes from the saturator; all manual labour and draining being thus dispensed with. The mechanism is not liable to derangement from this practice, as the drum makes a tight joint with the sides of the chamber.

Introduced warm into the turbine, the salt dries much more quickly, and the product which emerges is of better appearance and is in a homogeneous state, free from lumps. The dryness is indicated by the figures for the percentage of water, which are 0.80 to 1. The nitrogen reaches 20.5 to 20.7 per cent., and even more; whereas with other systems of turbines, employed in the ordinary way, the nitrogen will not exceed 20.2 per cent. The high efficiency of the apparatus under consideration arises from the fact of the introduction of the sulphate into the drum while the latter is in motion; so that the sulphate is subjected to the maximum centrifugal force from the first moment of its treatment. The minimum of mother liquor is retained, the sulphate does not cake together on storage, and the sacks containing it do not deteriorate. A further advantage is the fact that the horizontal axis may be driven from an ordinary motor, from a steam or a gas engine, or even from a belt. Moreover, in consequence of the charging of the turbine while it is in action, the machine remains in equilibrium. The charge is removed from the apparatus by means of an extractor controlled by an outside screw; and the

operation requires from two to three minutes, according to the power of the machine.

In adopting the new system of turbine in conjunction with existing installations in sulphate works, the arrangements may be modified with advantage. If the saturator is of the continuous type, entirely closed, the salt is transferred to the turbine by means of a cock fixed on the conical bottom of the saturator. If the latter is of the usual rectangular type, open above, a special cock is affixed to the inclined floor of the apparatus, and the salt then flows into the turbine without the necessity of handling it at all. It should be stated that the turbine gives the same results when used in conjunction with an existing installation where the sulphate is removed from the saturators by hand. The turbine may also be employed in the gas-works themselves in treating anthracene and naphthalene, for which purpose it effects considerable economy and gives a better product.

ILLUMINATION OF INTERIORS.

Artificial Illumination by Gas and Electricity.

In the "JOURNAL" for the 21st ult., we noticed the first of the series of three special lectures on "Illumination of Interiors" arranged to be delivered by Professors Morris and Smith at the East London College, Mile End Road. The second lecture was given by Professor Morris; his subject being "Artificial Illumination by Gas and Electricity."

At the close of the first lecture, Professor Morris described Mr. Trotter's daylight photometer; and he opened the second by giving the results of further experiments with it. The diaphragm used was of such a size that the ratio of the area of the hole to the area of the hemisphere was 0.003. Measurements were made, in failing light, from the roof of the College, with the hood alternately in position and removed; and the mean ratio of the reducing factor of the diaphragm came out as about 0.015, or five times as great as the ratio of diaphragm area to the area of the circumscribing hemisphere. As a check, the lecturer tried balancing an arc light against daylight by means of a bunsen photometer; and he obtained values bearing out the measurements made with the Trotter instrument when using a ratio five times as great as that given by the makers.

Proceeding to the subject of his lecture, Professor Morris reminded his audience that the chief methods of utilizing coal gas as an illuminant are flat-flame burners and incandescent mantles—the latter working at both low and high pressure. The flat-flame burners were, he said, well on the way to becoming extinct; but the others were undoubtedly a highly-efficient means of illumination. A number of experiments on a Keith high-pressure burner were carried out at the College about two years ago. While improvements had been made since then in the durability of the mantles, the results already published could still be taken as standard ones, obtained under strictly scientific conditions so far as regarded illuminating efficiency. There was one point, however, and that was the relation between the efficiency of gas illumination and the calorific value of the gas employed. If they took an electric lamp, and used it first in one place and then in another, they would get absolutely identical results, both as to light and consumption of current, providing the voltage applied to the terminals was the same. This, however, was by no means the case with gas. In the tests just referred to, a high-pressure lamp was tested first at the College and afterwards in North London; and the illuminating power was 425 and 680 respectively—the variation being due to the different gas used. Seeing that practically all coal gas was now used for its calorific value, it seemed to the lecturer it was only fair that the consumer should be charged on this basis. In his opinion, the now obsolete "illuminating power of the gas," as specified by the Board of Trade, should be discarded, for a heat basis.

Turning to electric lamps, Professor Morris gave the following list of them, with figures showing their efficiency:—

Type of Lamp,	Watts per Candle Power.	Candle Power per Watt.
Carbon	3.50 ..	0.29
Tantalum	1.90 ..	0.53
Tungsten	1.30 ..	0.77
Helion	1.10 ..	0.90
Arc (open)	1.00 ..	1.00
Flame arc (globe off).	0.25 ..	3.80
„ „ (globe on).	0.40 ..	2.50

He said the table showed the great increase in efficiency obtained by the use of metallic filament lamps, and the considerable loss brought about by the globe which was necessary with such lamps as flame arcs. A lamp which really fulfilled the conditions for proper illumination laid down in the first lecture—i.e., that in which the source of light is entirely shielded from the eye—was to be found in the inverted arc lamp; but it was particularly necessary that the ceiling above the lamp should be perfectly white. When used in workshops, it was desirable to place light boarding above the lamp, and to see that this reflecting screen was whitewashed fairly frequently. A lamp which called for notice at the present time was the Moore vacuum tube lamp, which had not the dazzling effect met with in other sources of light. There was probably less eye-strain in looking at these

tubes when in operation than in looking out of a window. The great disadvantage attending this or any similar system was the liability to the accidental breaking of the tubes.

The lecturer next dealt with the quality of light; remarking that some lights are often spoken about as being "dazzling" while others are referred to as "soft." He pointed out that the chief determining factor in this matter is the intrinsic brilliancy or the candle power per unit area of the source. He gave the following figures to show the comparison between various light sources on this basis:—

	Candle Power per Square Centimetre.
Sun.	100,000
Arc lamp	16,000
Tungsten lamp	150
Tantalum lamp	67
High-pressure incandescent gas	25
Carbon filament lamp	16
Flame arc lamp (10-inch globe)	3
Low-pressure incandescent gas	3
Flat-flame gas	1
Kerosene lamp	0.5

If a lighted tungsten lamp were looked at for a short time, when the observer turned away he could still see a kind of image of the filament in the field of vision. Any light which caused this should be provided with a shade. Probably all light-sources having an intrinsic brilliancy exceeding about 10 to 20 candle power per square centimetre, come under this category. On this basis, the high-pressure gas-lamp was better than the metallic filament lamp; though probably even carbon filament lamps should be provided with an efficient shade. Up to the present, it had been the practice of gas engineers to have high-pressure gas-lamps, when used for street illumination, with clear glass lanterns. The lecturer expressed the opinion that this should not be so, but that slightly frosted glass or similar protection from the direct rays should be employed.

Passing on to deal with the next consideration for efficient illumination—i.e., fluctuation—the lecturer remarked that anyone who had had to read by the light given by electricity generated by a badly governed water-wheel, internal combustion engine, or other prime-mover of which the speed varied to any appreciable extent, would have noticed how very annoying the changes of light became. When either a flame arc or a gas-lamp happened to be out of order, violent fluctuations in light took place which might possibly be amusing under certain circumstances, but were decidedly unpleasant for those who wished to use the light.

After some remarks on the fluctuations of light on electric railways and tramways, the lecturer came to the question of shades for lamps. He said it was an interesting problem as to whether, for interior illumination, it was preferable to have a good local illumination at points where it was required for reading or writing, and more or less allow the general illumination to look after itself, or whether sufficient general illumination should be provided for all purposes. At one time he held the former view; but more recently he had inclined towards the idea that a combination of the two is the most desirable.

For street lighting, he for a long time (in opposition to general practice), insisted that shades should be provided, so that no horizontal rays might strike the eye when looking down the street. It would seem, however, that people preferred to see the effect of a number of bright points, rather than have a good illumination only on the ground. As an example, one might take the case of Whitehall. The high-pressure gas-lighting in this street was magnificent from the point of view of brilliancy, but certainly defective according to the view expressed above. For an efficient and scientific shade, it was necessary that, while the light should be deflected in the required direction, there should be as little loss as possible due to absorption. Such a series of shades or globes was that manufactured by the Holophane Company. The lecturer described these shades, and called attention to the remarkable extent to which polar curves of illumination intensity could be varied by them to suit the circumstances required.

In drawing his lecture to a close, Professor Morris said that a common fallacy existed that when the light of a room illuminated by (say) an arc lamp was deficient, it could be improved by lowering the lamp. But he produced diagrams which showed that while the illumination directly below the lamp was greatly increased, even to an undesirable extent, that at places some distance away was actually reduced.

Gas Companies' Accounts for 1909.—We have received from Messrs. John Allan and Co. the "Gas World Analyses of Gas Companies' Accounts for 1909." The accounts of 53 gas companies are analyzed, and the results set out on two large linen-backed sheets. On the left-hand one will be found particulars relating to the coal carbonized, the percentage of carburetted water gas produced, the quantity of gas made, sold, and unaccounted for, the yield of residuals, statistics of revenue, &c.; while on the right-hand sheet are given the distribution and management charges, bad debts, net cost of gas, mileage of mains, number of consumers and public lamps, total capital and the capital per ton and per 1000 cubic feet, and the reserve funds. As in the case of the "Analyses of Municipal Gas Accounts" issued early in the year, cardboard rules are supplied to facilitate comparison with figures of any of the undertakings given. The work is similar in appearance to its predecessors, and the price is 10s. 6d. net.

LIGHT-ECONOMIZING REFLECTORS FOR STREET-LAMPS.

This was the subject of a paper submitted to the Société Technique du Gaz en France by M. Grebel. He, however, did not read it, but gave an indication of its contents with the aid of diagrams on a blackboard.

In referring to the greater attention paid of late years to the figures for mean spherical intensity as a measure of the illuminating power of a light, the author gave diagrams of the curves representing this intensity in the cases of electric arc and filament lamps with and without globes, and of flat-flame and incandescent gas-burners—upright, inverted, and high-power. He proceeded to take the view M. Maréchal expressed in the latter's "L'Eclairage à Paris" (1894), that the ideal in street lighting is to provide uniform illumination of the ground. In investigating the conditions of such lighting in a simple mathematical manner, it is necessary to disregard certain factors in the cases; and the theoretical conclusions reached can only be taken as approximate. M. Maréchal, in the work just quoted, as well as in "Le Génie Civil" for Jan. 11, 1896, developed a method by which, from the characteristic photometric curve of a source of light, the illumination on the ground could be deduced, and *vice versa*.

It can be seen that even in the case of illumination at very short distances, but particularly at the greater and more usual distances, the source of light should give its maximum effect well above the 45° line; the variations in intensity being different from those of any existing lighting systems. In particular, the ray of maximum intensity with the unscreened electric arc, the photometric curve of which comes, as a rule, nearer to that of uniformly diminishing illumination on the ground, has not risen to any appreciable extent towards the horizontal passing through its source.

All known lamps and burners give, on the ground, illuminations in decreasing series which can be mapped out into concentric circular zones. In the case of a single light source, the isolux curves (of equal illumination) are practically circles; the framework or forked standards of the light only interfering with this distribution of the light. In the case of a street where the light sources A B C, arranged alternately on the two sides of the roadway, as shown in the accompanying diagram, form a diamond-shape pattern, the curves of equal illumination are circles which are distorted in consequence of the proximity of the other sources.

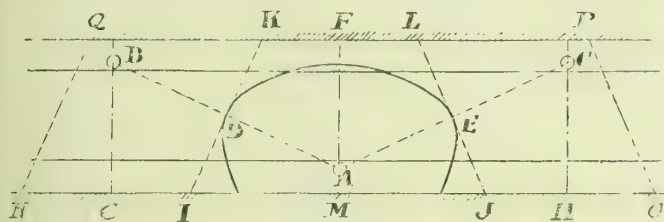


Fig. 1.

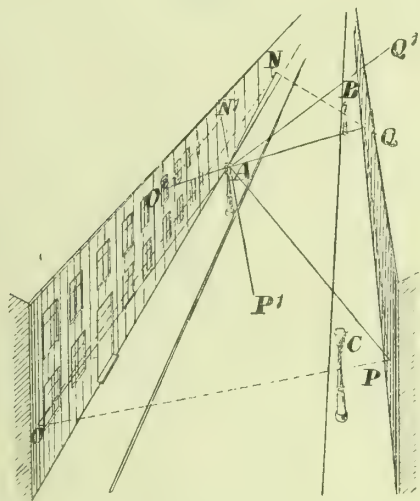


Fig. 2.

There are thus points D E F G H of minor illumination and I J K L of minimum illumination. In order to produce uniform illumination over the whole area of the street by means of light sources having photometric curves of even illumination, it would be necessary that the area illuminated by a source A should be limited exactly either to the area I J K L or to the rectangle formed by the lines B G and C H, if adjacent lights are to overlap by halves. The distribution of the light should vary with the azimuth. On the first hypothesis—a luminous flux—the light emitted should be greater in the directions A I, A J, A K, A L, than in the direction A F, A D, A E, and particularly A M.

If the light sources are taken as giving characteristic curves of evenly decreasing illumination which is more nearly in accordance with practice, for the light source A the illuminated area will be

limited to a figure which, for the sake of simplicity, we will assume to be a trapezium N O P Q. The luminous flux would then be prolonged into the directions A N, A O, A P, and A Q, contracted along A F, intensified along the lines A L, A K, A I, and A J, and both contracted and reduced in the direction A M.

Coming to the subject of reflectors and prisms, the author pointed out that of the methods adopted for the correct natural distribution of light, the diffusing globes of Frédeau and the reflectors (sometimes combined with prisms) of Habrowski deserve to be named among the most notable attempts in this direction. With these, the same distribution of light is obtained whatever is the meridian plane considered. The author's aim, however, has been to produce a distribution varying with the azimuth, and with the various purposes of the lamps. The reflectors of lamps used in street lighting cut down the solid angle of the illumination. This applies to incandescent gas or electric lamps provided with a reflector, as well as to arcs or high-power incandescent burners fitted with a globe and an outside shade or reflector. In the case of the square street-lamps, the solid angle is a very open quadrihedral ($A O^1 N^1 P^1 Q^1$) and is more often cut down by the supporting framework than by the edges of the reflectors. The form which the reflectors should have has not been thoroughly studied. Regard has most often been paid to ease of manufacture and of fitting to the lamps, &c. As M. Lévy has pointed out in his "Eclairage à Incandescence par le Gaz" (1905), "the chief consideration in public lighting is to give as strong an illumination as possible on the ground," without causing, in the neighbourhood of the burners, patches of extra brilliancy separated from each other by dark areas. A good reflector should be devised so as to use the light in the best way, and remove the reflected rays as far as possible from the burners. This latter condition rules out all simply concave or conical burners which give bundles of rays ranging from parallelism to divergence.

In devising a series of reflectors, the author has therefore kept before him the double task of economizing the light by reducing the solid angle of illumination and of distributing the light in a manner varying with the inclinations and with the azimuths, and affording, as far as possible, an illumination uniformly diminishing in the various meridians.

In the case of the diamond-pattern arrangement of street-lamps shown in the diagram, where reflectors of parabolic section are fitted to incandescent gas or electric lights, the rays of light will be intensified in the directions A L, A K, at the expense of those in the direction A M. The flow of light will thus be concentrated in the directions A K, A L, A I, A J. The forms of the reflectors will vary with the particular light sources employed. They are prepared on theoretical lines, and are corrected by practical trial. In order not to multiply patterns, they will be of forms capable of being utilized within fairly wide limits. Moreover, the reflector can be mounted upon an upright standard attached to the lamp, so that it can be used at a greater or less height above the source of light. Special forms of the reflector will be required—for example, in the case of light sources placed in the centre of the roadway or in the angles formed by sharp turns of the road. A reasonable estimate of the light which is saved by this system of reflectors is one-third or one-fourth—that is to say, the production of a given light with 90 litres (3.18 cubic feet) of gas per hour instead of with 112 litres (4 cubic feet) in the case of a 120-litre (4.23 cubic feet) burner. The author expressed the hope that he would be able to give next year some results of practical trials of his system.

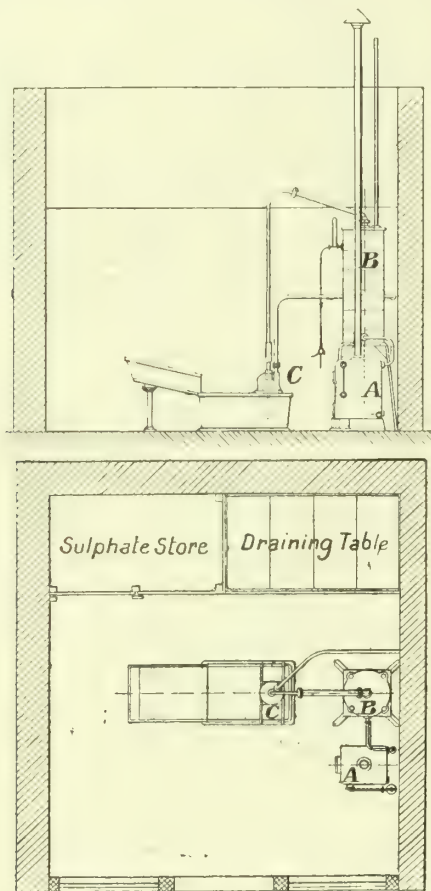
TREATING AMMONIACAL LIQUOR IN SMALL GAS-WORKS.

By M. FERDINAND CHEVALET.

[Abstract of a Paper Read before the Société Technique du Gaz.]

In small gas-works, managers are now almost compelled to deal with their ammoniacal liquor. It cannot be allowed to escape, and if it is sold in its crude state, it has to be stored for the greater part of the year, as the time for selling it is the autumn. The small maker has consequently to produce either sulphate of ammonia or a concentrated liquor, in doing which attempts have frequently been made to use an installation of the kind employed on the large scale. This, as a rule, means the full time of a workman, whose wages practically amount to the price of the manufactured product. Constant attention is needed for the small boiler, in the matter of fuel and water; and such an installation, besides producing disturbing variations of pressure, requires a good deal of supervision in the way of cleaning the boiler and keeping it free from scale. With the object of dispensing with both the steam-boiler and its attendant, the author constructed in 1878 sulphate plant heated by thermo-syphon tubes placed in the flues of the furnaces, or, better still, in a special flue along which some of the hot gases were caused to pass. The liquor was distilled in a series of boilers working at only atmospheric pressure; the distilled vapours reaching the sulphuric acid *via* a leaden bell, from which the objectionable gases passed off. The apparatus is described in M. Vincent's work, "Industrie de Produits Ammoniacaux," published in Paris in 1884, though the method has recently been brought out as novel. The apparatus has answered well for many years in different works; but there are difficulties

in controlling the heat, in consequence of the over-heating of the furnaces, thus leading either to incomplete treatment of the liquor or to dilution of the acid baths according to the presence of too little or too much steam. The *crux* of their proper action is the amount of supervision available. To avoid the steam-boiler, the author installed in several works distilling about 300 tons of coal sulphate plant of another type. It consists of a still of column form; the liquor entering at the upper part. The residual liquid finds its outlet at the base of the still, whence it passes to a boiler heated by an open fire. The boiler is similar to one used for generating steam in the ordinary way; but the feed is constant, and no supply pump or injector is necessary. It also works at the ordinary pressure. Hence the services of an attendant are not absolutely necessary. By using a large grating, so as to be able to burn a mixture of coke and slack in the furnace, an almost regular supply of steam is obtained. With the object of further reducing supervision and manual labour, an apparatus was designed in 1902 very similar to the one just mentioned, but with the heat obtained from a furnace formed by a kind of Siemens generator of very small size, which was charged with coke about every three hours. This answered all the expectations, and the workman had only to fish out the sulphate and look after the furnace. Yet here again there was a drawback of the irregular supply of steam.



The Chevalet Sulphate Plant.

Further study led to the production of a type of plant which is practically automatic. At any rate, when once adjusted, the only thing the workman has to do is to keep in it a sufficient supply of fuel. It will be seen from the accompanying illustration that it consists of a distilling column B, provided with constant feed, supplied with steam from a boiler A, furnished with a hopper for the fuel. The boiler is fed by the exhausted liquor from the still. The flow of liquor is regulated by the tap C. An automatic syphon draws off this exhausted liquor to the boiler, while the steam enters at the lower part of the distilling column. The air supply of the furnace, and therefore the production of the steam, is controlled by a temperature regulator, which forms the essential part of the apparatus, and is protected by patent. The products of distillation are collected either in a sulphuric acid bath or in an upright washer. The form of the installation and its constant action do not admit of the use of lime for decomposition of the fixed ammonia. About 10 per cent. of the ammonia is thus lost; but the plant gains in simplicity of construction.

In the practical use of the apparatus for the production of sulphate of ammonia and concentrated liquor, it has been found that for the former the installation can be left entirely to itself, except the filling of the coke-hopper every four hours. This is done without touching any of the cocks of the apparatus, and on the night shift may be entrusted to one of the men. Distillation can, however, be suspended during the night-time without prejudice to the saturation of the bath on resuming work in the morning. The removal of the sulphate to the drainer requires a couple of hours' work; but except for this, and the replenishment of the fuel, no manual labour whatever is needed. For fuel, the boiler

uses No. 1 coke—2 bushels per 220 gallons of the liquor treated. As to whether sulphate or strong liquor should be made, will depend, of course, on the market price of sulphate, sulphuric acid, and liquor. As a rule, it is more advisable to manufacture sulphate.

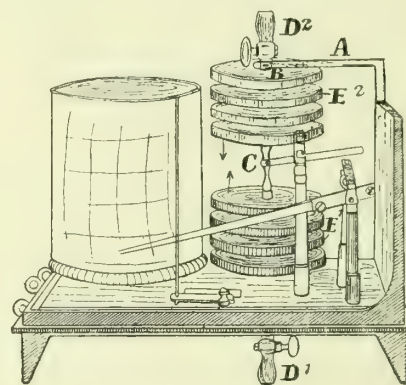
In conclusion, it may be said that most of the complaints in regard to the treatment of ammoniacal liquor arise from the use of defective plant procured by sparing expense in the first instance. The author would get rid of all vessels with soldered joints, and replace them by those with hammered joints. The former are constantly developing leaks and entailing costly repairs; while, owing to the variations in temperature, their life is short. With proper apparatus, it is possible, in works where 1000 tons of coal are carbonized per annum, and where the gas is well washed, to work up the ammoniacal liquor at a profit.

A NEW FORM OF PRESSURE-GAUGE.

One of the papers submitted at the recent Congress of the Société Technique du Gaz en France was on "A New Form of Pressure-Gauge." It was by M. Albert Largeron; but owing to his absence, it was not read.

The author began by remarking that information of a most useful kind being obtainable as to the operations of gas manufacture from a precise knowledge of the variations in pressure of the gas on its way from the retorts to the mains, simple means of automatically recording such variations should be of interest. As a rule, each piece of plant in gas-works is fitted with a pressure-gauge at both the inlet and the outlet. The differential pressure-gauge is a combination of these two instruments, since it gives the variation in pressure, and, by means of the cocks, which communicate with the atmosphere, also the absolute pressure, at any point. Such information obtained by observation is useful, so far as it goes; but it depends upon the watchfulness of attendants, and may, therefore, at times be neglected. Moreover, it is impossible to obtain in such a way a simultaneous record of pressure variations in all parts of the plant. The author, therefore, sought to provide the means of attaining this end; the apparatus described by him having the advantage of recording automatically actual pressure and changes in pressure. Only one instrument is needed on each apparatus or point where observations are to be made.

Inside a box of metal resembling a miniature purifier, a registering pressure-gauge is placed. The lid of the box is pierced with two holes, into which cocks are screwed. One of these connects the pressure-gauge with the inlet and the other with the outlet of the apparatus under examination. Thus arranged, the box receives two pressures—one being that of the inlet the other that of the outlet. The first tends to enlarge (excess of pressure), the second to contract. Thus the movement of the stylus is proportional to the difference of pressure—that is to say, to the change in the pressure of the gas in passing through the apparatus. This, of course, can be correct only when it is assumed that for pressures which are equal and in opposite directions the box performs oscillations of the same amplitude. In this way, records are obtained of changes taking place in pressure.



The value of these records led the author to convert the usual indicator into another equally simple in construction. The process consists in adding a second box in alignment with the first; the moving end being connected to the same point on the control lever of the stylus in such a way that the movements of the one are directly the opposite of those of the other. From the construction of the apparatus, it follows that for equal pressures in the two boxes the stylus will point to the zero mark. The same apparatus will register pressures; a cock being employed to connect one of the boxes with the atmosphere. As already noted, the equality of amplitude in the case of each box is the condition of correct indications.

Accompanying the paper was a record of a "Duplex" station meter of 1½ million cubic feet capacity, showing the changes in pressure corresponding to different periods in the distillation. Another diagram showed the change of pressure in the first of a group of three scrubbers; and a third represented the working of three scrubbers over a period in which an obstruction occurred

in one of them—the diagram being obtained without checking the gas.

The accompanying illustration shows a Coultolenc apparatus converted into a register of changes in pressure by the addition of a second manometric box. A standard A supports the box in the fixed position B. The two boxes are joined at C by the extreme ends of their moving parts. The cocks D₁ and D₂ establish communication between either box and the apparatus under examination. The two boxes have a common vertical axis; and it will be seen that the effect of gravity upon the first is to reduce the amplitude of the oscillations of E₁ and, upon the second, to increase that of E₂. Under this condition, it would be better to make the common axis horizontal.

TROUBLES WITH PRODUCER-GAS ENGINES.

The following letter, which appeared in the "Mechanical World" for the 1st inst., will probably be perused with interest by many of our readers.

I suppose no prime mover ever invented has been more productive of impolite, and often lurid, terminology, than the gas-engine running on producer gas. Its vagaries and erratic behaviour worry the owner, and gradually produce "nervous prostration" in the attendants. I have four running continually (or endeavouring to) on Dowson gas; two of which were designed for town gas, and the others for either producer or town gas. The last mentioned give the most trouble. The ignition is by magneto; and the very infrequent trouble here is easily located. The generator plant has been operating some eight years, and supplies the engines through different mains from a large gas-holder. Various combinations of fuel (coke and anthracite) have been tried, scrubbers kept scrupulously clean, engine valves and cylinder heads overhauled and cleaned weekly—in fact, everything done that time and brains could suggest or money buy. But even this constant watching and attention still fails to dispel that "haunting fear" or premonition of receiving still another message from the power-house to the effect: "No. 2 started to back-fire" (or something equivalent). "Lost the load before No. 3 could take it over. Have examined valves, ignition, &c., but can find nothing wrong."

Papers have been read, text-books written, and many articles published in the Technical Press on producer gas and its applications; but no definite or exact rules, so far as I am aware, have been given enabling one rapidly to locate and remedy producer-gas troubles. The design of the engines may possibly be faulty; but this will not account for such engines taking spasmodic fits of "back-firing," especially after working well for a considerable time. Engine makers often ascribe the trouble to dust held in suspension in the gas; but on filtering through a bye-pass and cotton wool the filtrate (if any) will be found of a tarry nature, entirely different from dust.

My experience leads me to think that the gas varies very considerably in its composition, probably due to the manipulation of the generator and the "hit-or-miss" principle of balancing the proportions of fuel and steam. What I believe is really required is a "recording analyzer" (something like the "CO₂ Recorder"), giving a time record of the variations of the most important components of the gas. The mere burning of an open jet, and judging from the appearance of the flame, is of little or no value. Barometric influences (regarded by some as a cause of trouble) can be neglected, as they are balanced by regulation of the air-cock.

The Editor of our contemporary invited other contributions on the subject; but, so far, they have not been forthcoming.

NATURAL GAS AND PETROLEUM IN AMERICA.

The President of the Society of Chemical Industry—Mr. Ira Remsen, of the Johns Hopkins University, Baltimore (Ma.)—devoted a portion of his Inaugural Address at the annual meeting of the Society held in Glasgow last week, to the subject of natural gas and petroleum in America. He led up to it with some remarks on the present excessive use of coal and pointed out that more economical methods of combustion are loudly called for. He said one check on coal consumption was found in the use of other forms of energy for the production of heat; water being the chief factor. On the subject of coke production, he said there was a marked improvement in the direction of economy. There was an increasing demand for the bye-products—gas, tar, and ammonia. With regard to coal tar—that "magic substance, that Pandora's box"—this was of much less economic importance in America than in some European countries. Why this was so it was not easy to say, though no doubt the tariff and labour were important factors. At the present time, coal-tar manufacture in the United States was confined principally to the production of creosote and of tars and tar pitches suitable for making roofing papers, paving materials, &c.

Coming to the subject of natural gas and petroleum, the President said that Mr. I. C. White, an eminent geologist of West Virginia, one of the speakers at a conference of the Governors of the United States, scientific men, and others, held at the White House in May, 1908, dwelt especially on the waste of the country's fuel resources. He had for years been a daily witness of the great waste of natural gas, and expressed himself strongly on the subject. He said: "The record of waste of this best and purest fuel is a national disgrace." He then continued: At this very minute, our unrivalled fuel is passing into the air from uncontrolled gas wells, from oil wells, from giant flambeaus, from leaking pipelines, and the many other methods of waste, at the rate of not less

than 1000 million cubic feet daily, and probably much more. The heating value of a billion cubic feet of natural gas is roughly equivalent to that of a million bushels of coal. What an appalling record to transmit to posterity." The President went on to remark that the rapidly extending use of natural gas is of importance as a check on coal consumption. The city of Baltimore, which has a population of about 600,000, is now engaged in negotiations which will probably lead to the introduction of natural gas from the oil-fields of West Virginia, about 200 miles distant. The gas can be furnished at a considerably lower price than water gas, which is now used for illumination and to some extent for heating. Several advantages it is thought will accrue from the introduction of natural gas. The illumination will be less costly, and the gas is a cheap fuel as compared with coal. The industries as well as households will, no doubt, make extensive use of it, and will find it profitable to do so. But, more than this, the substitution of natural gas for coal as a fuel will make Baltimore a cleaner city than it now is, though it has not suffered as much as many other well-known places from the curse of smoke.

Passing to the subject of petroleum, the President pointed out that there is now but little waste of it. There is, however, opportunity for waste in the process of refining; but this has been managed with such skill that only 1·5 per cent. is lost. When petroleum was first refined, kerosene was naturally the most important product—in fact, it was about the only product that was useful. After the kerosene was extracted from the crude oil, the rest was thrown away. To-day kerosene is relatively less important than formerly. It is hard to say which can be called the residual and which the principal products. There are at present nine products or classes of products obtained from petroleum. Their names are given in the subjoined table, together with the yield of each class in percentages, and the total production in the United States for 1909. This is stated in barrels with the exception of coke, the figures of which are tons.

Kind of Product.	Per Cent. Yield.	Production in 1909.
Kerosene	20·50	15,000,000
Lubricating oils of all kinds, including greases	10·00	7,500,000
Naphthas, all grades	15·00	11,250,000
Gas oil, used for enriching water gas	30·00	22,000,000
Paraffin wax	1·50	1,125,000
Roofing pitch	2·50	1,875,000
Paving pitch and road-making oils	2·00	1,500,000
Coke	3·00	300,000
Fuel oil	14·00	1,050,000
Loss in manufacturing		98·50 } 100 1·50 }

In closing his remarks on this subject, the President dwelt on the fact that, in working out the problems of the petroleum industry, chemistry has played an important part. In addition to the general problems involved in refining, there is a special problem that was presented by the petroleum found in the neighbourhood of Lima (Ohio), and known as Lima oil. The deposits are very extensive; but for a long time it was impossible to use the oil on account of the presence in it of small quantities of sulphur compounds, which gave it a disagreeable odour not adapted to the uses of the household. Chemistry solved this problem, and made available immense quantities of petroleum that otherwise could not be used.

USE OF ALUMINIUM IN GAS-WORKS.

In a "note" presented to the meeting of the Société Technique du Gaz, M. Camille Roche points out that the price of aluminium having now fallen from 5 frs. to 2 frs. per kilo., the use which can be made of the metal in the gas industry becomes of considerable interest. Despite the difficulties which have been experienced in working it in the past, aluminium has been found of great utility in a number of trades; and a notable feature of importance with respect to its use in the gas industry is its immunity to vapours containing sulphur in any form (sulphurous acid, hydrogen sulphide, &c.), as well as the gases from purifiers and spent oxide, containing a greater or less proportion of cyanogen compounds. In like manner the metal is unaffected by ammonia and its compounds. The immunity which it enjoys to sulphur and ammonia vapours has permitted of use being made of it in place of copper for several purposes in the writer's experience. Copper electrical conductors of a diameter of 56·10 mm. formerly passed to the outside air above the retort-house doors. They were fixed about 6 metres in the air, and were thus exposed to all the sulphurous vapours arising from the quenching of the coke. Two years' exposure sufficed to corrode them completely; but on replacing the copper by aluminium, the necessity of renewing them has been obviated.

Again, the electric switch-board in the exhauster-house had its copper parts attacked by the ammonia and covered with a brown deposit. The contacts which could not be soldered to the board were thus affected, and heated unless they were constantly cleaned, while those of aluminium installed side by side with the copper do not give rise to the slightest trouble.

Compared with brass, aluminium exhibits a degree of resistance to the residual sulphur compounds in gas which confers a much longer life upon all vessels or fittings for which it is used. It may be employed, instead of brass or bronze, for many purposes with

great advantage. It can be brazed as readily as other metals, and takes quite a good polish; while taps, &c., work easily and form tight joints.

Aluminium tube, it should be stated, is made in all sizes and thicknesses. The diameters of from 6 to 15 mm., with thickness of wall from 12-10 to 15-10 mm., are suitable for gas-fittings, and are the same as those adopted for brass. Also all bronze foundries prepare very clean castings of aluminium, and the parts are turned with the same tools as for bronze. In brazing aluminium parts together, a certain discoloration is produced; and therefore fittings, &c., should be made up so that the brazed joints do not occur where they are prominent. The writer has had constructed a variety of gas-fittings, the cost of production of which in aluminium has been below that in brass, though larger tubes—15 mm. as against 10 mm.—were employed. These fittings are more rigid and have a better appearance; the pleasing colour of the aluminium obviating the cost of decoration. Added to these advantages is the fact already mentioned, of immunity to the products of combustion of the gas, which feature alone provides an inducement to adopt aluminium.

The metal has likewise been applied for the mountings of manometers in the works; the sulphur gases quickly causing the cocks of the brass instruments to stick. Substitution of the brass by aluminium has been followed by most satisfactory results, inasmuch that aluminium cocks were also fitted to the Pelouze and Audouin apparatus and to the washers and purifiers. It would be interesting to try the metal for the drums of meters.

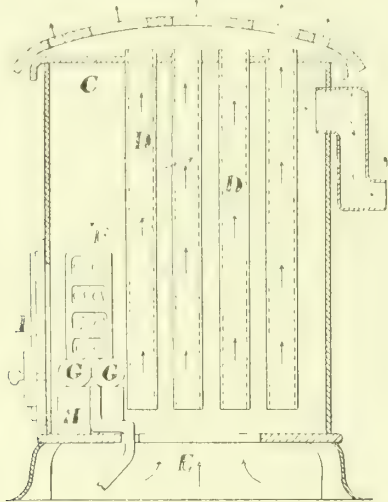
REGISTER OF PATENTS.

Apparatus for Heating Air.

CLOAKE, A. G., of Holborn Viaduct, E.C.

No. 654; July 10, 1909.

This arrangement for heating air by means of gas relates to that class of apparatus wherein a chamber, having in it a series of tubes through which the air to be warmed is passed, has a receptacle for the fuel arranged within it, so that the products of combustion of the fuel are caused to pass over the tubes, and are then led to a chimney or flue, so that they do not mix with the air being warmed.



Cloake's Gas-Stove.

In the vertical central section shown of the apparatus, the sheet-iron or cast-iron body is at the lower end supported upon a base-plate, while at the upper end it carries a plate C, in which a series of air-tubes D are fixed; so that the air which enters through an opening E in the base-plate will pass upwards through the tubes D and enter the compartment to be warmed. F is a basket adapted to contain the lumps of asbestos or other material to be rendered incandescent; the basket being carried upon a stand G and being arranged in conjunction with a pipe H, through which a mixture of gas and air is passed for the purpose of heating the material in the basket. I is the door adjacent to the basket, and provided with transparent panels. The products of combustion pass in the direction of the arrows to a flue pipe J arranged in the body of the stove.

Mouthpieces or Ascension Pipes of Gas-Retorts.

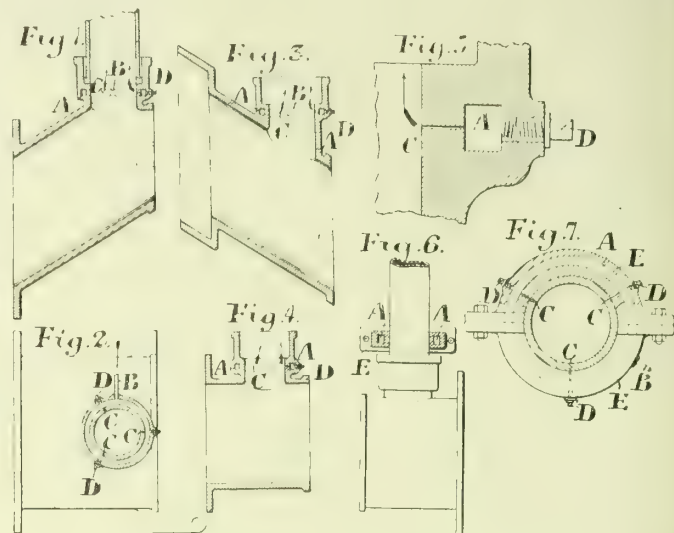
FARQUHAR, W. B., of Ilford, Essex.

No. 13,982; June 15, 1909.

This invention has for its object to provide "more convenient and efficient means than heretofore for introducing steam into the ascension pipes of gas-retorts in order to keep them moist, and thus prevent them from getting stopped up by deposits."

Previously, as the patentee points out, it has been proposed to force water or steam into the mouthpiece or ascension pipe, through suitable pipes passing through the mouthpiece or ascension pipe—the pipes in some cases being provided with removable plugs to permit of a wire being inserted into the pipes to clean them. According to the present proposal, the steam, before passing into the branch-pipe or ascension-pipe, first passes into an annular channel cast in one with the branch

pipe, or the annular channel is fixed to the branch or ascension pipe; the channel being provided with radial perforations through which the steam passes.



Farquhar's Retort Mouthpieces and Ascension Pipes.

Fig. 1 is a sectional side elevation of an inclined retort mouthpiece with the invention applied to the ascension pipe socket in same. Fig. 2 is a sectional plan of fig. 1. Fig. 3 is a sectional side elevation of another form of inclined retort mouthpiece. Fig. 4 is a sectional side elevation of a horizontal retort mouthpiece. Fig. 5 is a sectional elevation of part of the socket (on a larger scale). Fig. 6 is a side elevation of a horizontal retort mouthpiece and ascension pipe. Fig. 7 is a part sectional plan of fig. 6 (on a larger scale).

In figs. 1 to 5, the socket is cast with an enclosed annular channel A round the base of it, forming an annular steam passage all round the bottom of the socket and connected by the pipe B to a suitable steam supply. Passing transversely through the channel A, there are (preferably three) radial or tangential holes of suitable size (say $\frac{1}{2}$ inch more or less) through the outside wall of the channel, and then drilled at C to a much smaller diameter through the inner wall of the branch pipe at the base of the socket. The holes in the outer wall are plugged with removable screwed plugs D; and through the holes in the inner wall the steam issues from the annular space A as fine jets into and up the ascension pipes, thereby keeping them moist. In case the jet holes C should get stopped up, they are easily cleaned by first removing the corresponding plug D from the hole in the outer wall of the channel A and inserting a prickler.

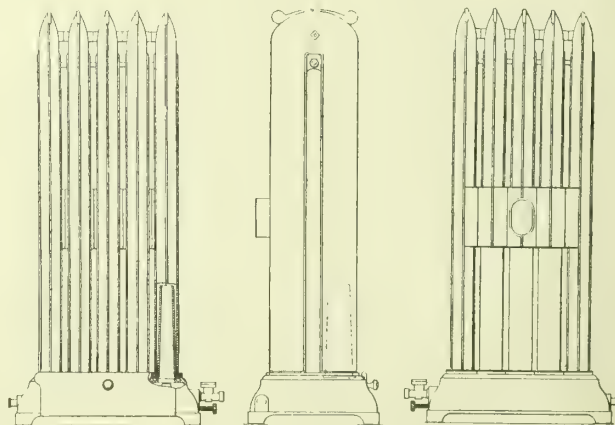
Instead of the annular channel A being cast in a piece with the socket of the branch of the mouthpiece, the channel is formed as a separate annular pipe embracing the ascension or rising pipe, or embracing the branch pipe on the mouthpiece at the base of the socket (which branch pipe would then be made longer than shown) and furnished with a steam connection for the steam supply, and also having small nipples, holes, or branches which correspond with the steam-jet holes C in the ascension or rising pipe, or in the branch pipe at the bottom of the socket to form the steam-jet. An example of this modification is illustrated in figs. 6 and 7, where the ascension or rising pipe is enclosed by the annular steam-pipe E made in halves to fit round the pipe—the halves being bolted together. In the outer wall of the pipe holes are tapped, fitted with screwed plugs D, and in the inner wall there are the smaller steam-jet holes, which are, as shown in fig. 7, continued through the pipe; so that the steam-jets will pass from the steam space A in the pipe E into and up the interior of the rising pipe.

Gas-Heated Radiators.

YATES, H. J. (John Wright and Co.), of Birmingham.

No. 20,828; Sept. 11, 1909.

This invention, relating to gas-heated radiators of the non-condensing type, comprises the employment, at the rear of a number of independent or separate elements mounted over a burner provided with a flame-



Yates's Gas-Heated Radiator.

orifice beneath each element, of a discharge box or chamber with which all the elements communicate, and from which the burnt gases are withdrawn by a flue-pipe or other conduit.

Each element (except the two end elements) is produced in the form of an inverted U-shaped tube of oval or other section, and having the rear member about one-half the length of the front member—the rear members of the end elements being continued to the same length as the front members. Each extremity of the short or rear members of the elements is adapted to form a section of a box or chamber; and the end elements are provided at corresponding positions with hollow lateral extensions or projections; so that, when all the elements are assembled in the usual order, the box sections and projections come together and form a complete box or chamber at the rear side of the apparatus. In conjunction with one of the box-sections is formed a branch, to which an ordinary flue-pipe is attached. All the elements are mounted on a base, beneath which is a burner with an outlet or flame orifice opposite each front member of the elements; while adjacent to the burner are suitable gas and air regulating devices.

The illustration shows the construction in front elevation, side elevation, and rear elevation of a five-element radiator constructed in accordance with the invention.

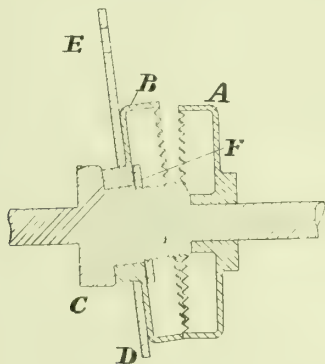
Stop-Mechanism for Prepayment Gas-Meters.

MILNE, J., and ALEXANDER, W., of Edinburgh.

No. 20,952; Sept. 14, 1909.

This invention relates to meters in which the valve controlling the supply of gas is opened by the coin-operated mechanism and closed (after a predetermined consumption) by means of gearing connected to the ordinary meter-registering mechanism. The operation is effected by a pair of crown-wheels having a different number of teeth, but always in gear at one part of their periphery.

One (A) of the pair of crown-wheels is fixed to the gearing connected with the meter-registering mechanism, so that it cannot be rotated except by the working of the meter. The other crown-wheel B is carried loosely by a nut or washer F, against the bevelled collar C, which is connected to, and rotated by the operation of, the coin mechanism—the two crown-wheels being always in gear at one part of their periphery. To the wheel B is fixed a disc D, on the periphery of which is a slot E, in which the valve spindle is carried. The slot is so disposed that a partial revolution of the crown-wheel on which the disc is mounted causes the valve-spindle to be moved forward or backward—thus opening or closing the valve controlling the supply of gas to the meter.



Milne and Alexander's Stop-Mechanism for Prepayment Meters.

After the insertion of a coin, the bevelled collar C is caused to make a complete revolution. This rotation of the bevelled collar against the boss of the wheel B imparts to the latter an oscillating movement; and, furthermore, in consequence of this wheel containing a different number of teeth to that of the wheel A, into which it gears (the latter being held stationary owing to its being in connection with the gearing of the meter-registering mechanism), the oscillating wheel B is given a rotary movement. This movement is proportional to the difference between the number of teeth of the two crown-wheels, and is either in one direction or the reverse, according as the number of teeth in the wheel B is greater or less than the teeth of the wheel A into which it gears. This partial rotation of the wheel B, and the slotted disc D which it carries, causes the valve to be opened so as to pass gas to the meter. The working of the meter imparts rotary motion to the wheel A carried by the gearing attached to the meter-registering mechanism; and as this wheel is always in gear with the oscillating wheel B, it causes the latter to revolve with it. As, however, the movement thus given to the wheel B and disc D is arranged to be opposite in direction to that imparted by the operation of the coin mechanism, the valve is closed after a predetermined quantity of gas has been passed through the meter—a quantity regulated by gearing interposed between the meter-registering mechanism and the driven crown-wheel A.

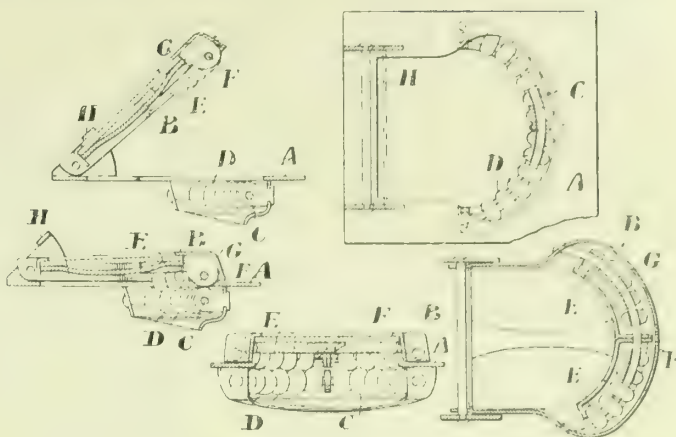
Torch Traps for Street Lamps.

PARKINSON AND W. & B. COWAN, LIMITED, and CHESHIRE, W., of Birmingham.

No. 23,299; Oct. 12, 1909.

This invention relates to the hinged traps or flaps of street and analogous lamps—more particularly that type in which anti-friction devices are carried by the front edge of the hinged flap member or trap proper and also by the corresponding edge of the torch opening or aperture in the carrier or base frame to which the flap is hinged, so as to facilitate the insertion of the torch and prevent damage to it.

The trap comprises a horizontal foundation plate or base frame A (forming part of the bottom of the lamp), provided with a central aperture through which the torch is inserted, and to one side of which the trap or flap member B is hinged. Below the front edge of this central aperture a semi-circular or curved wire rod C is carried, upon which a



Parkinson and Cowan and Cheshire's Street Lamp Torch Trap.

number of balls or rollers D are loosely strung or threaded. The ends of the wire carrier rod are threaded through, and supported by, a pair of lugs or brackets at the opposite ends of the guard casing, and is further supported at about its middle by a third lug or ear suitably attached to the frame. The front edge of the hinged trap B is similarly provided with a series of balls E loosely threaded upon a curved wire carrier rod F, the opposite extremities of which are threaded through, and supported by, the ends of an overhanging or hollow front part G, and also supported at its middle by lugs. When the trap is closed, the anti-friction balls E thereon fit within the inner circumference of the ring of balls D on the frame, and lie close up to them.

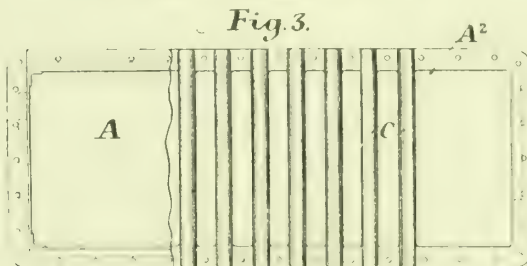
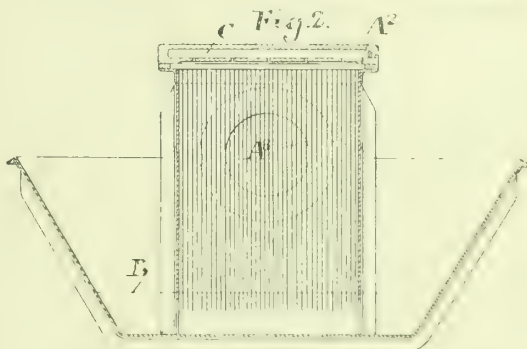
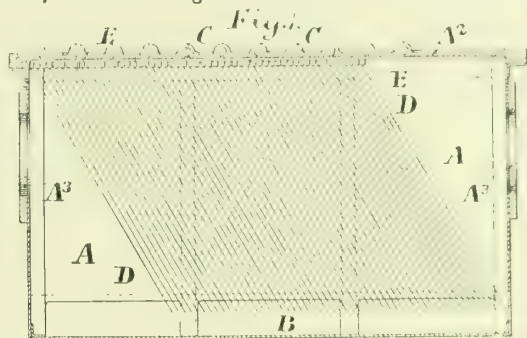
The trap automatically falls by gravity and closes the aperture when the torch is withdrawn from the lamp. To prevent the trap being thrown too far back when the lighting torch is introduced into the lamp, a stop H is provided.

Separating Tar from Combustible Gases.

BURSTALL, F. W., of Birmingham.

No. 24,261; Oct. 22, 1909.

Within a gas-tight chamber or box through which the gas to be operated upon travels, either by a slight suction or pressure, the patentee provides numerous vibrating or quivering wires, or wire-like lengths, each of which has one end free or unsupported; and he arranges, in connection with the wires, a number of water, steam, or other inlets, which discharge into the chamber or box and on to the



Burstall's Tar Extractor.

wires at an angle to the wires, so that the combined actions of the gas treated flowing through the chamber and the spraying water set up a continuous vibrating or quivering effect of the wires, through which the gases to be treated must pass during their passage through the chamber.

A "desirable form" of the invention for extracting tar from combustible gas is represented, on p. 121, by a longitudinal section (fig. 1), a transverse section (fig. 2), and a partial plan (fig. 3).

The chamber A is a stationary one enclosing a good space, and is provided with a removable lid A², gas inlet and outlet A³, and a water-sealed bottom B; it being otherwise entirely a gas-tight structure, maintained also in this respect by the lid and the inlet and outlet branches. In connection with the lid are provided a number of water-passages C, through which numerous small openings communicate with the interior of the chamber in such manner that the water is sprayed into the interior. Longitudinally of the chamber the wires D are numerous, and extend at small distances apart right across the interior of the structure, with their one ends E fixed, and their other ends free. As all the wire lengths are between the inlet and outlet, and extend almost the full depth of the interior of the chamber, the gas passing through must be broken up and made to flow in a circuitous manner through the greater part of the whole of the wires, "particularly having regard to the fact that the chamber is much larger in depth and width than the inlet and outlet, which is desirable, and compels the expansion of the gas within the interior of the apparatus." Each of the wires is able to vibrate or quiver independently; and it is not intended that they should touch at any time. It will be seen that the water inlets are arranged at an angle to the wires.

In action, it is believed that the wires vibrate or quiver within a dense water vapour or atmosphere provided by the liquid, and that the tar in suspension clings to the wires and gradually trickles downwards off their free ends into the bottom of the chamber, where it can be removed; the vibrating or quivering of the wires being effected by the combined actions of the gas passing through the box and the water spraying on to the wires.

The water seal at the bottom of the chamber is sufficient to prevent any gas finding its way through; and it is intended to provide so that the same water may be used over and over again by pumping the surplus of the seal into a pressure tank or pump supply suitably situated and connected up to the passages C, which preferably have their inlets alternately placed on different sides.

It is preferable, the patentee points out, to rigidly connect a number of wires at their one ends to a bar E, whose length extends transverse of the chamber, as shown in fig. 2. This bar is narrow, as shown in fig. 1, and is fixed rigid between the top of the body of the chamber and the lid. The bar carries a single row of wires, each of which is placed a small distance apart along the bar transversely of the chamber. Longitudinally of the chamber a number of such wire-carrying bars are fixed at distances apart to cross the chamber, with spaces between the bars for the free passage of the water on to the wires.

Although the invention has been mainly designed for the purpose of extracting tar from combustible gases, it is equally applicable for extracting or separating other suspended matter from gases, as, for instance, for recovering ammonia, in which case the wires would be coated with lead. The washing material, dependent upon the gas treated, could be either oil, tar, or an acid or alkali.

APPLICATIONS FOR LETTERS PATENT.

- 15,329.—BARKER, W. H., JUN., "Conveyors for coal." June 27.
 15,349.—BREEDEN, J., AND CO., LTD., and BREEDEN, F., "Valves for radiators." June 27.
 15,351.—GUEST, A. A., and GIBBONS, W. P., "Machines for discharging and charging gas-retorts." June 27.
 15,384.—PACE, P. C., "Generating combustible vapour." June 27.
 15,398.—HOWLIN, W., "Automatically opening and closing cocks, valves, and the like." June 27.
 15,408.—TREZISE, J. M. G., and SHEPPARD, W. J., "Photometers." June 27.
 15,411.—WILDE, P. R., "Utilizing the waste heat of combustion products." June 27.
 15,413.—HIND, R., "Regulating the supply of gas." June 27.
 15,428.—CASSADY, G., "Fluid pressure engines." June 27.
 15,435.—SCHUCHARDT, G., and A. FRISTER AKT.-GES., "Incandescent burners." June 27.
 15,447.—BELL, G., "Regulating the supply of gas." June 28.
 15,488.—GROSSER, J., and FLEISCHER, J., "Gas-heating stove." June 28.
 15,512.—IONIDES, A. C., JUN., and SWAN, J. B., "Producing a combustible gas." June 28.
 15,533.—LIDDALL, J., "Cooking-stoves for gas and solid fuel." June 28.
 15,585.—YOUNG, F. B., "Automatic gas lighting and extinguishing device." June 29.
 15,687.—HUGUENIN, A., "Producing a difference of pressure in water, gas, and like mains." June 30.
 15,707.—TEED, F. L., SULMAN, H. L., and PICARD, H. F. K., "Recovery of sulphur from gases." June 30.
 15,741.—ROBSON, G., "Automatically operating gas-burners." June 30.
 15,747.—CHEVRETOT, H. A., "Automatic temperature recorder." June 30.
 15,817.—CHRISTIE, M. G., "Manufacture of ammonium sulphate." July 1.
 15,861.—STOBIE, V., "Gas-producers." July 2.
 15,877.—BURKHEISER, K., "Preparation of ammonium sulphite or sulphate from gases." July 2.

New Water-Works for Bacup.—The Cowpe water undertaking of the Bacup Corporation, which was commenced in 1901, and has involved an expenditure of upwards of £230,000, will be officially opened on the 21st inst., by Mrs. J. H. Maden, of Rockcliffe House, the Mayoress of Bacup. The scheme includes a large low-level and a small high-level reservoir; the former having a capacity of 150 million gallons. When full, the large reservoir will have a water surface of 15½ acres; and it is estimated that it will yield a supply of 625,000 gallons per day, after discharging the compensation water the Corporation have to furnish.

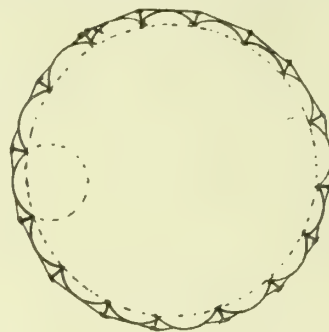
CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gasholder Tanks with Bulging Sides.

SIR,—The bottle-shaped gasholder tank described in the last issue of the "JOURNAL" is a most interesting and ingenious departure from the ordinary mode of construction. It is scientifically sound, and obviates the use of very thick plates for the sides of large tanks, which are a necessity in the ordinary form of construction.

The invention reminds me of a tank that I patented in 1901, for attaining the same object. This tank was formed with fluted sides, as shown in the sketch; the object being to reduce the strain on the sides,



by splitting them up into a series of circular arcs of much smaller radius than that of the tank, with vertical posts at the intersections, united by a ring girder at the top. Of course, the greatest objection to this mode of construction is the enormous stress on the top girder; and if I understand the "M.A.N." construction rightly, it is open to similar objections.

It would be most interesting if M. Bonnet would add the following information to that he has already so ably and clearly given:—

- (1) What is the section of the horizontal girder for the example described in his paper?
- (2) In fig. 4, "Polygon of Strains," does the "Strain on the Horizontal Girder" represent the horizontal outward radial force acting at the summit of each of the vertical posts? Surely it is not the actual strain or stress in the girder itself?
- (3) Are the posts put at a distance of 1 metre apart only all round the tank?
- (4) Do not these outward forces induce great stress in the horizontal girder circumferentially? If so, how much?

M. Bonnet's paper is, by far and away, the most interesting and novel that has appeared for a long time on the subject of gasholder tanks.

71, King William Street, E.C., July 7, 1910.

F. S. CRIPPS.

The Königsberg Chamber Settings.

SIR,—In the "JOURNAL" for June 28, I read the report of the meeting of the German gas men at Königsberg and the visit to the Königsberg Gas-Works.

I am the designer and contractor of the inclined furnaces reported on. The slight delay in discharging the last chamber originated through the four-weeks trial-run having come to a close the very morning of the visit. It was the forced run of this trial which had caused some carbon to collect on the roof of the chamber through overheating. This carbon prevented the coke at once leaving the chamber. In this connection, I may mention that the coal which is being carbonized at Königsberg does not allow too strong a heat of carbonization. With too great a heat, the cake of coke gets disconnected and with the carbon forming a ledge, this breaks off a piece of the cake and makes the remaining coke stick.

Accidentally, on this particular day of the meeting of our congressmen, the mechanical discharge had a mishap, causing hand labour to be applied to work otherwise done by the machine. Afterwards, when the carbon ledge had been knocked away, and this particular chamber received its normal charge and treatment, everything worked smoothly, as several witnesses next day could testify.

On the day of the visit of our gas men, the result of carbonization was 37 c.b.m. out of 100 kilos. of coal—thus showing that the slight hitch had in no way affected the good working of the furnaces.

May I here express my personal views, which are that (I am fully convinced) horizontal chamber furnaces of my system are superior to any other system of furnaces at present on the market. They are cheaper in construction; are less susceptible with different kinds of coal for carbonization; they use less fuel; and they produce a better gas. If there be higher costs for labour, these are more than compensated for by these advantages.

Dortmund, July 6, 1910.

AUG. KLÖNNE.

A Result of Electrolysis.

SIR,—I made the enclosed photograph a few days ago; and the facts connected with it will, I feel sure, be of interest to readers of the "JOURNAL." The photograph is a view of a piece of cast-iron casing-pipe, 2½ inches in diameter, through which passed an electric cable, insulated in the fashion in vogue some years ago. The history of the piece of pipe is as follows.

At midnight on Saturday, the 21st of May last, the police reported a serious escape of gas at all the electric-boxes surrounding one of the principal squares of this city. As all the gas-pipes in this particular square are in the roadway, and as the latter is laid in concrete and



sets, it required twelve hours' strenuous work to find out the cause of the escape, which was coming into the boxes in such volumes that it could be heard as it issued from the iron casing-pipes. By noon on Sunday, the cause was laid bare. It was found to be due to a fault in the cable, which had fused the casing-pipe at a point at which it crossed a 12-inch gas-main—passing over it at right angles and in contact with it. The 12-inch main was also fused; the hole in this pipe being about 1½ inches in diameter, the sides of it containing some of the copper of the cable. A similar piece of copper can also be seen in the photograph, adhering to the left-hand side of the hole at the bottom. It looks whiter in the photograph—on account of its lighter colour.

Fortunately, no damage was caused by the escape, beyond the rousing of one household, into whose premises the gas was entering from one of the electric boxes in considerable quantities. The cable, it should also be stated, was laid some years ago, and in a manner which has since been abandoned.

The above particulars are taken from my report to the Gas Committee, dated the 26th of May.

A. M'I. CLELAND,
Superintendent of Mains,
Belfast Corporation Gas Department.

Belfast, July 4, 1910.

P.S.—When cut out, the piece of pipe was found to have been cracked by the heat. It was, therefore, necessary to hold the pieces together by means of a long bolt, seen in the photograph.

The Coalite Company and their Patents.

SIR,—We observed in a recent issue of your paper a letter from Messrs. Hunt and Co., confirming as "substantially" true certain misstatements made by you as to the coalite patents.

The misstatements were that the Coalite Company had been unsuccessful in "defending" their master patent; and that the "stupid pretensions of the coalite people, in respect to a monopoly for the production of a sort of half-carbonized coal, was knocked on the head."

These statements are neither actually nor "substantially" correct, nor have they the shadow of truth; and it is a matter of regret to us that Messrs. Hunt should lend their name to confirm them.

It is well known that the distinctive feature of the coalite process is the arrestment of low-temperature distillation at a particular stage, to produce a residue having the characteristics determined by those conditions of treatment.

In the application to which reference is made, there is no claim to arrestment of the distillation at any stage. What is claimed is the use of steam throughout the whole process of a low-temperature distillation, as distinct from its use at the beginning or the end; and great virtue is claimed in that, by such use of steam, the temperature of the retort is kept down.

Apparently, the fact around which these misstatements have gathered is that the Coalite Company did not stop the grant of a patent on this application, on the ground of their own patent. But the use of steam in carbonizing is well known, and no claim to its general use was made in the coalite patent—the fact being other prior patents were relied upon as anticipations by the Coalite Company in their opposition.

It is known to use steam throughout a carbonizing process; and so long as its use does not infringe any existing valid patent, it is unobjectionable. But if, for example, steam be used in the coalite process by others than the licensees of the Coalite Company, it follows that the coalite patent is infringed, and the issue of infringement could only be determined in the High Court. These circumstances, however, have not arisen; and therefore to say that the Coalite Company have been unsuccessful in defending their patent, in circumstances where the patent has never been attacked, is absolutely untrue, and being untrue its publication is indefensible.

Finally, we would suggest that by your reference to the "stupid pretensions" of the Coalite Company, your hostility carries you beyond the limits of your criticism. No higher testimony can be adduced to the patentability of any invention than has been adduced in respect to the coalite process, in that patents have been granted upon it, after investigations, in Germany, the United States, and in every other country where the grant of patents is only made as the result of an investigation as to novelty and patentability; and the criticism that you have offered is more than met by the grant of those patents.

EDWARD EVANS AND CO.

Chancery Lane, W.C., July 4, 1910.

["It is well known that the distinctive feature of the coalite process is the arrestment of a low-temperature distillation at a particular stage, to produce a residue having the characteristics determined by those conditions of treatment." Just so. The use of steam is also well known in carbonizing processes; and so is the use of low as well as high temperatures. There is no necessity to discuss here the question of patents with Messrs. Edward Evans and Co. That firm, Patent Office records, or Patent Office officials—whether British, German, or American—cannot teach us the whole history and practice of carbonization; for the simple reason that much of the practice has never been the subject of patents.—ED. J. G. L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Fylde Water Board Bill, Paisley Gas Order Confirmation Bill, Water Provisional Order Bill.

Bill read a second time and committed: Shirebrook and District Gas Bill.

Bills reported, with amendments: Glasgow Gas Consolidation Bill, Mallow Urban District Gas Bill.

Bills read the third time and passed: Abertillery and District Water Board Bill, Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Gas Orders Confirmation Bill (No. 2), Workson Urban District Council Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Abertillery and District Water Board Bill, Gas Orders Confirmation Bill (No. 2).

Lords Bill reported: Great Grimsby Gas Bill.

Bills read the third time and passed: Fylde Water Board Bill, Garnant Gas Bill [Lords], Matlock Bath and Scarthin Nick Urban District Council Bill [Lords].

The Montrose Water, &c., Order Confirmation Bill, to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, has been presented, read the first time, and ordered for second reading.

BROWNHILLS AND DISTRICT GAS ORDER.

This Provisional Order, by which the Brownhills and District Gas Company sought to maintain their existing gas-works and construct further works, came before the Committee of the House of Lords presided over by Lord DONOUGHMORE for confirmation last Tuesday.

Mr. BELL (Parliamentary Agent) appeared for the promoters; and Mr. VESEY KNOX, K.C., represented the Walsall Corporation, who petitioned against the Order.

Mr. BELL said that for forty years past, with the consent of the Local Authority, the promoters had been supplying gas within the Brownhills district; and they asked, by this Order, for statutory confirmation of what they had done. The only objectors were the Walsall Corporation; and in order to meet their objections, the promoters agreed, subject to the approval of the Board of Trade, to insert a new protective clause in the interests of the Corporation. The Board of Trade struck out two paragraphs of the clause which the promoters agreed to insert. As the agreement was to be subject to the approval of the Board of Trade, he could not well object; but it seemed to him that the Board of Trade should state their reasons to the Committee for refusing to accept these two paragraphs. He had received a letter from the Board of Trade in which they stated that they objected to the proposed clause on the ground that it embodied section 46 of the Walsall Gas Act of 1876, which gave the Corporation power to supply gas within the neighbourhood of the borough. This, the Board of Trade considered, was far too wide. He agreed that if it were proposed to insert such a clause in the Bill at the present time it was very doubtful if Parliament would allow it.

Mr. VESEY KNOX said the matter in dispute was entirely one between the Walsall Corporation and the Board of Trade, because the promoters had loyally carried out their part of the undertaking. The Corporation simply asked that they should be allowed to continue to supply the district which at present came within their area of supply; and the Company agreed that they would not supply Steelfield and the part of Walsall Woods which came up to the borough boundary.

Mr. BELL said he failed to see why a saving clause like this, which could do no harm to anybody, should not be inserted in the Order. The Board of Trade appeared to have nothing to say in the matter. He thought therefore that their Lordships were entitled to insert the clause as drawn.

The CHAIRMAN: If the Board of Trade do not think it worth while to come before us, we have no option but to insert the clause.

Mr. BELL said, as to the second part of the clause, he was entirely in their Lordships' hands. It had reference to the protection of the Corporation tramways undertaking. The Board of Trade objected to the proposed clause on the ground that it was unnecessary, and that the Corporation had all the protection they needed in the Order as it stood, and in the provision of the Gas-Works Clauses Act, 1871, which was incorporated in the Order.

Mr. VESEY KNOX said the Corporation had tramways which ran right out to Brownhills. They had cost some £25,000; and they asked to have a clause inserted for the special protection of the tramway lines and electric wires. The Board of Trade ruled that the Corporation had sufficient protection under the general law, and struck out the special protection which they asked for.

Mr. HONEY, who now appeared on behalf of the Board of Trade, said he had no instructions to appear in this matter. Mr. Bell had read a letter which the Board sent to the Agent of the Walsall Corporation explaining the grounds on which they objected to the proposed new clause. They had also communicated a copy of the letter to the Agent of the promoters.

The Committee decided to insert the proposed new clause in its original form.

GAS COMPANIES (STANDARD BURNER) BILL (NO. 1).

House of Commons Committee.—Monday, July 4.

(Before Sir HENRY KIMBER, Chairman, Mr. BALDWIN, Mr. A. G. C. HARVEY, and Mr. F. W. S. M'LAREN.)

This Bill came before a Committee of the House of Commons, constituted as above, for consideration to-day.

The promoters were represented by the Hon. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, and Mr. PADDON. Counsel appearing for the petitioners against the Bill were: For the Mersey Docks and Harbour Board, Mr. BALFOUR BROWNE, K.C., and Mr. TALBOT, K.C.; for the Liverpool Corporation and other Councils, the Bootle Corporation, the Hastings Corporation and Torquay, Mr. RAM, K.C., Mr. TALBOT, K.C., and Mr. COURTHOPE MUNROE.

Mr. FITZGERALD opened the case for the promoters at considerable length. He said the Bill was promoted by eight companies, and dealt with the standard burner used in testing the illuminating power of the gas supplied by these companies. The other two Bills (Nos. 2 and 3) dealt with the same question. Two instructions had been sent to the Committee; the first being: "That it be an instruction to the Committee on the Bill that they do hear the case of the promoters, the Liverpool United Gas Company, separately, and do, on the request of any of the petitioners, consider the expediency of dividing the Bill, in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." There was a general instruction to the same effect referring to all the Bills before the Committee: "That it be an instruction to the Committee on the Bill that they do, on the request of any of the petitioners, consider the expediency of dividing the Bill in order to remove any difficulty that may, in their opinion, be proved to exist (by reason of the inclusion of several cases in the Bill) in the submission separately of any of the cases in opposition." Accordingly, in opening the first Bill, he did not propose to open the Bill so far as the Liverpool Gas Company was concerned. He proposed to treat their case as a separate case, and when the hearing of the other cases had been concluded, to take the Liverpool case as a separate Bill.

Mr. BALFOUR BROWNE objected to this course.

Mr. FITZGERALD said he understood that the Liverpool case was not to be taken first; and therefore he was only prepared to open the general case.

Mr. BALFOUR BROWNE argued that the Liverpool case covered the whole case, and something more.

Mr. RAM, who appeared for the Liverpool Corporation, contended that the Liverpool case would clear the way for every other case.

Mr. FITZGERALD said that Liverpool had certain special features that were not to be found in the other cases.

The CHAIRMAN eventually announced that Mr. Fitzgerald would have to take the responsibility of what happened afterwards. He was entitled to conduct his case as he pleased. If the Committee found that they could not appreciate the case from the opening upon seven-eighths of it, they would call upon him to go on with the case of the Liverpool Company.

Mr. FITZGERALD undertook to take the responsibility. He said the Bill was largely unopposed, as were also the other two Bills. The first Bill was promoted by eight companies; and its object was to enable them to adopt as the burner for testing the illuminating power of the gas the improved burner known as the "Metropolitan" argand No. 2. This burner had been prescribed by the London Gas Referees for use by the London Gas Companies; and it had been in use by them for the last five years. It had also been adopted by the Board of Trade under the advice of their technical advisers; and it was the burner which was inserted in any Provisional Orders made by the Board of Trade for the purpose of testing gas. It had also, under the authority of Parliament, been adopted by a number of gas companies and local authorities; so that altogether there were between 80 and 100 companies and local authorities who were to-day using, or in a position to use, the burner. The authorities of the two Houses, in the "Model Clauses" which they issued every year, had adopted the burner with regard to the testing of gas. Parliament had over and over again sanctioned the use of the burner; and it was established as the best one in existence for the purpose of testing gas. It ought not to be a question every session as to whether or not it was the best burner. But the suggestion was that, because the companies were getting rid of a disadvantage which they ought never to have been subjected to, and because they would be able to supply gas of less illuminating power than Parliament intended them to supply, they ought to reduce the price of their gas. The simple answer to the whole of this contention was that it was only an act of justice. They were only putting themselves in the position of supplying gas which Parliament intended they should supply. If the matter was to be considered further, there was this complete answer—that any economy which resulted in the manufacture of gas under the existing gas legislation invariably went, either in whole or in great part, to the advantage of the consumer. The companies were either sliding-scale or maximum-price companies; and two of the local authorities who were opposing the Bill had in their districts—one the Hastings Company, which was a sliding-scale Company, and the other the Torquay Company, a maximum-price concern. But in the case of all sliding-scale companies, they could not increase their dividend without lowering the price of gas; and the effect of this was that the greater part of the benefit went to the consumer and not to the shareholder. It depended, of course, on the amount of capital and the quantity of gas sold; but, broadly speaking, the consumer got three or four times as much pecuniary benefit. Where they were dealing with a maximum-price company, who were paying their maximum dividend (as in the case of the Torquay Company), the whole of the benefit went to the consumer. If, by the adoption of the standard burner, the economy was £500 or £1000 a year, that inured to the benefit of the consumer in the shape of a reduction of the price of gas, because the shareholders, being in receipt of their maximum dividend, could get no more. On various occasions the question had been raised

as to whether it ought to be accompanied by any reduction in the price of gas, and as far as he was aware there was only one case where any reduction was made. There were many cases where the illuminating power had been reduced, as in the case of the London Companies, where they were allowed to reduce the illuminating power from 16 candles to 14 candles. There they were called upon to make a reduction in price. But with regard to the adoption of the standard burner, the only case he knew of where it had been accompanied by a reduction in the price was that of the Brighton Company. In that case, however, there were other advantages which the Company were getting—including what was known as a capital redemption fund. In the present instance, he would ask the Committee to adhere to the practice of allowing the companies to have the best burner for developing the light of the gas supplied, which was what Parliament intended, and not to make any alteration in the standard price. The saving, in fact, was very small. It represented about three-eighths of a penny per candle per 1000 cubic feet. So that if there were even a difference of two candles made by the use of the standard burner, the resulting economy to them would be represented by $\frac{3}{8}$ d. per 1000 cubic feet. They were asking to be placed in a position to supply what Parliament intended them to supply—in most cases, 14 candles. In the other House, it was suggested that, as far as the incandescent burner was concerned, it might make very little difference; but that where persons were using the old flat-flame burner it did make a very considerable difference in altering by a couple of candles the gas supplied. He believed the Committee would find that this was not the case; and with the ordinary consumer, even if he was using a flat-flame burner, that the difference was not apparent. About 90 per cent. of the gas now used was consumed in incandescent burners; and in some places the flat-flame burner had almost disappeared. On this Bill, as on every Gas Bill that had been promoted during the last few years, the petitioners against the Bill always raised another point, whatever the Bill was for. At present, gas companies were required by the General Acts and by their Special Acts to test the illuminating power of gas, and there was not a single case where Parliament had put upon a company, against its will, a test for the calorific value of gas. The only case of a company which was under an obligation to test the calorific value of the gas subject to a penalty, was the Gaslight and Coke Company. The provision was there inserted not by the decision of Parliament, but by agreement in the Bill dealing with a great burden of important matters, and was settled between the Company and the London County Council. The time might come when it would be considered that the calorific value of gas was more important, and accordingly Parliament would substitute a test for calorific value instead of one for illuminating power; but it would be most undesirable in the case of an ordinary company or local authority to have the two tests. Some of the petitioners had raised other questions which were not at all germane to the Bill. One had raised the point as to whether the provisions of the General Act of Parliament as to the reinstatement of roads were sufficient. There was nothing in the Bill dealing with the laying of pipes. In the other House, it was put forward that the effect of adopting the new burner, by altering the actual quality of the gas supplied—reducing it in some cases from 15½ to 14 candles, or whatever it might be—it would have an unfortunate effect on the gas-engines in use. They also said there was no such thing as 14-candle power gas. With regard to the scrapping of gas-engines, in Glasgow they originally supplied 25-candle gas. They had gradually reduced the illuminating power; and this year a Bill promoted by the Corporation had already passed the two Houses reducing the illuminating power to 14 candles. Though this Bill, in respect of other matters, was most fiercely contested, no objection was raised to the testing provision. Important places—such as Scarborough, Croydon, and Swansea—were raising no objection to the present Bill. The Corporations of Scarborough and Swansea appeared in opposition in the other House, and, having heard the discussion there, they had not renewed their opposition in this House.

Mr. Charles Carpenter's Evidence.

Evidence was first given in support of the Bill by

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company. He said the No. 1 London argand, the invention of Mr. William Sugg, was selected by the Metropolitan Gas Referees because it developed to the best extent the light-giving power of the gas, and was at the same time practicable for the consumers' use. In those days coal was distilled in an extravagant manner, and large quantities of expensive cannel coal were used to bring the illuminating power to the prescribed standard. These conditions had now come to an end; and it would be impossible to revert to them. Before many years had passed after the adoption of the burner, its defects became increasingly manifest; and in 1870, Mr. Charles Hunt called attention to these defects. The burner was constructed for a particular quality of gas which was made at the time of its invention. In those days, gas was distilled from coal at a comparatively low temperature, and a very low yield of gas was the result. The flame from the burner rose almost to the top of the chimney, and very nearly filled the chimney itself. As gas distillation was conducted on a more scientific basis, it was seen that the yield of gas that was satisfactory in those days was very uneconomical—a higher temperature was obtained and a greater volume of gas distilled from the coal. The gas distilled with the higher temperature had not a higher proportion of hydrogen; and the flame from it was very low indeed. In one case they had a flame which almost filled the chimney; and if they used a flame which was shorter, a much larger volume of air rushed upwards, with the consequence that the gas was overburdened. One of the defects of the burner was that too much air was admitted, and the luminosity was destroyed. Instead of indicating the true luminosity of the gas, it destroyed it. This was a defect which gas companies had been suffering from since the burner was first introduced.

By the year 1891, the defects of the burner had become so glaring that the South Metropolitan Gas Company offered to bear the entire cost of an independent Committee to undertake an investigation into the matter if the Board of Trade would appoint one. The interest in the question increased throughout the country; and in 1893 a deputation on the subject waited upon the Committee from the Institution of Gas Engineers. Professor Harcourt, the Senior Metropolitan Gas Referee, was fully aware of the defects of the burner; and in 1893

he publicly stated that by its use any deficiencies in the gas were greatly exaggerated. The Referees endeavoured to get over its defects by using it quite regardless of the quantity of gas being consumed in it; and this method received parliamentary sanction in 1900. The Act said the gas was to be burnt in the burner at the rate of 5 cubic feet per hour; and the Referees proposed to get over the difficulty by saying "you shall burn it at such a rate as will give a light of 16 candles." The 16-candle flame was much more nearly the size of the flame that was produced from the gas made by the burner invented, and the amount of air passing through between the flame and the chimney was more nearly in accord with the burner. The Referees then said: "Do not burn your gas at 5 feet an hour, but at whatever rate is required to make a 16-candle flame; and when you have done that, by a rule-of-three sum, supposing the rate were 4 feet for 16 candles, 5 feet would give 20." This was legalized in 1900. Five years later, in 1905, the London County Council reopened the whole matter. The question arose as to what was the use of having a method of testing a gas the object of which was to tell the consumer what he was getting, when he had not the least idea of what was going through the burner. It was then said that the only proper way of testing the gas, in order to tell the consumer what he was really getting, was to pass it through at the 5-feet rate.

The matter was thrashed out at great length before a Committee of the Upper House. The Committee decided—and he thought that they were impressed by the evidence placed before them of the consumer knowing what gas was put into the burner—that the 5-feet rate should be reinstated. But they said, "in making your test, you shall have a burner which is so arranged that the air supply can be regulated." As a result of the Committee's recommendation, he had invented the No. 2 "Metropolitan" argand, which was provided with a chimney just in the same way as the No. 1. The difference between the burners was that underneath the No. 2 there was a shutter, which was moved up and down in the same way that the wick of a lamp was turned up and down. Having adjusted the 5-feet rate, the shutter was turned up or down to admit sufficient air into the orifice below the burner to burn the gas with a proper light inside the chimney.

There was a clause in the London Gas Act of 1905 which gave the Referees power to prescribe a better burner, because, of course, his burner might not turn out to be the best. The whole object of the Legislature was that the gas should be accurately tested—that whatever method was used for testing the illuminating power, it should be one that would produce the full illuminating power from the gas. No privilege was granted by giving them this burner; but it removed an injustice from which not only the companies but the consumers suffered. The measuring instruments destroyed a certain amount of the luminosity; and money had to be spent in providing for this loss. The burner would enable the gas purveyor to provide the article which Parliament intended he should supply; and it enabled him to do it in the most economical manner, both to the company and the consumer. In London alone, hundreds of thousands of pounds had been wasted; and it was the consumer who had to provide this money. The gas in London had been tested with this burner for five years. The object of the Bill was to confer the undoubted benefit to London or other towns in the country. The continued use of the No. 1 argand necessitated artificial enrichment of gas with American oil or petroleum spirit, when it would be more economical to the consumer if he were supplied with the gaseous products of the distillation of coal. The consumer was adequately protected; for the character of his supply could be kept of more constant quality, and great fluctuation in the quantity of the rich hydrocarbons present was avoided. In this way, better efficiency was obtained from the incandescent burners commonly in use. It had been suggested by the opponents to the Bill that if the change in the burner was permitted there should be some *quid pro quo*. But Parliament had authorized the change to a large number of companies and local authorities in the Provinces, and they desired to have the commodity accurately measured. Their financial position had been settled and their prices fixed by Parliament always on the assumption that the commodity would be accurately measured.

In reply to the CHAIRMAN, witness said that in 1870 the price of coal jumped from 6s. to 20s., in consequence of which the various gas companies increased their prices for gas in order that they might continue to pay the full dividends that they were entitled to pay. This was not thought fair by Parliament, because in 1875 the sliding-scale was introduced, and if, owing to better methods of manufacture, a company was able to make gas more economically, it shared it with the consumer, who got a proportion of five-sixths—the company getting one-sixth. If the price of coal were to rise, and the cost of making the gas was greater, the burden again fell on the consumer and the company in the same proportion. If there was an economy arising from the use of this burner, it would go to the consumer. With regard to companies where the standard charge was the maximum price, and where the company was paying its maximum dividend, any saving necessarily went to the consumer. Hastings was a sliding-scale Company; and Liverpool and Torquay were both maximum-price Companies paying their maximum dividends. It was alleged in the other House that the substitution of this burner would compel the consumer to increase his consumption in order to get the same amount of heat or light. The change was made in the case of his Company five years ago. The whole of their make of gas had been carefully metered; and it was found that there was no big increase in the amount of gas burnt by the consumer now to what there was before the change came in vogue. It was suggested that the consumer would have to burn 25 to 30 per cent. more gas; but they were not sending out the gas, nor was the consumer buying it. This was also the common experience of other districts which had effected the change.

MR. HONORATUS LLOYD: Does the reduction of illuminating power mean a corresponding reduction in the calorific power?

Witness: No; the two things do not go together. You can have a considerable reduction of illuminating power and a very slight reduction of calorific power. For instance, you might make one gas of 16 candles and you might make another gas of 14 candles, and the 14-candle power gas might have a higher calorific value than the 16-candle gas. There is no definite relationship between the two.

Replying to the CHAIRMAN, witness said one test could not be applied to the two. They had taken out the whole of the tests made by the

London County Council of the Gaslight and Coke Company's gas. They found that 17.3 candles gave 140.1 calories, 16.8 candles gave 141.8, 16.3 gave 141, 16 gave 141.7, and 15.5 gave 140.5.

MR. BALFOUR BROWNE remarked that he understood Liverpool was to be taken separately, and that the Liverpool United Gas Company had to prove their case. At the same time, Mr. Carpenter had gone over a good deal of general principle; but when the Liverpool case came on, he took it that the witness would then be recalled and cross-examined.

THE CHAIRMAN: I do not see any objection to that.

In reply to Mr. RAM, who rose to cross-examine on behalf of Hastings, witness said that anyone who was accustomed to burn oil in a lamp—and the poorest of the poor were accustomed to do so—could use his burner. For test purposes, the price of the burner was three guineas. The reason for this was that it was made to the exact measurements prescribed by the Referees' instructions; and it was the measure by which hundreds and thousands of pounds' worth of gas was sold every year. But if the burner was to be used by the consumer instead of the incandescent burner, he had obtained from a Birmingham firm an estimate of the cost at which they could provide them. They could manufacture and supply the burner for 102s. per gross net, which worked out at about 9d. each. To this would have to be added the cost of the dies, which would be about £120; and this cost would have to be distributed over the number of burners made. If the burners were in general use, and if there was no mantles, an order for 10,000 burners would be quite small, and for the cost of the dies another 2d. or 3d. would have to be added to the 9d. He had ascertained this since he was examined before the House of Lords Committee. If they were made in ten thousands, they would come out at under 1s. each. For the flat-flame burner they paid 2d. or 3d. each; and a good incandescent burner cost 9d. or 1s. This burner was simply for the purpose of burning gas in order to get from it its inherent luminosity. If the burner was going to burn 5 feet only, there would have to be a little regulator which would make the burner stand up a quarter-of-an-inch higher. In the use of the burner, if the shutter were closed, the flame would burn right up above the chimney; and the consumer would then turn down the shutter until the proper flame was obtained. He could not accept at all that with the burner the companies would be able to give the consumer worse gas than he was getting to-day. He would get a gas that was in the minds of Parliament as the illuminating power that should be given.

MR. RAM: Would the gas be of less illuminating power?

Witness: It would be the illuminating power that Parliament intended.

When the consumer turns on his gas-burner, would he get a less light than he is entitled to to-day?—The result of using the burner will be that part of the luminosity will not be destroyed.

In reply to the CHAIRMAN, who asked whether the gas supplied through the burner would give less light than the gas which the consumer was supplied with to-day, witness said that if the same gas were burnt in the old burner, owing to its faulty construction, a portion of the illuminating power was destroyed, and it did not give the full result. But with this burner, they produced a gas which was decidedly more economical.

MR. RAM: Is it a fact that the consumer will, with the new burner, get gas of less illuminating power than he is getting to-day?

Witness: Of course he would. That is the whole object of the Bill, that he has something which is now waste to him.

THE CHAIRMAN: If the Bill is passed would he get less light?

Witness: No; he would get no less light than before.

MR. RAM: I am speaking of the consumer who is using a certain burner to-day. The gas is being tested with the No. 1 burner. You will take away the No. 1 and test with the No. 2. The consumer will turn on the same burner and get less illuminating power in his light than he would to-day, would he not?

Witness: He will if he sticks to that burner; but he will be given a burner by which he will get more.

Will he get less in the way of light and heat than before?—Not necessarily.

Over and above the saving to the company and the loss of light and heat, if, in addition to that, there is a loss to the consumer, do you agree that he ought to have some compensation?—If there is a loss to the consumer, he ought to have compensation.

Replying to further questions, witness said he did not agree that the purveyor of gas would be enabled to send out gas of a candle power less by 3.16. The consumer was getting more than Parliament gave him, and much more than he wanted. In the flat-flame burner it would be a little less; but in the incandescent burner, he would very probably get more, because nearly all incandescent burners were made for low-quality gas.

MR. RAM: Is it your case that, after you have saved what you call the loss of illuminating power to the company, this will be the only benefit the company will get?

Witness: The company want to save wasteful expenditure.

Is that all?—Undoubtedly it puts the company in a better position to meet the competition in which it is involved with electric lighting undertakings. It strengthens their position in the competition they have to meet. The value of a candle has been estimated at three-eighths of a penny per 1000 cubic feet. With regard to the Hastings Company, the substitution of the No. 2 argand will be an advantage to the consumer.

MR. RAM: The burner you propose to use will make a difference in the illuminating power of the gas that the consumer will get?

Witness: It will make a difference.

In re-examination by Mr. PADDON, witness said the No. 2 burner would give the absolute value of the gas, and it would enable them to compare the working of one town with another. This was a very important thing to be able to do; and it was a thing which could not be done at present. Now, there were a number of unreliable results in comparing one gas with another. Tests had been made with the same gas between two burners showing a difference of over two candles; but the consumer, in using the gas, would not experience the disadvantage of any such difference as this. Some 90 per cent. of the consumers in the case of his own Company were using incandescent burners, and would not be affected.

Tuesday, July 5.

Professor Vivian B. Lewes's Evidence.

Evidence was given this morning by

Professor Vivian B. Lewes, the Chief Superintendent Gas Examiner to the Corporation of the City of London. He said it was of the greatest importance to bring about uniformity in the method of testing gas. The adoption of the No. 2 burner would practically do away with the irregularity as to illuminating power, and they would have a candle power meaning a certain definite consumption, which would convey to one's mind what the value of the gas was. This was of the greatest possible importance to the consumers themselves, because it would give power to gas manufacturers of standardizing their apparatus. If they had the standard burner, they must have a universal method of testing; and the large apparatus makers would be able to sell stoves for 14, 15, 16, and so on candle power. Thus the cost of manufacture would be reduced; and it would be of enormous benefit to the consumer as well as to everybody else concerned in gas manufacture. At present, the manufacturer did not know what 14-candle power gas meant; but if the standard burner were allowed to be used, he would know that he had to supply a burner for a stove for dealing with a thing of a definite value. Under the London Gas Act of 1868, the Gas Referees were appointed, and the test-burner to be used was one which should be suitable for obtaining from the gas the greatest amount of light, and one which should be applicable for use by the consumer. As gas was being made at that time, the No. 1 argand fulfilled these two conditions. It was adapted to burn 5 cubic feet per hour for a certain quality of gas, and admit the proper quantity of air for the consumption of the gas. The air admitted exactly burnt the gas to the right point for developing from it the greatest amount of light. But if gas was put through the burner which required more or less air, the burner could not supply the greater or the less quantity of air. It was designed to test a gas of one kind and quality. If the burner were used for a gas which was richer in hydrocarbons and needed a greater quantity of air, it would smoke, and the full effect of the gas would not be obtained. If they took a gas which required for its perfect combustion less air in the aperture, the carbon in the flame was rendered luminous and was burnt up too quickly. The burning of gas of a lower candle power than 15 diminished the amount of light the gas was capable of using. Perfect luminosity was only obtained when there was the proper amount of air. From the years 1868 to 1889, the gas was of 16-candle power. If 14-candle power gas were forced through the burner, it would not give the proper illuminating power the gas was capable of giving. The company would have to force through a gas of 15½ or 16 candles.

There were many mixtures of gas, each of which took its own particular volume of air; and the luminosity of the flame in the chimney was governed by the flow of gas, and with the old-fashioned gas they got less light-giving conditions. He was quite satisfied that the No. 1 burner required, in order to fulfil the statutory requirements of the 14-candle power gas, that 15½-candle power gas should be forced through it. In order to do their duty, the gas companies had to give the consumer more than he was entitled to. If the No. 2 burner were brought into use, the consumer would be getting a real 14-candle power gas; whereas previously he had been getting 15½-candle power. He would be getting his statutory legal right, which previously he had been unable to obtain on account of the inaccuracy of the instrument. The gas companies would be in a position to give the consumers what Parliament intended them to have.

With regard to the flat-flame burner, it was rapidly dying out. Less than 10 per cent. of the burners now used were flat-flame. This burner had now been practically substituted by the incandescent burner. The mantle gave such an enormously increased light over the argand that on the Continent flat-flame and argand gas-burners were dead. Here they were progressing rather more slowly; but it was in the right direction. In the more progressive towns, it would be found that 92 per cent. used the incandescent mantle.

In distilling two kinds of coal, it was possible to get two gases, which were enormously different in their composition. Cannel coal gave a different gas to South Yorkshire coal. The manufacture of gas had changed enormously. Up to the year 1889, they had practically pure coal gas. In America they had carburetted water gas, which proved very successful; and early in the nineties it had become established in this country. From that time down to the present it had been very largely used in conjunction with coal gas. It offered very great advantages to the gas manager, because gas could be made very rapidly. It offered a great advantage to the consumer, and cheapened the initial cost of the plant. Hydrogen and carbon monoxide were the two base gases. Instead of getting a 3-inch flame which they had been obtaining with coal gas, it dwindled down to 2½ inches; and it was manifest that there was too much air going into the burner and destroying the amount of light obtained from the flame. Mr. Charles Carpenter had arrived at the practical idea that what was wanted was an adjustment of the quantity of air to the quality of the gas. In the No. 1 argand, the amount of air was fixed by the burner, and it was not possible to get a true return. But with the Carpenter burner they obtained the true result—namely, the burner which was most suitable for securing from the gas the greatest amount of light. The burner could be used by any consumer. It was perfectly simple. The only question was price; and it was found that it could be bought at the same price as the ordinary incandescent burner. It required no more adjustment than the top of the ordinary flat-flame burner. The great objection which the opponents to the Bill appeared to have was that the introduction of this burner would enable the companies to supply gas of a lower illuminating and heating power. If it were possible for the gas companies to work down absolutely to the figure, it undoubtedly would be the case that it would enable the gas manager to make gas of 1½ to 2 candles less. The Gaslight and Coke Company were supplying a 15½-candle gas. Gas managers had an intense objection to being fined for half-a-candle less power. As a rule, the gas sent out by them was far above the ordinary standard. His experience was that with gas of the poorer quality, from 14 to 15 candles, the "London" argand destroyed from 1 to 2 candles. One of the finest object-lessons that the country had had in gas lighting was when, some years ago the late Sir George Livesey desired to reduce the illuminating power of the South Metropolitan Company's gas. The County Council met him in a very

cordial spirit, and said: "Very well, reduce your candle power, and let us see what the effect on the consumer is." The candle power was reduced for six months, and there was not a single complaint. On the old burner there was practically no connection between the calorific power and the illuminating power. With the standard burner, which would bring out the true illuminating power of the gas, there was a slight difference; but they would require to have two or three million tests before they could arrive at it.

As to the difference between the flat-flame and incandescent burners, he said it would be found that with the flat-flame consumer there would be a certain loss of light; but it would only be a very slight difference. With regard to the incandescent consumer, he ventured to say it would make no difference at all. By regulating the burners, they would get a very slight rise in the illuminating value of the gas. It was the temperature of the flame which created the light; it depended upon the rate at which the gas was burning. With regard to power and cooking, the difference of one or two candles would, in all probability, be perfectly inappreciable to the ordinary consumer of gas for these purposes.

In cross-examination by Mr. TALBOT, witness agreed that it was very easy, by mixing gas in different proportions, to vary the mutual relations of illuminating power and calorific value. Roughly speaking, the more water gas they mixed in, the lower would be the heating value. The effect of bringing the gas down to 14 candles with the new burner would be that the consumer would get a gas from 1½ to 2 candles less in value. The object of the gas companies was to get the burner which would give accurate results. If they made a profit on the transaction, the profit, with a sliding-scale company, would go to the consumer in a certain proportion; and with the maximum-price company, the whole of it would go to the consumer. When the No. 1 burner was inserted in the various Acts, it was the best for the purpose. The No. 2 burner had been invented and the definition of 15-candle gas had been changed. He would not dispute that they could have the same gas and burn it with a dozen different burners and each would give a different illuminating power.

Re-examined by Mr. PADDON, witness said the No. 1 burner was only suitable for one form of gas, and failed to conform to the Act. When the No. 2 burner was prescribed in connection with the London companies, it became more generally adopted by the Provincial companies; and it was on the assumption that it was thought to comply with the prescription that it should get the greatest amount of light from the gas. The No. 1 burner might be compared to the pound weight that did not weigh a pound. There was a difference in the laboratory between the two burners of about 2 candles; and it would be very nearly as much as if the consumer was using a flat-flame burner. But if the flat-flame burners were collected and tested, he thought there would be hardly a burner which would give 5 candles. The change would have no effect on 95 per cent. of the consumers. If the gas distributed to the public was below the standard value, the No. 1 argand would exaggerate the difference; whereas the No. 2 did not. It was possible to get a gas of lower illuminating power than another, and yet of a higher calorific value. The No. 2 burner had started the province of what was called economic gas manufacture.

Mr. W. J. A. Butterfield's Evidence.

Mr. W. J. A. Butterfield, the Secretary to the Metropolitan Gas Referees, then gave evidence. He said he had made a special study of gas legislation with respect to illuminating power in London. The Metropolitan Gas Act of 1860 first made uniform provision for testing the illuminating power of gas by the argand burner, which consumed 5 cubic feet per hour. He thought the No. 2 burner went as nearly as any burner could do to develop from the gas the greatest amount of light. The question of the burner was quite independent of the standard or maximum price imposed by Parliament. The No. 1 burner was an exaggeration of what Parliament intended in connection with testing arrangements. If the No. 2 burner were adopted, it would be very unfair if there were any alteration of the financial basis of the London Gas Companies, seeing that the Metropolitan Companies had obtained the use of the burner without making any concession at all. There was no definite relation between the light given by the flat-flame burner and that given by the No. 1 argand in testing the same gas. There was a fairly definite relation between the light afforded by a flat-flame burner and that afforded by a No. 2 argand burner with gases of different quality. The difference as between gases of different qualities by the No. 1 burner was greater than the difference in the light afforded by the same gases in the flat-flame burner. It would certainly be unfair to contemplate the imposition of a calorific power standard associated also with the illuminating power standard. In the one case in which the calorific power test had been imposed—that of the Gaslight and Coke Company—it was imposed after the Company had introduced the No. 2 "Metropolitan" argand burner for testing purposes. There was room for further investigation before a calorific standard was determined upon; and he thought each company should have a period during which it might obtain information as to the calorific power of the gas supplied. He did not think the change in the proposed burner had ever had, or could have, the effect of making the consumer burn more gas. What harmful effect there was would fall upon the flat-flame consumer.

In reply to Mr. TALBOT, witness agreed that with a lower-grade gas more must necessarily be burnt to give the same light in the flat-flame burner. He believed it was the fact, with regard to incandescent lighting, that if one were to ask for a burner to consume 14-candle gas and one to burn 15 candles, a different burner would be supplied.

Mr. TALBOT: With regard to heat, do you say you would not have to burn more gas with a lower quality to get the same heat?

Witness: That assumes that the calorific power of the gas increases in increasing the illuminating power.

Does the calorific power vary with the illuminating power?—The 14-candle coal gas as supplied in one district in London, on the average, is of slightly higher calorific power than 16-candle coal gas in the same district.

If you lower the illuminating power of the gas the calorific value follows?—Yes.

And above 14 candles, there is no relation between the two?—With

14 to 16 candle gas, it is fairly constant; the 14-candle gas is slightly higher. It is practically constant up to about 18 candles.

In reply to the Chairman, Mr. TALBOT said that when the London Gas Bill was promoted, the standard illuminating power of the South Metropolitan Company's gas was 14 candles. It was tested with the No. 1 argand burner in a particular way, which gave more light from the gas than the manner which was proposed in the London Gas Bill using the same burner. The London County Council, the promoters of the Bill, in order to compensate for this, proposed to call it 13-candle gas instead of 14 candles. The Bill was contested by the Gas Companies; and the proposal to retain the No. 1 burner and call the gas 13 candles instead of 14 candles was done away with by the Committee of the House of Lords. The Committee agreed to the insertion of a clause giving the Gas Referees power to prescribe for testing the burner which must be the most suitable for affording the most light.

Mr. TALBOT (to witness): The effect of this Bill will be to allow these companies to supply the consumer with a different quality of gas to that which, in fact, he gets now?

Witness: Yes. I take the view that for many years the consumers have been getting rather more in the way of quality than Parliament formerly intended them to have. I think it is to the consumers' advantage, because it will tend to cheapen gas manufacture. I think the consumer has been suffering through getting a higher quality gas.

In re-examination by Mr. PADDON, witness said the whole of the objections to the Bill could be met by giving the consumer a new flat-flame burner. It would be perfectly easy to supply a new burner which, with a lower-grade gas, would give the same light.

Mr. Corbet Woodall's Evidence.

Mr. Corbet Woodall, the Governor of the Gaslight and Coke Company, was the next witness. He considered that the application of the Companies in the Bill was justified both in the interests of the consumers and of the public. The No. 2 test-burner was superior to any other. It was already in use by upwards of 80 gas undertakings, some of which were municipalities; and it was specified in the Model Bill. They had a clear right to have their commodity measured fairly and accurately. In London, the standard of illuminating power had been reduced from 16 to 14 candles; and the burner which was suitable in the old days was quite unsuitable now. His Company had made the concession that every company must make—that they would make the gas at a little less cost; but the result of it was that there was an earlier reduction in the price of gas than otherwise would have taken place. They agreed to a reduction in the standard price, not because the reduction in the illuminating power was too much, but in order to secure an unopposed Bill with the London County Council. With regard to the present Bill, he did not consider the adoption of the No. 2 burner was any ground at all for an alteration in the maximum or standard price. If there was an economy from the adoption of the burner, five-sixths of any benefit would go to the gas consumer. The adoption of the burner was an act of justice to the companies, inasmuch as from the year 1868 the principle had been recognized that the burner ought to be such as would develop the greatest amount of light. So far as he was aware, Parliament had only increased the price of gas on the adoption of the test-burner in one case—that of Brighton. The companies would reap some advantage from the change; and the advantage of having a standard that would make the working of the companies throughout the kingdom fairly comparable justified the application that was being made. At present, they had to keep the gas at a fictitious value by using enrichers. Any advantage that might be gained under the Bill must go to consumers under the regulations of the sliding-scale and maximum-price companies. These were competitive days; and every advantage that a company could have would help towards the reduction of the price of gas. The chief aim of gas companies was to get the price down so as to hold their own in the competition that had to be met. An alteration in the standard price would not necessarily mean any alteration at all in the selling price; but it would mean that the dividends of companies would be reduced in certain cases. It would merely affect the shareholders of standard-price companies, and would not touch the maximum-price companies. He was strongly opposed to alterations of the standard price. People buying stock at auction, purchased in regard to the standard price and the dividend. If the standard price were reduced, these people would be injured; and the changes had a tendency to affect the premium. If the proposed change were made in the burner, the consumer would get a better gas; and if there were any economy, he got the lion's share. His own feeling was that a calorific standard was inevitable in the near future; but it should be adopted generally by Public Act, and not filtered in by occasional Acts of this sort.

Cross-examined by Mr. RAM: When a gas company comes to Parliament for an advantage, in whatever way it may be, the practice of Parliament generally has been to see that the consumer gets some advantage coincident with, and corresponding to, the advantage gained by the company?

Witness: I think Parliament needs to be satisfied that the change proposed is not of a one-sided character.

The effect generally is, is it not, that if a company get an advantage they have to give some corresponding advantage, either by increasing the candle power or by reducing the price?—I do not think I can accept that. This same question has been before Parliament on so many occasions, and on none of them has there been any reduction of price required so far as I am aware.

If there is a financial advantage in this case, should the consumer participate in it?—Yes.

Replying to further questions, witness said the saving would not be considerable. Part of the saving, such as it was, the consumer would get in the case of the sliding-scale companies, and in the case of the maximum price companies they would get all of it. When the No. 2 burner was put on the Gaslight and Coke Company, the quality of the gas was maintained at 16 candles. They really got very little advantage indeed.

Mr. RAM quoted from the evidence previously given by witness, to the effect that if a 20-candle power gas were supplied giving a certain illuminating power, and for a 15-candle power gas the same price were charged, it followed that the person who wanted to get the same light must burn 25 per cent. more gas.

Witness replied that that was so, if the gas were burnt in a flat-flame burner; but he did not care to consider the flat-flame burner at all. It was, or ought to be, absolutely dead. For heating purposes, practically the same result would be obtained as they got now.

Witness was then asked with regard to a list of companies which had been placed before the Committee indicating the decisions of Parliament in previous cases; and he agreed that in some of these cases there was a reduction of price concurrently with the alteration of the burner. When a gas undertaking came to Parliament with a maximum price ridiculously high, it was lowered; but no reduction was practically given for the introduction of the argand No. 2 burner.

In re-examination by Mr. FITZGERALD, witness said there was no relation whatever between standard price and maximum price. In the case (say) of a company that had its maximum price fixed 40 years ago at 6s., and when it came to Parliament the price of gas had gone down to 2s. 6d. or 3s., almost as a matter of course the maximum price was reduced so as to have some fair relation to the actual selling price. If it happened that the maximum price was reduced in this way at the same time as the testing was authorized by the standard burner No. 2, the two things had no relation to each other. It was ridiculous to say that the maximum price was reduced from 6s. to the 2s. 6d. standard—the two things had no relation to each other at all. The consumer would get almost the whole of the benefit from the change in the burner. The arrangement as it stood was a perfectly reasonable one. Counsel having pointed out that it was said that the consumer would require to use more gas, witness replied there was no reason for such a statement. The consumers who continued to use antiquated burners would suffer; but anything that tended to compel them to give up the extravagant and adopt the economical was in their favour. In Germany, the municipalities and companies had ceased to test illuminating power altogether; and in over 90 per cent. of the gas that was used, the luminous value of the flame was of no importance.

Mr. Alex. Wilson's Evidence.

The next witness called was,

Mr. Alexander Wilson, the General Manager to the Glasgow Corporation gas undertaking. He said that in 1869 the gas supplied was of 25-candle power; but this had been reduced from time to time. In the present session, the Corporation had in Parliament a Bill, which had passed through Committees of both Houses, under which the illuminating power had been reduced to 14 candles; and the standard burner to be applied was the "Metropolitan" argand No. 2. They adopted this burner in 1907; and since that time there had been no increase in the consumption above the normal increase of previous years. The use of incandescent burners was rapidly extending with them. The Corporation had had no complaints from consumers with regard to their gas-engines, owing either to the adoption of the standard burner or the reduction of the illuminating power.

In reply to Mr. RAM, witness said the profits from the gas undertaking were applied in the reduction of the price of gas. He agreed that there had been an increase in the use of electricity.

Mr. FITZGERALD: If no convenience of any sort has been found with the gas-engines in Glasgow, it is not likely that the gas-engines in any other town will be the worse for it?

Witness: I do not expect there will be any difference.

Wednesday, July 6.

When the Committee met this morning,

The CHAIRMAN announced that the No. 1 burner was admitted to be defective except as regarded 16-candle gas; and it was abandoned for that reason. The No. 2 burner cured these defects. The No. 1 burner untruly registered gas of under 16 candles, which was an injustice to the companies. The point was that the No. 2 burner admittedly accurately and truly registered not only 16-candle gas, but gas of any quality below that, and any quality up to 20 candles. The Committee did not require a repetition of that evidence.

Mr. H. E. Jones's Evidence.

Mr. H. E. Jones was then called. He said that some of the petitioners were apprehensive that the adoption of the No. 2 burner would put some extra cost upon them. Most of the companies with which he was connected were sliding-scale companies. They were supplying gas cheaply and paying high dividends; and all of them had obtained the use of the No. 2 burner. It was not true the consumer would burn more gas; it was not so in the history of the companies who had adopted the burner. In no case had there been an increase in the total sale of gas. If the contention of the opponents was right—that by the adoption of the burner more gas would have to be burnt—these companies must account for it; they could not conceal their records. He had knowledge of companies outside London; and his experience was that by the adoption of the No. 2 burner the consumer would not be prejudiced in the slightest. He would be benefited.

The CHAIRMAN: The apprehension has been expressed that the poor man would be compelled, in order to get the same light, to use a larger quantity of gas, which would put him to great expense. The Committee would like to see that it would not injure the poor consumer.

Witness replied that his Company had a large percentage of working men consumers—something like 75 per cent. In their case there had been no increase since the adoption of the No. 2 burner, which was adopted in 1905. He quite agreed with Mr. Carpenter's evidence in this respect. The flat-flame burner never did give the full value of the gas. There was a difference of 5 or 6 candles between the argand and the flat-flame burner; so that the difference really was negligible. The suggestion had been made that, owing to the adoption of the standard burner, there would be some considerable change in the calorific value of the gas. His experience was that the difference between 14 and 16 candles was only $\frac{1}{3}$ per cent. for each candle. A difference of $\frac{1}{3}$ per cent. would be absolutely negligible for all practical purposes. There were much heavier losses than that in the apparatus for cooking and heating purposes. With regard to the list of companies which had been referred to, the details there given did not necessarily mean that an alteration of standard price or standard dividend was in connection with the changing of the burner.

The CHAIRMAN: There is no case in which compensation was given for the mere substitution of the correct burner for the incorrect one?

Witness: That is so.

Mr. MUNROE: With regard to Hastings, supposing Parliament allows this change of burner, you say that the gas consumer will be in no way prejudiced?

Witness: In no way whatever. He will be benefited.

Supposing you have gas which, measured through Sugg's No. 1 burner, shows 15 candles, and you pass that gas through the No. 2 burner, I suggest that it will show something near 10 or 11 candles?—A 15-candle gas by the No. 1 burner might show 16 candles in the No. 2 burner.

Your candle power to-day is 15 candles; and if gas is passed through the No. 2 burner, it shows about 18 candles?—That is my experience.

Mr. RAM pointed out, in reply to a question by the Chairman, that the consumer was now entitled to a certain candle power gas. Now the gas companies said the test-burner had not been wholly accurate, and had caused them to supply a somewhat better gas, because it had failed to show the full candle power of the gas supplied. The crucial point was that if the Committee found on the evidence that the No. 2 was a better burner, and one that was more just to the companies and would enable them to show a true test, let them have the burner under the conditions that it was not denied that it would confer a considerable amount of benefit on them. The question was, Would the advantage conferred upon the companies be greater than the mere removal of the injustice? It was perfectly certain that gas of an inferior quality would be supplied to the consumer; and the point was whether the consumer ought not to receive some consideration in regard to this. They would obtain a less good article than they were getting to-day. They would have to use more gas to obtain the same light; and if they used more, they would have to pay more.

The CHAIRMAN: Do you mean to suggest that Parliament, in prescribing the test, did not intend it to be a true and accurate one?

Mr. RAM: It is because we think Parliament did intend it to be a true and accurate test that we are saying that, inasmuch as it is a truer test, let them have it; but let the consumer be compensated.

Mr. FITZGERALD: The consumer will get what Parliament intended him to get—namely, the exact illuminating power which was mentioned in the Act.

The CHAIRMAN: Will the consumer by this burner get really 14 candles?

Witness: He certainly will.

And he will not pay anything more for it?—No.

Mr. MUNROE: Do you suggest that if this burner is allowed, we shall get exactly the same article we have been getting before?

Witness: No.

And is not the article we have been having prescribed by Act of Parliament?—It is a very faulty prescription.

And the actual price named in the Statute is to remain the same?—Yes.

Supposing by this burner there is a reduction of 5 candles. If a candle power is worth 1d., the Hastings Gas Company will save £9300 a year on the present consumption. Into whose pocket is this saving going?—Into the consumers' pockets.

But there is nothing in the Bill to divert the £9000 into the consumers' pockets?—There is the sliding-scale.

Apart from this saving, it will cost less to produce the gas which will pass the test of the No. 2 burner?—It will cost perhaps 1½d. or 1d. less per 1000 cubic feet.

Do you suggest that for the purposes of heating, cooking, and motive power, the gas tested under the No. 2 burner is equally as good?—Practically as good. It is as good for all common-sense purposes.

I put it to you there is a difference of 12 per cent.?—Certainly not. It is not ½ per cent.

In reply to Mr. FITZGERALD, witness said that, assuming an economy was to be effected in the manufacture of gas, five-sixths of it would go into the consumers' pocket under the sliding-scale. They could not, under the sliding-scale, increase the company's dividend without first decreasing the price to the consumer.

Concluding Evidence for the Promoters.

Mr. William Cash placed before the Committee a table relating to the financial position of the companies under the Bill; and remarked that four of them were sliding-scale companies and four maximum-price companies.

Mr. W. C. Young, Gas Examiner to the London Corporation, said his experience was that the change in the burner would not necessitate the burning of any more gas by the consumer for common purposes. He was also the Gas Examiner to the Hastings Corporation; and with regard to the tests which had been referred to as having been taken there, he said that they had no value whatever. It was impossible with the apparatus at Hastings to make a test with the No. 2 burner in conformity with the proposals of the Bill. The substitution of the No. 2 burner would be entirely to the advantage of the consumers of Hastings. The Gas Referees were of opinion that the flat-flame burner was worn out after it had been used for six hours. The difference in the use of the standard burner would be from 1 to 1½ candles. The light which the consumer obtained from the flat-flame burner was considerably less than that which the Company had to supply under their Act. When the Company were supplying 15 candles, the flat-flame consumer would be getting about 9½ candles. The difference of 1 or 1½ candles was a negligible quantity.

Mr. Charles E. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, agreed with the evidence given by Mr. Jones. Of any economy that might result, £80 out of every £100 would go to the consumer. If, on the substitution being made, they changed the flat-flame burner for a new one, it would make up to the consumer any loss, negligible or otherwise, that might be brought about.

Mr. Robert Beynon, the General Manager of the Torquay Gas Company, gave similar evidence.

Mr. FITZGERALD announced that this would be the case for the Bill.

The Torquay Corporation were no longer opposing the Bill at present, although they might appear later on.

The Case for the Opposition.

Mr. RAM then proceeded to call his evidence in support of the case for the Hastings Corporation.

Mr. Thomas S. Berry (of Messrs. Sherwood and Co., Parliamentary Agents) gave evidence in proof of a table containing the details of a large number of companies indicating the course which Parliament had taken in previous cases. He said it was a matter of inference whether Parliament had made any alteration of price in consequence of the change in the burner.

Mr. B. F. Meadows, the Town Clerk of Hastings, said his Corporation opposed the Bill as the result of a conference of the local authorities. The view of the conference was that they would get an inferior quality gas, a less illuminating power, and a lower calorific value. The price charged in Hastings was 2s. 10½d. per 1000 cubic feet; and the Corporation's consumption amounted to £6000 a year.

Mr. HONORATUS LLOYD: It is the natural corollary if, as a matter of fact, we are agreed that the old burner has registered inaccurately against the Company, the result is that the Company has had to go to unnecessary expense to produce an article which Parliament never intended the consumer to have?

Witness: I agree.

And if this Bill is passed, the unnecessary cost which Parliament never intended should be expended will be saved?—Yes.

Continuing, witness said that wherever the Corporation had electric mains they were converting the gas lighting into electric lighting. They were gradually extinguishing gas for public lighting and substituting electricity. The undertaking did not pay in the sense that local authorities were handicapped when they were in competition with companies, because they had to make large provision for the sinking fund. From this point of view it did not pay.

Mr. A. G. Smith, the Gas Examiner engaged by the Liverpool Corporation, said that, in connection with the general case of all the authorities, he went to different towns in the country making experiments with the gas. On March 22, he tested the Hastings gas. With the No. 1 burner, the illuminating power was 15·28 candles; and the same gas tested five minutes afterwards with the No. 2 burner showed 18·44-candle power. There was a difference of 3·16 candles.

Mr. HONORATUS LLOYD: Could you tell me whether the present burner used at Hastings measured accurately?

Witness: I think so.

Do you also say that the proposed burner is an accurate one for Hastings?—Yes.

How is it that two accurate burners testing the same gas produce different results?—One has an adjustable air supply.

Yes, that is just the difference. The accurate one is the one we propose to adopt?—My contention is that the accurate burner, so-called, will enable the companies to send out a lesser quality of gas.

Is the proposed burner accurate?—It increases the luminosity.

Are you in favour of the new burner being adopted?—I am to a certain extent.

Are you generally in favour of its being adopted?—I suppose it would be a good burner; but it would not be applicable to Liverpool.

Professor Frankland's Evidence.

Professor P. F. Frankland, Professor of Chemistry at the Birmingham University, said he had devoted special attention to the composition of the illuminating power of gas. It was advantageous to the consumer to have a gas of high illuminating power; and the effect of the Bill would be to enable the companies to send out gas of less illuminating power than they were at present supplying. It would be labelled as a gas of the same candle power; but it would be of inferior quality. The whole question depended upon the burner in which the gas was burnt, and the rate of consumption. By altering these two things, they could make a gas of a very different candle power. It was cheaper to manufacture gas of a lower than a higher illuminating power. The Bill would enable the companies to supply at the same price an article which would be less advantageous to the consumer, and which would cost less to the gas manufacturer to produce. If the consumer wished to have the same illuminating power, he would undoubtedly have to burn more gas. He had made experiments with the Liverpool gas; and the flat-flame burner, which was the standard for Liverpool, gave an illuminating power of 14·1 candles. With the No. 1 "Metropolitan" argand it gave 16·3 candles, and with the No. 2 "Metropolitan" argand 19·1 candles. If the companies had been coming to Parliament to alter the 15 candles to 12, the result would be precisely the same as they were now proposing; and they must have given a concession to the consumer from the point of view of price. There was no exact ratio between the calorific power and the illuminating power of gas, except where they were dealing with one kind of gas. If the gas was of a different character altogether, with a higher illuminating power, the calorific value would not follow at all.

In reply to Mr. HONORATUS LLOYD, witness said he did not know whether the gas he tested at Liverpool was the Corporation gas—the ordinary gas that they supplied. Asked what candle power he was in favour of, he said the higher it was the better. He knew that the whole course of Legislature for some years has been to reduce it. He considered that both Parliament and the Board of Trade were making a mistake. Parliament had been steadily favouring the manufacturer. He had no fault to find with the proposed new burner from the point of view of accuracy. For the purposes of commercial contracts, his view was that the existing burner was preferable to the new one. The No. 2 burner would give the maximum illuminating power of any gas better than the No. 1 burner; and he agreed that it was the best burner if it was handled skilfully and honestly.

Replying to Mr. TALBOT, witness said there was no such thing as 14 or 15 candle power. Whether a particular gas showed that light depended on the burner and the rate of consumption.

Mr. Isaac Carr's Evidence.

Mr. Isaac Carr, the Manager of the Widnes Corporation Gas-Works, said the gas supplied by them was at a lower price than that of any

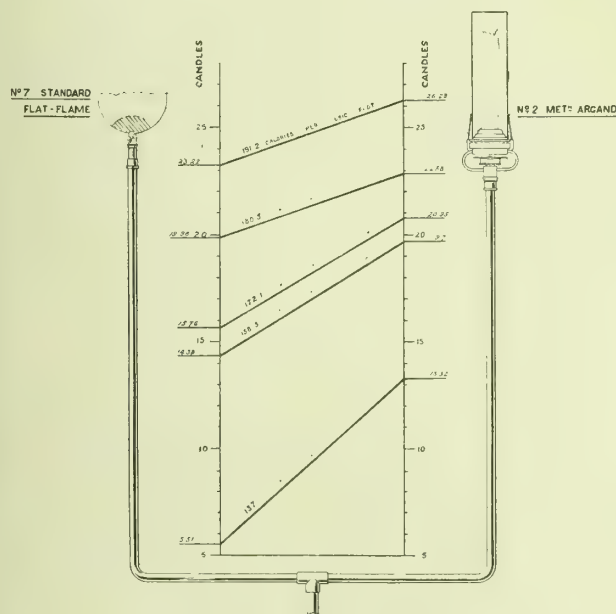
other town. They charged 1s. 2d. per 1000 cubic feet to small consumers, 1s. to consumers of 3 million cubic feet per annum, and 10d. to all users of gas for motive power. No attempt, however, had been made to reduce the illuminating power; and he was of opinion that such a reduction was equivalent to an increase in price. He had made experiments to determine the relation of the difference in photometrical value between one test burner and another; and he found that 14-candle gas as tested in the 15-hole Sugg-Letheby argand was returned at over 20 candles when tested in the No. 2 "Metropolitan" argand. Gas of 14 candles tested in the "Metropolitan" No. 2 argand gave a result of 8 candles in the Sugg-Letheby argand. There was no such thing in the abstract as candle power. His Corporation had a Bill in Parliament in 1908 seeking additional powers; but there was no attempt to reduce the illuminating power or interfere with the statutory method of testing. The standard remained at 14 candles as tested with the Sugg-Letheby argand, with 15 holes and a 7-inch chimney. Since then, there had been various new argand test-burners invented in order to appreciate the photometrical value of gas. The gas passed through them looked as though it were of a better quality when passed through some other burner. In testing the Widnes gas (which was kept as constant as possible in quality), it might be made, according to the burner screwed on to the photometer, 14, 16, 17, 18, 20, or 22 candle power. The standard 14-candle gas in the Sugg-Letheby burner was shown in the No. 2 "Metropolitan" argand as 19 and 20 candles. It was made to appear much stronger in one burner and much weaker in another. He produced a number of burners, and said the same gas put through them showed a different result in every case. He held a high opinion of the No. 2 burner until he heard Mr. Carpenter say, before the other inquiry, that he could obtain a good result, or a result, from a non-luminous gas. He told the Committee in the other House that, by testing methane (which was practically a non-luminous gas) in this particular burner, he could obtain a light. Up to that moment he (witness) thought it was a good burner; but he then set to work to consider how that came about, and his views had undergone considerable change. He had taken a quality of gas which registered in the "London" argand burner, the burner under consideration, 15.7 candles, and the same gas tested in the proposed manner registered 19.7 candles, and in the standard batswing burner 12 candles. He mixed the gas with 6 per cent. of air—and, of course, a very small percentage of air destroyed the luminosity of the gas very rapidly. The result on the No. 1 burner was to drop the illuminating power from 15.7 to 14.8 candles; and on the No. 2 "Metropolitan" burner, it dropped from 19.7 to 18.3 candles. He then put more air into the gas and rendered it almost non-luminous. When there was 40 per cent. of air put in it, it registered 12.5 candles in the flat-flame burner and 5.5 candles in the No. 1 burner, but with the very extraordinary result that in the No. 2 burner it indicated 13 candles. It was a matter of surprise to him that a gas which was down to practically non-luminous gas in the flat-flame burner could give such an excellent result. His explanation of it was that the air necessary for combustion could with this burner be put into the gas at the gas-works and sent along through the mains, and, by closing down the damper more than would be required for a proportion of pure gas, so bring about the result. With one burner there was no means of restricting the air supply, and the same accurate result was obtained; but with the burner in which they could manipulate the air supply—air that must be had for combustion, and whether it was in the gas, or whether it

came from the air, did not appear to be of great importance—it was possible to get this excellent result, which he obtained by shutting the damper down more and retarding the inflow of the air necessary for combustion, because there was a large proportion of air mixed with the gas. In the other House, he had said he regarded it as a suitable burner for testing purposes; but what Mr. Carpenter said about the effect of getting light from some non-luminous gas had led him to change his views, and, in consequence of his recent investigations, he no longer regarded it in the same light. It was capable, of course, of fair and proper treatment.

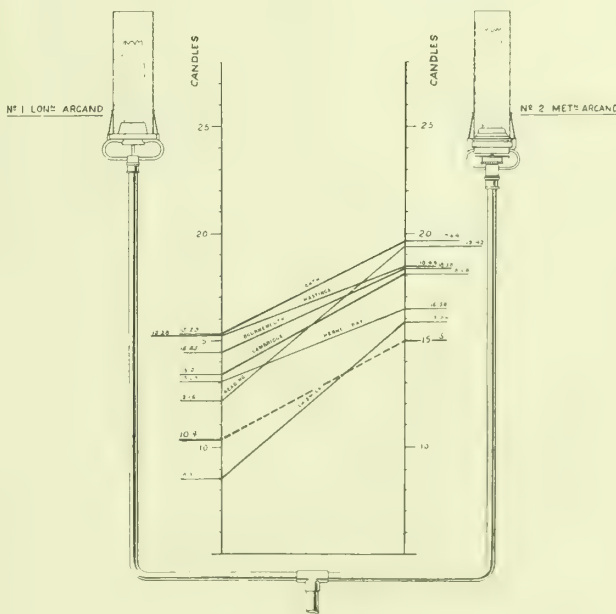
The CHAIRMAN: Do you mean that it could be improperly used?
Witness: Yes; it is capable of most improper use.
At the will of the tester?—At the will of the gas maker. It very frequently happens in the process of gas making that an excess of air may get into the gas, which would immediately be detected in the older burner; but it would not be detected in the proposed burner, because the operator, in making the test, would admit less air to the burner in consequence of the air contained in the gas.
In other words, you think that the gas companies might fraudulently defeat the test?—I do. I say this opens up a possibility that I never dreamed of until this matter came forward.
The last witness told us that there was no such thing as 14 or any number of candle power gas. How did the expression "so many candle power gas" first arise? It must have been for a real comparison of the light of gas with the light furnished by so many sperm candles?—That is so.
And the light given by them is a quantitative reality?—Yes; and I think that was very clearly explained by Professor Frankland. Supposing we dismiss the sperm candles, and take the pentane standard of 10 candles. What is the light emitted from a lamp known as the pentane lamp, which gives a constant light of 10 candles and which is universally accepted as the standard of light? It gives a result equal to 10 candles—a constant 10-candle standard. Taking this pentane lamp test, and testing with the pentane standard any constant gas—say, the Widnes gas—gives these different results. If you come along to test my gas, I say: "Do you want 14, 16, 17, 18, 20, or 22 candles?" and I screw on the burner which will give you the result that you require, or that I say I want you to have.
If by the pentane burner, which shows a light of 10 candles, you want to ascertain 14, there must be another step. Is that adjusted by a photometer?—It is simply the multiple that is changed.
I suppose there is such a thing as a really accurate 14-candle power light?—That depends entirely on the burner used. That is to say, with the Sugg-Letheby burner you get a light equal to 14 candles; but the same gas in this burner gives a light equal to 20 candles. So that the light depends on the burner. If you were to screw on an incandescent burner, you could get the light very much larger—exaggerated still further. But I am speaking now of the ordinary test burners that are made statutory; and there is this range between the existing statutory burners of 14 to 20 candles.
Mr. RAM: How is the light created in the pentane lamp?
Witness: It is an atmospheric gas.
That requires no burner to make it 10 or 12, or anything else?—No. It is measured through a screen. You can vary the height of the flame; but you cannot vary the opening through which the light is emitted from the burner. When the instrument comes to you from the makers, as passed by the Metropolitan Gas Referees, there is a

CAS COMPANIES (STANDARD BURNER) BILLS N^o1. N^o2. & N^o3. SESSION 1910.

DIACRAM SHOWING THE RELATION OF THE ILLUMINATING POWER AND CALORIFIC VALUE BETWEEN N^o 7 STEATITE BATSWING AND N^o 2 METROPOLITAN ARCAND BURNERS



DIACRAM SHOWING THE RELATION OF THE ILLUMINATING POWER BETWEEN N^o 1 LONDON ARCAND AND N^o 2 METROPOLITAN ARCAND BURNERS.



* * The dotted line in the right-hand diagram shows the observations made by Mr. Carr at the offices of the London County Council, 40, Craven Street, Strand, on the 7th inst.

measured point which the flame must be lifted to, and there is a measured opening in the partition through which the 10-candle portion of the light is emitted on to the testing disc; so that if you conform to the instructions, you get a 10-candle light.

The CHAIRMAN: Now the question is, as between the two burners, which is the better one for the purpose of proving this actual 14-candle power light?

Witness: When the question of the Widnes Corporation coming to Parliament was under consideration two years ago, I advised my Committee that I understood the relationship between standard test burners. I said: "It is quite unnecessary for us to apply for powers to adopt the No. 2 'Metropolitan' burner," because we could have done two things. We could either have called our gas 20 candles, re-christened it, and, instead of calling it 14 candles with the existing burner, we could have gone on supplying the same quality gas and have said we were supplying 20 candles. Or we could have done this, which the promoters are seeking to do—we could have supplied 14-candle gas in this burner, which would have meant a reduction of nearly half the illuminating power. We should have supplied a very inferior quality of gas, and we should have got into all sorts of difficulties.

Mr. HONORATUS LLOYD: Which nobody else has.

Witness went on to say he was dealing with 14 candles, compared with what they were now supplying in Widnes. There would have been all sorts of difficulties; and he advised the Corporation that no attempt be made to obtain a lowering of the quality of the gas.

Mr. RAM: Supposing a gas company comes along to you and says: "I have got some gas and I am bound to supply it to a customer of mine at 14-candle power," what burner would you tell him to put on that gas to do it?

Witness: In my case, the statutory burner is the Sugg-Letheby 14-candle burner.

If you take the same gas and apply the "Metropolitan" No. 2 burner, will it still give 14 candles?—No; it would give between 19 and 20 candles.

Thursday, July 7.

Mr. Carr continued his evidence in chief this morning. He said he had prepared a table showing the result of a series of tests which he had made with nine different burners, using a portion of the same bulk of gas through each one. The gas was stored so that it could undergo no change, and so that the relation of the photometric value between the different burners might be accurately ascertained. In the Sugg-Letheby burner, the gas came out at 14.2 candles; in the flat-flame standard No. 7, at 14.7; in the "London" No. 1 argand, at 16.2; and in the "Metropolitan" No. 2, at 20.30. Having regard to these results, he thought the difference of 3.16 candles found by Mr. Smith in the Hastings gas was probable, and he believed it might be even greater. The Hastings test was made at a 15-candle rate; and this was the reason that such an excellent result was obtained in the No. 1 burner. A 10-candle power gas through the No. 2 burner would be 15 candles; and the less the number of candles, the greater would be the difference. The Widnes Corporation could have had the No. 2 burner for the asking; but the gas they supplied would have been reduced to between 8 or 9 candles—a most inferior article. It was a fallacy and an unfair argument that any change in the quality of the gas would not adversely affect a consumer with a bad burner. The promoters contended that if a consumer had a flat-flame burner and a good gas, with a low-grade gas and a good burner he would not feel the difference. They must give a man credit for burning his gas properly. He had made experiments at the Liverpool Corporation Gas-Works, having regard to the substitution of the No. 2 burner for the No. 7 flat-flame burner (which was the Liverpool test-burner); and he found that with the 20-candle power gas there would be a saving, having regard to the purchase of raw materials, improved coke, and so on, of 4.8d. per 1000 cubic feet. The saving to the Liverpool Gas Company was not quite on all-fours, however, with that of the Liverpool Corporation. But if he was right that the saving was 5 candles, then there was a saving in the cost of production of 4.8d. He had also prepared a table showing the reduction in the illuminating power and the reduction of calorific power, with regard to both flat-flame and incandescent lighting. He found a reduction of 5 candles on the 16-candle power gas, which meant that, in order to obtain the same light, the consumer would have to spend 7.3d. per 1000 cubic feet more. All the flat-flame consumers using gas for heating, cooking, and motive power would be adversely affected. Where a gas-engine was working at its maximum, with the change that was proposed it would be no longer capable of doing the work it was now doing. With other engines working within their maximum pressure, they would get over the difficulty by using more gas. The company got the benefit of this and the consumer lost it; or unless there was some benefit to the consumer, the benefit would go to the company. The ratio between the flat-flame lighting and the incandescent lighting was different—there was an actual loss in the incandescent lighting of 2 per cent. per candle, and in the case of the flat flame it was very much more.

With regard to the opposition to the Bill, he said that some of it had disappeared. In the case of Ipswich, the Company had given a reduction in the selling price; and on account of this, the Corporation had withdrawn their opposition. Ilford had vanished for the same reason. The Brentford Company had withdrawn from the Bill; and in the case of Richmond, a clause had been inserted that the Act was not to apply to them without the consent of the Corporation. All incandescent gas-burners were of the same type; and the consumers would have to use a larger quantity of gas in order to obtain the same light when the gas was of a lower quality. Referring again to the Richmond case, he said he would be willing to take a similar clause to the one that had been given there.

Mr. HONORATUS LLOYD: Do you approve of the No. 2 burner?

Witness: No.

Did you approve of it when you were in the other House?—Yes.

And you changed your mind because Mr. Carpenter explained that with a non-illuminating gas some candle power might be shown with the No. 2 burner?—Yes.

What was the non-illuminating gas to which Mr. Carpenter alluded to?—I believe it was methane.

Have you measured methane with a flat-flame burner?—No.

Do you know that it shows luminosity?—I believe it does.

Then you would condemn the flat-flame burner?—If I was obliged to have a light from such a gas with a flat-flame burner, I would say it was an unsuitable burner.

Why do you condemn the No. 2 burner because it shows that which the flat-flame burner shows, and not condemn the flat-flame burner?—There are conditions which I have already explained.

You would not condemn a burner because it showed a degree luminosity with a non-luminous gas?—That would depend on circumstances.

You have made experiments with the No. 2 burner with a non-luminous gas?—Practically non-luminous.

Have you made the same experiments with the flat-flame burner with the same gas?—Yes.

What gas are you now describing as non-luminous?—A coal gas mixed with 40 per cent. of air.

And what luminosity did you get?—1½ candles with the flat-flame burner, and 13 candles with the No. 2.

Replying to further questions, witness agreed with what he said in the other House that, with a lower-grade gas, the "Metropolitan" No. 2 was the best testing burner invented. In the other House, he also said: "I say the burner is excellent. It is the best burner up to this time which was ever invented, in my judgment." He said he was referring then to a statutory burner.

Mr. HONORATUS LLOYD: Do you agree that Parliament intended from time to time to prescribe a burner which would measure the maximum amount of light?

Witness: My view of what Parliament intended in Gas Bills differs from yours. I cannot answer your question in the way you put it, for the reason that I hold the view that the whole legislation in gas matters has been that, whatever gas companies have required ever since I can remember, they have succeeded in getting. Whenever an improved burner, improved standard, or improved device of any kind has been in favour of the gas companies, it has been made statutory, and the whole legislation been dominated by the gas companies.

Do you suggest there is a difference between companies and local authorities in this respect?—The companies have taken the lead, and some local authorities have followed.

Do you suggest that Parliament did not understand?—That is what I feel at the present time. The matter has never been understood, and it is not understood now.

Will you assist us with your conclusion of what Parliament intended?

—In my opinion, Parliament has acted in the best interests, from the cases that have been put before them, of the companies and the consumers.

Even assuming that Parliament has been mistaken from beginning to end, what is their mistaken view? Was it that they intended to prescribe a burner which would measure the greatest amount of light?—I say that what Parliament understood in granting these powers to the various companies was that whatever the company could do in the photometer room, the consumer should be reasonably able to do in his house.

In further cross-examination, witness said he heard that the burner might be made for 5s., and Mr. Carpenter had said that it could be made for 1s.; and he agreed that it was capable of practical use. The burner was capable of admitting a large proportion of air, which would be prejudicial to the consumer.

Mr. HONORATUS LLOYD: You mean to say it is capable of regulation so as to provide the proper amount of air for showing the maximum amount of light?

Witness: Yes.

Do you suggest that Parliament through all these years has intended, when it has said *x* candle power shall be given, that it meant one thing in Newcastle and a different thing in the Isle of Wight?—Yes.

When Parliament prescribed 16-candle power in Northumberland and 16-candle power in Cornwall, do you suppose they intended to prescribe two different things?—I can only tell you that if they prescribed 16-candle gas in two different towns, the effect was that they were two different qualities of gas.

Replying to further questions, witness said at Widnes the candle power was 14 in the prescribed burner—the Sugg-Letheby. The gas varied at different times of the day. They enriched with cannel and benzol.

Mr. HONORATUS LLOYD: Which chiefly?

Witness: It depends upon circumstances and upon the material available.

Let us assume that it is about equal. Is it the fact that benzol has the effect of raising the candle power for a short time so as to enable it to pass the test, and when it gets outside to the pipes it drops?—That depends upon the circumstances.

The severer the weather, the more benzol you have to use in order to pass the test?—Yes.

And the effect wears off still?—In proportion; it does not all wear off.

The further the distance from the measuring instrument the worse gas the consumer gets?—Yes.

Do you enrich it in the evenings?—Yes.

And you do that to produce a higher-grade gas for lighting purposes?—Yes.

Because you know perfectly well that the lower-grade gas is better for power?—No.

Then why do you not enrich it in the daytime?—We do.

Then why do you further enrich it in the evening?—Because we find it desirable, having regard to the large number of flat-flame burners in the town. We give gas in excess of our statutory obligation in the daytime and in the evenings.

Mr. HONORATUS LLOYD then called attention to the evidence given by Mr. Carr before Lord Rayleigh's Committee; and he mentioned the divergence in the results of the tests which had been given by Mr. Carr, as compared with the figures of Mr. King, who was a member of the Committee.

Witness, in explanation of this, said that Mr. King was the Manager of the Liverpool Gas-Works, which were three miles from Widnes, and they were producing gas at two to three times the cost at which it was

being produced in Widnes. It was quite true the candle power in Liverpool was high. Frequent reference was made to the comparison of the cost of manufacture in Widnes and the selling price in Widnes and Liverpool; and Mr. King set up hostile tests to disgrace him in the matter of illuminating power. For a long period of years Mr. King kept a secret testing-station in the town of Widnes; but where the testing-station was, what burner he used, or the conditions under which the tests were made, he never knew or understood. He only knew that, because of his jealousy, Mr. King was seeking to account for the enormous difference in his works and those of Widnes. There was a difference of 2 candles between Mr. King's tests and his; but for hostile tests he did not think that was very extraordinary. Two years ago, Widnes considered coming to Parliament; and they could have had the new burner for the asking. But his advice was that it would be a mistake to substitute the No. 2 burner, because it would have resulted in their giving gas of about half the quality they were now supplying, and would have prejudiced the best interests of the Gas Department. He did not object to 18-candle gas in the No. 2 burner, but below this it would be a mistake.

Mr. HONORATUS LLOYD: Do you say that gas of high illuminating power is the right gas to supply to-day?

Witness: I do not agree with excessive enrichment. It depends on the quality and what you call high illuminating power.

What do you say is the best candle power?—I say that the candle power depends upon the raw material at the disposal of the various gas authorities throughout the kingdom. I do not believe any injury would be done by lowering the candle power in Liverpool provided that it is lowered on proper terms. The lowering of the candle power would enable the Company to effect a very considerable saving in the process of manufacture. The consumer would have to use more gas to get the result he is obtaining to-day; and if the Liverpool consumer were met by a reduction in the price of gas, I see no reason why the No. 2 "Metropolitan" burner should not be substituted for the No. 7 bating, which would be equal to a reduction of five candles. I do not suggest or recommend excessive enrichment.

Do you agree with Professor Frankland with regard to illuminating power—"the higher the better"?—No.

In answer to Mr. MUNRO, witness said the No. 2 "Metropolitan" burner had been recently introduced in Dublin; and he was informed that there were a very large number of complaints resulting from the quick drop in the candle power of the gas. In London, the drop had been very gradual, and had not been felt as in the case of Dublin.

Mr. J. G. Newbigging's Evidence.

Mr. J. G. Newbigging, the Chief Engineer and Manager of the Manchester Corporation gas undertaking, said there was no provision in the Bill to ensure that the consumer would participate in any saving that might be effected by the use of the No. 2 burner. He had made experiments with a view of showing what the effect of the use of the No. 2 burner as a standard test burner would be on the consumers who used the incandescent mantle or the flat-flame burner, and also with regard to heating, cooking, and motive power. In the majority of towns in the United Kingdom, at least 20 per cent. of the gas for lighting was consumed in the flat-flame burner. They were generally used in the poorer class houses and manufactories, and where there was a good deal of vibration—in places where the incandescent mantle would not be suitable. There were various forms of flat-flame burner in use; but he thought the one most commonly used was the No. 7 standard.

The actual effect of the proposed change would be to enable the companies to send out a much poorer gas and still conform to the prescribed illuminating power. Provided the consumers were not to be injured in any way, it was advisable to have a common standard for testing gas. But if the companies were allowed to use the No. 2 argand, they would have a considerable advantage, and there was no provision to give a compensatory equivalent to the consumers. This was a one-sided bargain, and did not do justice to the consumers. The company was secured by its Act to save a considerable amount of money; whereas the consumers were not so safeguarded. It would depend upon the will of the company whether they would get any of the saving. He did not agree with the case put forward by the promoters, that in using the present burner they were placed at a disadvantage because a certain amount of light was not shown in it. There had been a great many fallacies introduced into the case for the Bill. It was not true that in testing with the No. 1 burner the light was destroyed. That was not the way to put it; it was misleading. The burner failed to register the illuminating power; but it went forward to the consumer, and the consumer got the benefit of that quality.

The CHAIRMAN: He gets the benefit of the advantage of the instrument?

Witness: Oh, no. He pays for what he is getting. He pays the whole of the cost—the cost of manufacture, the cost of distributing it, he pays the dividend of the company, and every charge—and he is entitled to the whole saving. The burner fails to register; but when he gets what is passed through the burner, he gets what he is entitled to under the Act.

Mr. RAM: The consumer only gets what he is entitled to, and therefore he does not get any advantage by reason of the fact that the companies are put at a disadvantage?

Witness: That is so.

We say there is a considerable loss to the consumer; but the promoters say the consumer will get the benefit, because the producer will be able to make the gas more cheaply, and ultimately the price will be reduced. Is it the fact that in all cases the consumer must get such advantage?—No; I do not think he necessarily gets an advantage. The money saved may be expended in various directions; and if the companies are allowed to use this burner without some restriction, it is putting a premium on decreased efficiency of management.

The CHAIRMAN: Supposing they have saved by cost of production and cost of supply. How do you say that may lead to diminished efficiency?

Witness: They will have a greater balance in hand to deal with, and they will not keep up to the high state of management which should exist. They may form superannuation funds, and so on.

But only so far as the law allows them?—They may expend money in experiments on the works. They may spend money on the works which ought to go to capital, and all that sort of thing.

That comes under the head of diminished efficiency?—No.

Mr. RAM: They would have less incentive to be as good as they could be in their working?

Witness: Yes.

But apart from this, could they raise the salary of every one of their employees?—Yes.

And the directors, too?—Yes.

Continuing, witness said that with regard to sliding-scale companies the promoters suggested that any money saved by the use of the burner would accrue to the consumer, and that whenever the dividend went up the price had to go down. But he would point out that before the sum was large enough to amount to any appreciable figure by which the dividend could be increased or the price lowered, there would be a considerable accretion to the Company. When the burner was first introduced five years ago, he made experiments in Manchester to discover the effect on the consumer. Manchester was under no restrictions for testing, and they were quite at liberty to distribute whatever gas they thought was best for the consumer. Their guide in manufacture in Manchester was by the calorific standard, because the bulk of the gas was for heating purposes. They saved a considerable sum, which had been given in one form or another to the consumers or the ratepayers.

The Hastings Gas Company, using carburetted water gas for enrichment, would be enabled by the change of burner to save at least $\frac{1}{4}$ d. per candle of reduction in the illuminating power. The difference, according to the tests that had been made by Mr. Smith, was a little over 3 candles; but it was quite possible, by manipulating the mixing of carburetted water gas and coal gas, to make a gas of 10 or 11 candles in the No. 1 burner show as 15 candles in the No. 2 burner. But with 3 candles it was a reduction of 20 per cent. in the illuminating power. The extra cost to the consumer in using this gas would be 7.2d. per 1000 cubic feet; for heating, cooking, and motive power, it would be 3 $\frac{1}{2}$ d.; and for incandescent lighting, just over 2d. At $\frac{1}{4}$ d. per candle, the saving to the Hastings Gas Company would be £4197 per annum on the present consumption; and in the case of Torquay, it would be £1629. But if they only saved $\frac{1}{4}$ d. on their production, it would work out at £2798 a year.

Mr. HONORATUS LLOYD: In Manchester, you endeavour to carry on the business so as to give the consumer the benefit of any economical management there might be?

Witness: The consumer and the ratepayer.

Largely the ratepayer?—No.

But, as a matter of fact, you take out of the net profits of the gas undertaking £50,000, £60,000, and £70,000 a year, and distribute it to the ratepayers?—The consumer and the ratepayer are practically one and the same person.

Have you constantly and consistently advocated that the profits of the Corporation gas undertaking ought not to be distributed in reduction of the rates?—Yes, because, of course, every gas engineer wishes to sell his product at the cheapest price. But there is going to be a change, so that the consumers shall have more of the saving.

As a matter of fact, if there is a saving by reason of our Bill, with a sliding-scale company generally speaking four-fifths of the saving must go to the consumers?—It does not necessarily follow that they will get it.

With regard to the maximum-price company, if they are paying their maximum dividend and the reserve is full, the whole saving must go to the consumer, assuming honest men?—It is not necessarily a question of honesty. They can expend money thinking they are entitled to.

Manchester, until 1905, had the flat-flame burner. Did they return their illuminating power in 1900 as 19.40 candles, and until the year 1905 did they gradually reduce it to 17.04 candles?—Yes, it was a gradual reduction, because if it had been dropped immediately 4 or 5 candles, it would have had a serious effect on the consumers.

You had not the pluck to do it all at once?—We had not the pluck to commit commercial suicide.

Was not the object to prevent the consumers finding it out?—Our object was to do away with enriching the gas. Our policy is to give the maximum quality of the gas in illuminating power and calorific value which can be obtained without enriching.

After that you dropped, within a fraction, 2 whole candles in one year?—Yes.

In six years you reduced the candle power from 19.40 to 15.30?—Yes; and we gave the consumers or ratepayers the benefit of it.

When you began these operations, the price was 2s. 3d. per 1000 cubic feet, and when you had finished it was still 2s. 3d.?—Yes.

Up to now it is not very patent that the consumers had any advantage?—On paper, no. When I was in charge of the Manchester gas works 10 years ago they were in very bad condition, and we have spent large sums of money out of revenue in bringing them up to date. We also give stoves to the consumers free of rental; and these two items cost us something like £30,000 per annum.

Having got down to the 15.30 candles, and rid of 5 candles, you adopted our burner?—Yes, in order to make ourselves comparable with other undertakings. We do not attach any importance to luminosity of the gas now. We take the calorific value.

Having adopted the burner, you called the gas that you had supplied as 15.30 candles 17.67 candles?—Yes.

Did the heating value go down when you changed to this burner?—It went down in proportion to the loss in illuminating power—3 per cent. per candle.

Did you make any difference in the price?—No. During that year (1906) there was a heavy increase in the price of coal.

But in that year you applied £59,000 to the rates and £57,000 to works?—I am not sure whether that was the year.

The CHAIRMAN: That was the very way in which you suggested the wicked directors might absorb it, instead of distributing it among the consumers?

Witness: The consumers generally, in the case of a company, are not shareholders in the undertaking. With the municipality, the case is rather different.

Mr. HONORATUS LLOYD: Has this Bill, which seeks to prescribe the No. 2 burner, your approval?

Witness: Yes, on certain conditions.

Parliament has prescribed a price and a quality?—A price and an article.

Are you not aware that Parliament has used the word "quality"?—With a particular burner.

And the particular burner is one of the things mentioned under the heading of "quality"?—Yes; but you must take the burner into consideration.

The consumer pays according to the registered measurement by the burner?—He pays for the quality of the gas as shown in the burner. That is the bargain.

There is something which goes through which is not measured; and it is obvious that the balance between what is measured and what is not measured is not paid for?—Oh, no.

The CHAIRMAN: Let me try. Say the consumer pays for 14-candle gas, and he gets 15½ candles?

Witness: He pays for that.

How does he pay? The price is fixed with reference to the 14 candles; it is not fixed in relation to the 15½ candles?—But they would be able to keep up their price of gas so that the consumer should pay. The consumer pays for everything.

In reply to Mr. RAM, witness said that what the consumer had to pay was so much per 1000 cubic feet as supplied to him through his own meter in his own house.

The CHAIRMAN remarked that he had asked to be allowed to see a number of tests in relation to the matter carried out; and the County Council had made arrangements that the Committee should see them made.

It was thereupon arranged that junior Counsel, and Mr. Carpenter for the promoters and Mr. Carr for the petitioners, should accompany the Committee.

Mr. RAM remarked that, whatever tests they might choose to have, he would ask them to have one test made in which the gas was being passed through actually at 5 cubic feet, as specified in the Act.

After a short discussion, it was decided that the decision on the Bill should be deferred until the Liverpool case had been heard, and that there should be a separate reply by Counsel on each case.

Mr. Ram's Speech.

Mr. RAM then proceeded to address the Committee on behalf of the Hastings Corporation. He said he viewed the case with great apprehension, because it was one of the most extraordinary difficulties and complications, and he thought that certain matters had been perhaps unnecessarily imported into it. He submitted, on behalf of the various authorities, that what the consumer really was entitled to in each case was a light specified by the particular Act under which the Company supplied him with light. He also submitted that a fallacy which had been imported into the case was that there was such a thing in the world as a 12, 14, 15, 18, or 20 candle gas. The thing in itself did not exist. It was something which was not ascertained, but ascertainable, and a thing which could only be ascertained by certain conjunction of circumstances. What the customer was entitled to, in each separate case, was such an amount of light as was produced by a certain specified treatment of a certain quality of gas burnt at a certain specified rate in a certain specified burner, and for these he had to pay a specified price. All these considerations hung one on the other; and the Committee could not, in justice to the consumer, alter any one of the ingredients which were necessary for ascertaining the true light without considering in each individual case, and probably altering in each individual case, some, if not all, of the ingredients. If any one of the circumstances were taken away, the bargain as between the gas company and the consumer was changed, unless all the circumstances were taken into consideration, and if necessary all or some of the circumstances so adapted as to meet the altered circumstances of the case. The consumer had not benefited by getting a better production; he had got that to which he was wholly entitled. The promoters contended that the saving effected would be only equivalent to the saving of the loss; but his case was that it would be more than that. He thought it was without dispute between them that if the Bill passed it would be possible for companies to supply to the consumer an article which would be less efficient than he was getting to-day. The poor consumer who used a flat-flame burner must either burn considerably more gas or have a considerably worse light, or he must change his burner and put in at his own cost a more expensive one. The use of the proposed burner would effect more than they were quite willing it should do—make up the injustice; and the consumer ought to have his proportion, in one way or another, of any advantage that went to the company. Counsel then referred to the list of companies who had been put before the Committee by him, and remarked that the same list was put in in the other House by the promoters with a view of showing that there was only one case in which Parliament had made an alteration in the price of gas in consequence of the change in the burner. This was not the fact. The table was erroneous; and he wished to remove from the minds of the Committee any false impression that might exist.

Counsel had not concluded his speech when the Committee adjourned.

Friday, July 8.

When the proceedings were resumed this morning,

Mr. RAM remarked that on the previous evening the Committee intended to see certain tests applied, and asked whether the Chairman desired to say anything on the matter.

The CHAIRMAN thought not. The Committee saw the process adopted in the testing of gas; but anything he might mention would not affect what Mr. RAM might say in continuing his address. They were shown how the photometer worked, and how the test was taken. This was what they wanted to see; and they saw it.

Mr. RAM: I am afraid we have not gained all we had hoped. We have repeatedly challenged the other side to have a test, and we thought it was going to be made in your presence.

The CHAIRMAN: No; not at all. I wanted to see how the testing was

worked, and how the new burner and the old one respectively operated when the photometer was applied.

Mr. RAM: Well, then, I leave it at that.

Mr. HUTCHINSON, who appeared for the promoters, said that any results which might have been pretended to be shown would not indicate any results to which importance could be attached.

The CHAIRMAN: As to a test, you may consider that nothing was done.

Mr. RAM said he had hoped the Committee would have seen that which would have enabled them to judge as to the accuracy of the two cases. Continuing his address to the Committee, he said something had happened while this case had been going on. At Ipswich, a reduction in price had been given; and the Corporation had withdrawn their opposition. He believed the same position had been taken up in the case of Ilford; and when Mr. Carr gave his evidence, there had been no cross-examination upon it. These authorities had withdrawn from the Bill; and if the Committee were to give their decision upon the Bill without having the facts relating to these cases placed before them, an injustice would be done both to Hastings and to the Committee.

Mr. HONORATUS LLOYD: The Agent for the Bill tells me that, in reference to the Corporation of Richmond, there was an agreement made two years ago, and a provision has been made with regard to them that nothing in the Bill shall affect the agreement. With reference to the other two cases, the Agent for the Bill has had no information whatever, except that the local authorities have withdrawn. We know no more about it.

Mr. RAM submitted that, before the Committee decided on the Bill, they should know what had been done in these two cases. Year after year arrangements had been made between gas companies and their consumers whereby, to the great advantage of all concerned, alterations had been made. But if the Bill were passed without any recompense or compensation to the consumer, the burner would be imposed upon the country, and there would be no chance of altering it, unless the Gas Referees, or some other body of the sort, altered it universally. The Bill would exclude that. When it was proved to the Committee that these two places had had some concessions made to them in the matter of price, he thought that it would be strongly in favour of the reasonableness of his request that the same should be given to Hastings. There would be a reduction in the illuminating power and the calorific power of the gas which would be to the advantage of the Company; and if the burner were allowed, there should be such an addition made to the candle power as, in the opinion of the Committee, would put the consumer in the same position as he was in to-day. The consumer should either have the price of gas reduced or the candle power raised. But in this case, they were anxious to get a thoroughly good illuminating light, and they would rather that the candle power were increased. With regard to Ilford, the information for which he was asking must be in the possession of the promoters of the Bill; and he was told that Ilford had withdrawn because they had had a clause given to them. He felt that the Committee ought not to be kept in the dark with regard to the facts.

Mr. HONORATUS LLOYD: You are misinformed; there is no clause whatever.

Mr. RAM: Then what is the understanding or agreement that has been arrived at?

Mr. COOPER (the Agent for the Bill): I know nothing of any agreement or understanding.

Mr. RAM said Ilford had withdrawn. He did not know whether it was by understanding, agreement, or what; but what would satisfy Ilford would satisfy Hastings.

Mr. HONORATUS LLOYD: You have it from the Agent for the Bill that no arrangement has been made.

Mr. Honoratus Lloyd's Striking Reply.

Mr. HONORATUS LLOYD, in addressing the Committee on behalf of the promoters, said there were originally eight companies in the Bill; but under the instruction of the House, Liverpool would be dealt with separately. There were thus seven companies left, many of them being important places; and it was to Hastings alone they were indebted for the opposition. The time had come when gas, if it was to remain a competitive factor as against electricity, had got to be reviewed in legislation. In the case of Hastings, the electrical undertaking was run as a municipal trading concern, and on the lines that where there were electric mains the order had gone forth that street lighting with gas should be abolished and electricity substituted—and at a time when such enlightened places as London were returning to gas! Everybody knew that, when gas was supplied at a fair price for public lighting, electricity could not for a moment stand against it. In Hastings, they were doing it at a loss; but they considered nothing except making the municipal undertaking look as favourable as they could. And if gas as a commercial enterprise was to be allowed to stand a good and fair chance, it was necessary that gas companies should be in a position to supply it to the consumers at the lowest price. Gas companies had been looking about to see where savings could be made, and to whom the saving should go; and it had been obvious to Parliament for many years that the old-fashioned tendency of increasing the candle power was a mistake. It meant making a gas that could not be manufactured as a straight gas; and it involved enrichment by means of water gas, benzol, and cannel coal, in order to produce an artificial standard which was not only no good to anybody, but which had a baneful influence. Parliament had recognized this; and the tendency for many years had been to reduce the candle power to 14, and, indeed, to 12. It was reserved to Professor Percy Frankland to come and tell them that Parliament had mistaken the whole policy, and had acted in ignorance; and that throughout all these years both Houses had been doing that which was baneful to the consumer and everybody. He ventured to suggest, when the matter was before the other House, that, in order to support the opposition to the present Bill, the opponents had had to collect the cranks that there were in the gas profession. But there was not a man called before the Committee—or, indeed, a man who could be found—who would say that it was right and proper to keep up the candle power to as high a point as possible. Mr. Isaac Carr, of Widnes, had told them, though he immediately succeeded Professor Frankland in the witness chair, that

he did not agree with the answer given by Professor Frankland in regard to illuminating power. It was agreed, with the exception of Professor Frankland, that the right tendency of Parliament had been to reduce the candle power, because it enabled gas to be manufactured at an economical price and sold at a more reasonable figure, with beneficial results to both consumers and manufacturers.

It was suggested on the other side that there was not such a thing as x candle power; and his answer to this was "Rubbish." What Parliament had spoken of, and what Parliament had intended, was x candle power as tested by an accurate burner; and he defied the opponents to controvert it. This was the keystone of his case. There was no magical meaning with regard to candle power, as there was with horse power. The thing that was fixed was the maximum price on the one hand, and the candle power on the other; and the thing that might be altered from time to time was the burner which might be prescribed. With regard to the case put forward by Mr. Ram, the basis of the whole point, according to him, was that Parliament intended that x candle power, measured by a particular burner, was the keystone of the whole thing; whereas the case for the promoters was that Parliament throughout its history had said, time after time, that it should be x candle power with the burner which was supposed at the moment to be the accurate burner. He wished to impress upon the Committee that it was idle to suggest that, when they said 16-candle power by a special burner, as in the Hastings case, Parliament thought they were dealing with some artificial luminosity. It was idle to suggest that Parliament meant 15, 16, or 20 candle power in Hastings to be anything different in Glasgow, Newcastle, or Cornwall. The policy of Parliament had been that the illuminating power of the gas supplied should be equal to x candle power accurately measured. It was admitted by everybody who had been in the room on the one side or the other, that the gas-burner which was prescribed in Hastings was inaccurate. Mr. Ram himself admitted, as did his witnesses, that the Hastings burner failed to register the right illuminating power of the gas. In the other House, Mr. Carr had said that the No. 2 burner was the best that was ever invented for testing gas. But between the other House and this, he had made experiments, and satisfied himself that it was not so. And the fact that led him to come to this conclusion was that Mr. Carpenter had said the new burner showed a degree of luminosity with methane gas which, before the introduction of the No. 2 burner, had been described as non-luminous gas. Upon this he had based his changed opinion; and now he came and said: "I, Mr. Carr, am the only man to be found in the chemical world—in the gas industry—who will say that the No. 2 burner is not the best burner up to now invented." But Mr. Carr, having got his gas down to 15·30 candles had adopted the accurate burner—the No. 2. And now he could not understand whether the case against Hastings was that they were not to be allowed to use the burner.

Mr. RAM: I have said that you ought to be allowed to use it.

Mr. HONORATUS LLOYD: But in my learned friend's petition, it is said that we ought not to be allowed to use it. Continuing, he said Mr. Carr had told them that the new burner was capable of fraud, and ought not to be adopted. His Counsel had thrown him over, and said: "Nothing of the sort; you adopt it." But where Mr. Ram and he (Mr. Lloyd) stood together, he would have no fear of Mr. Carr. Mr. Ram's contention was that, if they were to be allowed to use the accurate burner, they ought to give some *quid pro quo*—in some cases a reduction of the standard or maximum price, and in others some additional candle power. But he would like to know why? If Parliament intended that 15, or whatever it might be, candle power was to be accurately measured, he was merely asking that the intention of Parliament should be carried out; and his financial position, the keynote of his whole undertaking, was established by Parliament upon this basis. To put it shortly, Parliament intended that the consumer should be entitled to gas accurately measured; and Parliament established the financial basis of the undertaker on this footing—sometimes prescribing a maximum price, and sometimes a sliding-scale with a standard price. In every case the intention was that the commodity supplied should be accurately measured. The consumer of to-day, with an admittedly inaccurate burner, was receiving x registered by the burner, *plus y* which passed on to the consumer, and which the test failed to register. The consumer, for the article which he received—namely, x which he was entitled to get, *plus y* which he was not entitled to—paid the actual price which was fixed, not by Parliament, but by the demands of trade upon a commercial basis. The company or the local authority fixed the actual price, having regard also always to the maximum or standard. But the maximum or standard price was fixed by Parliament upon the basis of the consumer being entitled to get what was measured by the test accurately. If the new burner was adopted, the consumer would still get x , as per test, to which he was always entitled, and which Parliament intended him to have. Inasmuch as the standard was fixed by Parliament, and always would be, upon the basis of supply being x as tested, there was no ground whatever for asking Parliament to interfere with the side of the bargain which fixed the price. Now Mr. Ram came along, and said: "I want you to say they should at Hastings supply, not that which Parliament intended them to supply, but that *plus* something else." Was this justice? He had heard of cases where it was said that Parliament was persuaded to put up the candle power from 14 to 15; but was it then suggested that there should be any change in the price—that the company were being called upon to supply a higher quality of gas than Parliament had originally intended, and therefore the price ought to be raised? No. As a matter of fact, there might have been justice in this case, if the companies were here seeking to alter the parliamentary bargain—that was to say, if the companies were saying: "Leave the test alone, but reduce the candle power that Parliament prescribed by how many candles you like." It might then have been remarked with equity: "You companies are seeking to go behind the arrangement, the financial basis, on which Parliament acted, and you are taking away that which Parliament intended; and there should be some alteration of the standard price." But the companies were not seeking to alter the figure which Parliament said should be the basis of their financial arrangement.

Uniformity was what he ventured to impress upon the other House; and here they had Mr. Newbigging, who said that in Manchester he had adopted the No. 2 burner principally in order that he might com-

pare his undertaking with others. The witnesses from Widnes and Manchester had suggested that, though under the Acts of Parliament the profits of a company were provided for, there were ways of diverting profits (some of which they would rather not mention); and if the power asked for in the Bill were granted, the temptation would be such that the companies would depart from their honourable ways. But they objected to the importing of the word "honest;" and Mr. Ram had said that his (Mr. Lloyd's) cross-examination of Mr. Newbigging with reference to what was done at Manchester was an excellent illustration of what might be done elsewhere. But he forgot the whole point, which was that the companies here were operating under Acts of Parliament which prohibited the power of dealing with profits in any way but those provided by the Acts. Mr. Newbigging's Corporation were operating with a free hand. They could go as they pleased; and they had gone as they pleased. They were charging such an extortionate price for gas that they were able to apply large sums, not to the reconstruction of works, but to extension of works, which was a capital charge. Mr. Ram said: "What a horrible example;" and he (Mr. Lloyd) agreed that it was, for municipal trading. But these companies were restricted in this respect; and in the case of Hastings, four-fifths of any saving must go to the consumer. Whatever company they were to take, the saving must, by the very operation of the basis that Parliament had established, inure, either at the moment or eventually, to the benefit of the consumer. But it was suggested that there were methods by which the profits might be diverted. It was not usual in every Act of Parliament to repeat, "Thou shall not steal." The suggestion was that the dividends of shareholders and the fees of directors might be increased; and the companies might find out all sorts of ways in which they might apply the profits rather than reduce the price of gas. But what earthly good would the shareholders and directors be doing themselves? The argument of the companies was that if they were to be allowed to compete with other undertakings, such as electricity, it was necessary that all wanton and unnecessary extravagance should be got rid of. If they could supply gas more economically than to-day, their object was to do it, in order that they might have a chance of life on equal terms. The whole point was that whatever saving there might be would enable them to carry on their business on more economical lines; and the result must be that the customer would either take the whole, or the major part, of any saving that might accrue. They had been under an incubus that had borne heavily, not only on the companies, but on the consumers; and they were asking for relief from this incubus, and that the relief be given on ordinary equitable and statutory terms. It was a mere act of the justice to say: "You shall be called upon to supply with an accurate burner."

On the other side, they said: "But you are injuring the flat-flame consumer." As to the flat-flame burner, it was positively disappearing, and deserved to disappear, because he was working on uneconomical lines. But he did not want the Committee to accept the fact that they were desirous of doing an injury to the poor man; and according to the figures which had been put in by Mr. Carr, the flat-flame consumer would be in the same position. This only showed what could be done by juggling with figures. It was clear that the companies were now simply asking to remove an injustice; and it would be unjust and unfair to cripple them by altering the standard basis of charge, or the maximum basis of charge fixed by Parliament, on the supposition that they were dealing with an accurate test-burner. The case was one of national importance, because it was one which he believed would have the result of reducing the price of gas to the consumer, and enabling the gas companies to carry on their undertakings on better terms with their competitors.

This concluded the case for the No. 1 Bill; but the decision of the Committee was postponed until they had heard the case with regard to Liverpool.

GLASGOW GAS CONSOLIDATION BILL.

The Adjustment of Clauses.

When this Bill (*ante* p. 47) came, on Monday of last week, before the House of Lords Committee, presided over by the DUKE of BEDFORD, for the adjustment of clauses, a discussion arose upon clause 26, which the Committee had amended.

Mr. LEWIS COWARD, who appeared for the manufacturers, engineers, and others, pointed out that the words in sub-clause 2 were:

Except as by this section otherwise provided, the price to be charged by the Corporation for gas consumed by meter shall at all times be charged equally under like circumstances to all consumers.

The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating, and for the particular requirements of any trade, undertaking, industry, manufacture, or business, and may do all things needful therefor, on such terms and conditions in all respects as may be agreed between the Corporation and the person to whom such supply shall be given: Provided that the rate charged for gas supplied for any of such purposes shall be the same under like circumstances to all persons.

Then there was the proviso: "Provided all that the purposes for which the Corporation may supply gas under this sub-section shall not include lighting purposes." This proviso conflicted with clause 2 of the Bill, which was: "Provided that section 13 (relating to contracts) of that Act (the general law) shall be read and have effect as if that section applied to a supply of gas for any purpose." These unfortunate words made it a little doubtful; and on page 3 of the Bill, in clause 2, there appeared the words "except where expressly varied by this Act." It was going to be contended, he believed, that the Committee had expressly varied this by the proviso to clause 26, which he was sure the Committee never intended. All the opponents were agreed, with the exception of Lord Robert Cecil, who appeared for the Lanarkshire County Council, that it would be better if these words were taken out, because they were unnecessary.

Mr. BALFOUR BROWNE, on behalf of the promoters, agreed that they ought to be taken out.

Lord ROBERT CECIL said he understood that the Committee desired

not to make any alteration with regard to lighting, but with regard to power—that they desired to keep a flat-rate for lighting, but not for power.

Mr. BALFOUR BROWNE pointed out that the Committee had altered it to "under like circumstances" in both cases.

The Committee decided that the words should come out.

Lord ROBERT CECIL then asked for an alteration of clause 2, to the effect that the Corporation should repay any local authority in whom were vested the management of streets, bridges, &c., which might be interfered with by the Corporation, the extra expense to which the local authority might be subjected in consequence of the existence of the works authorized by the Act, and also the reasonable cost of superintendence during the execution of such works.

The Committee, after a short discussion, held that the clause had been disposed of, and could not be re-opened.

Lord ROBERT CECIL then asked to have sub-clause 4 of clause 6, which repealed the powers of the Coatbridge Gas Company to supply gas in the Parish of Old Monkland, struck out.

Mr. BLENNERHASSETT contended that this would affect the Baillieston Gas Company.

Lord ROBERT CECIL remarked that the Committee had put the Baillieston Company into the supplementary area instead of the City supply area; and all he asked was that Coatbridge should be allowed to go into the Baillieston area.

The Committee declined to reconsider this clause also.

Lord ROBERT CECIL pointed out, upon clause 27, that the new clause seemed to cut down the effect of sub-section 4 of clause 26, which provided that:

The price to be charged for public lamps within the City supply district shall at all times be charged equally (regard being had to the consumption of such lamps respectively) to the Corporation and to all local authorities of boroughs and other districts within the City supply district.

He understood that it was conceded by everybody, promoters and opponents, that it was right and proper that all local authorities should be treated alike. If the new clause 27 remained as it stood at present, there would be a reduction to a large local authority which would not be shared in by a small local authority. It would not be at all just on a question that had nothing to do with trade or commerce that one local authority should be treated differently from another. He suggested at the beginning of the new clause there should be inserted "Subject to the provisions of sub-section 4 of clause 26 of this Act."

Mr. BALFOUR BROWNE agreed that it should be so. It was the intention, and what was put before the Committee.

Mr. VESEY KNOX asked to have inserted in clause 50, with regard to the application of revenue, words similar to those inserted in the Greenock Act of last year.

Which fund shall be applicable to answer any deficiency at any time happening in the income of the Corporation from their gas undertaking, or to meet any extraordinary claim or demand at any time arising against the Corporation in respect of that undertaking, or for payment of the cost of renewing any part of the gas-works or mains of the Corporation.

Mr. BALFOUR BROWNE said he saw no objection to this proposal. He quite understood, when Mr. Vesey Knox was asking for a reserve fund, that it was to meet any extraordinary claims and to save their reducing the price.

The words were inserted in the Bill.

Mr. VESEY KNOX also proposed to insert:

Provided also that resort may be had to the reserve fund under the foregoing provision, although such fund may not at the time have reached, or may have been reduced below, the prescribed amount.

Lord ROBERT CECIL asked what was meant by applying the capital of the reserve fund to any deficiency in the income of the gas undertaking.

Mr. VESEY KNOX replied that if in some year, owing to a misfortune, such as a rise in the price of coal, the Corporation were short, they might go to the reserve fund to make up the shortage. That was, of course, the object of the reserve fund. When the reserve fund was full, the income would go into the revenue account.

The words were ordered to be inserted in the Bill; and the remaining clauses having been finally adjusted, the Bill was ordered to be reported, as amended, to the House.

SWANSEA GAS ORDER.

The Provisional Order to extend the limits of supply of the Swansea Gas Company came before a Committee of the House of Lords, presided over by Lord DONOUGHMORE, last Tuesday.

Mr. VESEY KNOX, K.C., for the Corporation of Swansea, addressing the Committee, said the parties had come to terms which, briefly, were these: "That the charge for gas within one mile of the existing borough boundary should be the same as that charged within the borough of Swansea; the price outside the one-mile limit should not exceed the Swansea price by more than 4d. per 1000 cubic feet. If the Company neglected to extend their mains to Birchgrove within one year of the confirmation of the Order, the Council should be at liberty to put in force their electric lighting powers relating to Birchgrove. The Company should within twelve months extend their mains to the Baptist Chapel at Killay, within 200 yards of Llewatha Bridge." A clause embodying these terms would be drawn up and submitted for approval of Counsel on both sides; and subsequently the Committee would be asked to incorporate it in the Order.

Gas v. Electricity for Museum Lighting.—At the meeting of the Folkestone Town Council last Wednesday, the Borough Surveyor reported that there are 93 gas lights and 18 electric lights in the Library and Museum, and that in consequence of extensions and alterations 50 extra lights would be required. The cost of electric light as compared with gas was 78 per cent. greater. The Museums Committee recommended the adoption of gas; and this was agreed to.

LEGAL INTELLIGENCE.

PROMOTION OF THE AMMAN VALLEY GAS BILL.

Action by Solicitors to Recover Costs.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Warrington had before him a case in which a firm of Solicitors (Messrs. Jordan and Lamington) sued Mr. Edmund Eaton for their costs in connection with the promotion of the Amman Valley Gas Bill. The defendant denied liability.

Mr. H. TERRELL, K.C., M.P., and Mr. LAVINGTON appeared for the plaintiffs; Mr. MULLIGAN represented the defendant.

Mr. TERRELL said the defendant was the moving spirit in connection with the Amman Valley Gas Company; and he desired to promote a Bill in Parliament for the purpose of getting statutory powers. There was a Company called the Gas and Water Works Supply and Construction Company, which Mr. Eaton had incorporated, and it was the fountain head of other companies. The Amman Valley Gas Company had obtained certain permissions from the Local Authority in the Amman Valley to lay mains; but as they had not fulfilled the contract upon which the licence had been granted, the authority gave them notice to take up the pipes. Thereupon Mr. Eaton desired to promote a Bill in order to give the Company statutory powers to lay mains and to do the necessary work. Mr. Eaton was a Director, and he instructed the plaintiffs to procure the passing of the Bill. Plaintiffs asked for a guarantee for their costs; and on Nov. 2, 1908, Mr. Eaton gave them a guarantee for their professional costs to the extent of £25, and undertook to obtain for them, or give them, a further guarantee for their costs as and when required. The promotion of the Bill went on, and plaintiffs over and over again asked for their guarantee; but they never got their money, except the £25 mentioned. Eventually the plaintiffs were told not to go on. They had recovered judgment against the Company for their costs; and they now sued Mr. Eaton, as they would obtain nothing from the Company.

Mr. MULLIGAN argued that if Mr. Eaton intended that the guarantee given should be for all the costs incurred, it would have been sufficient to say so, and there need not have been any mention of the £25. If the plaintiffs chose to go on when the defendant refused the guarantee, the fault was theirs. Mr. Eaton never intended to guarantee an unlimited amount.

Justice WARRINGTON held that there was a plain contract by the defendant to guarantee the costs incurred by plaintiffs to the full extent, and that there was nothing to limit the amount to £25. There must, therefore, be judgment for plaintiffs for £277 14s. 8d., the amount of their costs, and £5 6s., their costs in the action against the Company; and defendant must pay the costs of the present action.

Gas Poisoning through Alleged Defective Fittings.

At the Westminster County Court last Friday, his Honour Judge Woodfall had before him a case in which Mr. Archibald Clark and his wife claimed damages from the Gaslight and Coke Company for personal injuries sustained by Mrs. Clark owing, as was alleged, to their negligence. Mr. M. O'Connor appeared for plaintiffs; Mr. Vaughan Williams represented defendants. The plaintiff resided at Plais-tow, at a house where gas was supplied on the slot system. He had this altered to an ordinary supply; buying the fittings from the defendants for £1 16s. 6d. In January last year, he moved to East Ham; and the defendants removed the fittings and fixed them for a charge of £1. In September, a pendant in the dining-room fell, and Mrs. Clark held it up to the service-pipe in the ceiling for 40 minutes until a plumber was found—this being necessary, as the key supplied by the defendants would not, it was alleged, fit the tap, and the gas could not be turned off at the meter. The gas escaped all the time, and Mrs. Clark suffered from gas poisoning. It was contended that the fittings were unsuitable for the purpose for which they were supplied—the Sale of Gas Act being cited. The defence was that the pendant was properly fixed and tested, and the key supplied fitted the cock on the meter. The jury, after an hour's deliberation, found that the pendant was properly fixed, and that the key was reasonably fit for the purpose for which it was intended. Judge Woodfall entered judgment for the defendants, with costs.

Mr. Ewing's Action against the Greenock Corporation.

Our Scotch correspondent, writing on Saturday, says: As foreshadowed in last week's "Notes," the action by Mr. Ewing against the Corporation of Greenock was called in the First Division of the Court of Session on Tuesday morning. Mr. Macmillan, for the defenders, stated that the pursuer and reclaimer had taken no steps for proceeding with the case, and had not printed the productions. In these circumstances, he understood that the case was not to be further proceeded with; and he moved that the reclaiming note be refused, in respect of no appearance for the reclaimer. The motion was granted.

Kenilworth Gas Company.—At the annual meeting of the Kenilworth Gas Company, the shareholders adopted the report, which recommended the payment of the 5 per cent. preference dividend, and 7½ per cent., free of income-tax, on the ordinary shares. The Chairman (Mr. T. Kemp) said the past year had been one of exceptional success; the Directors were able to recommend an extra ½ per cent. dividend, and to reduce the price of gas by 3d. per 1000 cubic feet. Special meetings of both preference and ordinary shareholders were afterwards held to sanction an increase in the Company's capital by £2000 in preference shares, to rank *pari passu* with the existing shares. The Chairman explained that the money was needed in order to pay for a new gasholder in course of erection at the works. Both meetings approved of the resolution.

MISCELLANEOUS NEWS.

BELFAST GAS-WORKS EXTENSIONS.

The Twin Island Site Again.

The minutes presented by the Gas Committee at the last monthly meeting of the Belfast Corporation contained several references to the proposed extension of the gas-works. The Committee had approved of the draft of a proposed agreement between the Corporation and the Harbour Commissioners for the acquisition of ground at the Twin Island for the erection of auxiliary gas-works, and had forwarded it to the Solicitor of the Commissioners for approval. The Chairman of the Committee (Mr. J. A. Doran) intimated to the Committee that, with the Acting-Manager (Mr. Sieers), he had been considering the question of the congestion at the Ormeau Road works, and, with the view to ascertain what rearrangement and extension could be effected there, a plan and explanatory statement had been prepared, which he submitted to the Committee for their consideration.

The adoption of the minutes having been formally moved by Mr. Doran, Mr. Squire, in seconding the motion, reminded the Council that, when the Twin Island site was under consideration early in the year, an amendment in favour of such a rearrangement as the Chairman of the Committee was proposing was defeated. He wished the public to understand that this matter had been before the Council, and had been debated and overruled; and therefore it was not possible—meanwhile, at any rate—to reconsider it. If the public only knew that the scheme now suggested would cost from £150,000 to £160,000 before they came to deal with the ground, he thought they would have nothing to do with it. Mr. Curley said he believed Mr. Doran was on the right lines, and that there was ample space on each side of the present gas-works for the necessary extensions. He was of opinion that every facility existed for enlarging the present works at a moderate outlay; and some of the necessary property now belonged to the Corporation, while the remainder could be easily secured.

Mr. M'Keown thought it was premature for either the Council or the Gas Committee to enter into any agreement with the Harbour Commissioners; and he said he would move, as an amendment, that the part of the minutes referring to the agreement be referred back to the Committee for consideration. The Town Clerk (Mr. R. Meyer) said the deletion of the minute would serve no purpose, as it had already been acted upon, and was in accordance with the direction given by the Council that the Gas Committee and the Law Committee should be instructed to take steps to acquire the Twin Island property.

Mr. Doran, in reply, said that the Committee were not bound to the Harbour Commissioners. If they proposed to take their ground, it was on the understanding that the Corporation could get a Bill passed; and if they did not, there was no harm done. The experts whose services they had engaged told them that they would not be able to supply the city with gas in 1914 with the existing works; and if this was so, was it not the duty of the Committee to provide what was necessary to meet the increased demands? He himself was not tied to any site. Mr. Squire said the suggested rearrangement and extension of the present works had been discussed before; but he could not remember it. Was he to be told that if any member wished to formulate a scheme that would save the ratepayers half-a-million of money it was not to be done? The matter would be further discussed; for a requisition would be signed asking for a special meeting to be held at which the whole question could be considered.

The minutes were then passed.

BRADFORD CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Bradford Corporation (Mr. Charles Wood) has presented to the Gas Committee his report on the working of the gas undertaking in the twelve months ended the 31st of March last. It is accompanied by an analysis of the gas accounts, compared with those for the preceding year.

Mr. Wood says the most striking and satisfactory feature of the balance-sheet for the past year is that every item of expenditure on the manufacture and distribution of gas shows an improvement over the previous year. On the other side, there was a reduced revenue from coke; but as the price of this residual is invariably affected by the fluctuations in coal prices, it was inevitable that considerably less should be received in the period covered. Spent oxide produced a little less last year than before; the reason for this being that less new oxide was used, and therefore there was not so much to sell. This item should be deducted from the cost of purification. Thus upon every single item under the control of the Engineer, an improvement took place last year.

The total quantity of gas produced during the year was 2,071,179,000 cubic feet; being an increase of 5,068,000 cubic feet, or 0·24 per cent., compared with the previous year. The gas sold, including 155,886,000 cubic feet used in the public lamps, amounted to 1,944,971,000 cubic feet, or an increase of 0·43 per cent. Mr. Wood gives a table showing the quantities of gas sold in different districts during the year ended Dec. 31 last, and for the preceding year. For purposes of comparison, the figures for 1899 are also given; this period being prior to the taking over of the North Bierley, Clayton, Eccleshill, Idle, and Heaton districts. The table shows that for the first time there was an improvement in every district.

During the year ended March 31 last, 198,009 tons of coal and canal were carbonized; 5·52 per cent. of canal being used, against 5·41 per cent. in 1908-9. The average cost of the coal was 10s. 9·25d. per ton; the previous figure being 10s. 11·98d. The quantity of coal carbonized per retort was 307 lbs.; being exactly the same as

for the previous twelve months. The gas made per ton of coal was 10,460 cubic feet—an increase of 230 cubic feet.

Dealing with the revenue account for the year, Mr. Wood remarks that the total salaries for manufacture, distribution, and management amounted to £5510, and carbonizing wages to £27,924; being decreases of £28 and £397 respectively. Coal cost £106,638, or £4423 less; and the expenditure on purification was £4158, or £718 less. The sum of £26,661 was spent on the repair and maintenance of works; being a decrease of £1405. The repairs to mains and services, including the cost of new services, amounted to £5488—a drop of £764; and £241 less was spent on the repair of meters. Meter inspection cost £3658, or a decrease of £53. The Finance Committee's charges for administration and the collection of accounts were £1700—the same as for several years past. Miscellaneous expenses amounted to £332 more, stationery cost £116 more, and bad debts (£1332) increased by £463. The Committee paid £14,258 for rates, or £14 more than in 1908-9. The Stove Department cost £3573; but the revenue therefrom was £4156—leaving a balance of profit of £583, against £101 before. Mr. Wood says this is very satisfactory, and shows the year to have been the best since the opening of this branch of the Department.

The following are the main items of income: £188,083 was received for gas—an increase of £974; meter-rents amounted to £2580, or £32 increase; coke yielded £32,695, or £4087 less, the cause of which has been explained; tar brought in £11,166, or an increase of £112; ammoniacal liquor produced £16,826, an increase of £418; while the sale of spent oxide yielded £2500—a fall of £45. The cost of coal, less residuals (excluding the profit on the chemical works), was £45,950; being £868 better than for the year 1908-9. Purification, less the revenue from spent oxide, cost £1657, or £673 better; and the rents received amounted to £1004, or £18 less. The gross profit on the chemical works, including the profit on the sale of ammoniacal liquor, was £3365, against £4273 before. The gross profit for the twelve months amounted to £58,405; being £4065 more than for the preceding year. Interest on loans, &c., amounted to £29,635, which is a decrease of £679, instead of the normal decrease of £1000. Income-tax was £34 more; while the contribution of £26,615 to the sinking fund shows an increase of £50. The net loss is thus £737, or £4568 better than in 1908-9. During the year, the sum of £2507 was spent on capital account for the gas undertaking (entirely upon mains), and £390 at the chemical works. These sums bring up the total capital expenditure to £1,165,631.

During the past year, only £26,000 was received towards the cost of street lighting. The amount paid for gas used for this purpose worked out at 1s. 4½d. per 1000 cubic feet. For the current year, the Committee are to have £27,500.

The principal items of the working results are given in the tables appended to the report, and every item shows an improvement. The average price of gas in the holders has fallen from 11 9½d. to 11 6½d. per 1000 cubic feet. The average illuminating power of the gas supplied during the year was 16·81 candles, as officially tested; but Mr. Wood says it must be remembered, when comparing the results with others, that in Bradford the Act of Parliament requires a certain old type of burner to be used. When tested by the new "Metropolitan," No. 2 argand burner, Bradford gas gave an increased value of from 3½ to 4 candles.

The following are some of the items from the working statement for the past year; the figures for 1908-9 being given for comparison:—

	1908-9.	1909-10.
Coal and cannel carbonized, tons	201,952	198,009
Gas made, thousands of cubic feet	2,061,111	2,071,179
" per ton of coal, cubic feet	10,230	10,460
" per retort charged, cubic feet	1,105	1,139
Retorts charged	1,470,228	1,442,121
Gas accounted for, thousands of cubic feet	1,936,574	1,944,971
" per ton of coal, cubic feet	9,589	9,823
" per cent. on make	93·73	93·91
Coke and breeze saleable, tons	87,293	86,883
" per ton of coal, cwt.	8·04	8·77
Tar made, tons	12,300	12,171
" per ton of coal, gallons	11·87	11·98
Liquor made, tons	27,760	27,113
" per ton of coal, gallons	30·03	30·24

The analysis of the accounts shows that the net cost of gas was £129,678, or at the rate of 16·002d. per 1000 cubic feet of gas sold, compared with £132,769, or 16·454d. per 1000 cubic feet sold, in 1908-9. The net loss last year was, as shown above, £737, against £5305 before; the rates per 1000 cubic feet of gas sold being respectively 0·091d. and 0·658d.

OLDHAM CORPORATION GAS DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Gas Department of the Oldham Corporation (Mr. Arthur Andrew) has presented his annual report, which furnishes the following particulars.

The gross revenue for the past financial year amounts to £168,173, and the gross expenditure to £135,064; the balance carried to the profit and loss account being £33,109. The annuities amounted to £3348, the interest on loans and stock to £13,721, and the sums payable to the respective sinking funds to £5298—making £22,367; the net profit on the year's working being £10,742. Adding the balance brought forward, and deducting the amount to which the Corporation are entitled in aid of the borough fund (£9142), there is left a credit balance of £19,158. There was an increase in the amount received for residual products; the average price obtained for coke being 4·24d. per ton less than during the previous year, and 3s. 5d. per ton more in the case of tar. The cost of carbonizing (labour) was further reduced to the extent of 0·097d. per 1000 cubic feet of gas sold, due to less hand stoking being employed during the past winter, in consequence of the lessened consumption of gas caused by the bad state of trade.

The cost of fixing cookers free during the year amounted to £1728. The quantity of gas supplied to the street-lamps and to the municipal

buildings (free) was 83,686,000 cubic feet. The amount expended on the street lighting account exceeded the estimate by £326. The total number of lamps fixed in the whole of the supply area on the 25th of March was 5880. The number of incandescent lamps on that date was 4002 within the borough and 1404 in the out-townships; being an increase of 1016. The whole of the lamps within the municipal borough are now on the incandescent system. On the 25th of March last, the duty of supervising the lighting of the public streets devolved upon the Finance Committee. This change was deemed to be desirable owing to the Gas Committee ceasing to supply gas free for public purposes, as had been the case since 1886.

The quantity of gas manufactured at the different stations during the year was: Oldham, 68,770,000 cubic feet; Higginsshaw, 699,626,000 cubic feet; Hollinwood, 546,945,000 cubic feet; do. (water-gas plant), 74,962,000 cubic feet—total, 1,390,303,000 cubic feet, compared with 1,434,643,000 cubic feet in the preceding year, being a decrease of 44,340,000 cubic feet, or 3.09 per cent. The following quantities of coal, oil, and benzol were used in its production: Coal, 112,747 tons 8½ cwt.; gas oil, 218,858 gallons; benzol, 106,783 gallons. The average quantity of coal gas made per ton of coal carbonized was 11,666 cubic feet, compared with 11,717 cubic feet in the year 1908-9. The loss of gas from leakage, &c., was 73,837,000 cubic feet, or 5.31 per cent. of the quantity made, compared with 69,320,000 cubic feet, or 4.83 per cent., before. The policy of renewing very old mains, and the enlargement of small ones, was pursued during the year, with very beneficial results; and the quantity of gas afterwards consumed has generally shown an increase. The maximum quantity of gas delivered in 24 hours was 7,609,000 cubic feet, on Jan. 6 last, compared with 8,366,000 cubic feet the previous year; being a decrease of 757,000 cubic feet. The minimum quantity delivered was 1,572,000 cubic feet on June 4, compared with 1,504,000 cubic feet before; being an increase of 68,000 cubic feet. The average illuminating power of the gas, as tested by the No. 2 "Metropolitan" burner, was 20.11 candles.

The total number of meters fixed on the 25th of March last was 52,810, of which 2662 are of the prepayment type; 995 meters were fixed in new premises and others in which gas had not previously been used; and 144 meters were permanently disconnected. The actual number of consumers at the close of the financial year was 47,468. The number of meters fixed but not in use was 2401—a reduction of 696 during the year. The net increase in the number of additional cooking stoves and grills fixed free of charge to consumers was 2062. The total number in use on the 25th of March last was 17,078, excluding stoves owned by consumers. There was an increase of 3,031,000 cubic feet in the quantity of gas used by private consumers in houses and shops, and a decrease of 51,853,000 cubic feet in that consumed in mills and workshops; the decrease being caused entirely by short time in the cotton-spinning mills and bad trade in the machine-making works. Consequent on the bad trade and the reduced wages paid, there was a strong tendency to economize in the consumption of gas in private houses, particularly in the latter half of the year. The quantity of gas consumed through prepayment meters was 18,299,000 cubic feet.

The Improvement Act obtained last year enables the Corporation to manufacture residual products, and also gives increased powers regarding the pipes and fittings on consumers' premises, for testing the illuminating power of the gas by the "Metropolitan" argand No. 2 burner, and for the borrowing of a sum of £198,200 to carry out various extensions—the principal being a new gasholder and tank at Hollinwood, to have a capacity of over 5,000,000 cubic feet. The Act, on the other hand, has altered or modified certain powers which the Corporation possessed previously; the principal of these being the limitation of the profits which may be applied to the reduction of the borough rate to a fixed sum of £7500 per annum. The power to supply gas without charge for street lighting and other public purposes is now limited by the Act to public clocks, throughout the whole area of supply, and the Oldham Infirmary. The Act gives the Corporation the option of charging for gas consumed for public purposes within the area of supply at 10 per cent. less than the amount chargeable to private consumers for a corresponding supply.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Chairman of the Gas Committee of the Salford Corporation (Mr. F. S. Phillips) has presented to the Town Council their report for the year ended the 31st of March last. They express their pleasure in recording that the usual growth in the number of consumers, was maintained during the period named. The sales of gas, however, showed a slight decrease, equal to 0.01 per cent.; probably due to the continued depression in trade during the year. The demand for gas appliances generally was very satisfactory; and the business in cooking-stoves increased. The works and plant (under the supervision of Mr. W. W. Woodward, the Engineer and Manager) were being maintained in a thoroughly efficient condition; and a contract was let for the renewal of one of the gasholders at the Bloom Street Works—the existing holder having been in use for about fifty years. The coal and cannel carbonized during the past year amounted to 162,327 tons, and the quantity of gas made to 1,651,845,000 cubic feet, of an average illuminating power equal to 10.28 standard candles; the parliamentary standard being 18 candles within the borough and 17 candles as tested in the out-districts.

The accounts show that the net revenue from the sale of gas was £173,385; residuals produced £50,778; and the total receipts were £226,474. The expenditure in manufacture was £123,358; on distribution, £15,844; on management, £8036; and the total expenses were £166,853—leaving a balance of £59,621 to go to the profit and loss account. After meeting interest and redemption charges and allowing £6500 for depreciation, there was a balance of £15,034 transferred to the district fund account.

The Hartley Witney Rural District Council have decided to borrow £1015 for the extension and improvement of their water-works.

STOCKPORT CORPORATION GAS DEPARTMENT.

Engineer's Annual Report.

The Gas Engineer of the Stockport Corporation (Mr. S. Meunier) has presented to the Gas Committee his report for the year ending the 31st of March. It furnishes the following particulars in regard to the working of the gas undertaking in this period.

Mr. Meunier says the year, as a whole, was a very satisfactory one, though the net profits were about £436 less than before, due practically to an extra repayment on an outstanding loan. But for this it would have shown an additional £1160, or £724 increase, so following the gross profit, which rose by £696 to £41,077—the highest figure ever reached. The coal market was easier last year than in 1908-9, and the Committee were enabled to obtain coal at a somewhat reduced price per ton. This, with the further improved results obtained per ton carbonized, was of very material benefit to the Gas Department. The figures are 2436 tons more coal used, 26,253,000 cubic feet more gas made, and an average of 12,016 cubic feet of gas obtained per ton of coal carbonized, against 11,923 cubic feet before. Unfortunately, the advantage thus gained has been practically wiped out by the greatly diminished revenue from coke—viz., £2476—though the quantity made for sale per ton of coal carbonized was very nearly the same as in the previous year, and there was an additional quantity disposed of, amounting to 4565 tons. The receipts from tar advanced by £496; but those for ammoniacal liquor just about held their own—the quantity made per ton of coal carbonized being, in each case, about the same as before.

Nearly 24 million cubic feet more gas were disposed of during the past year than in 1908-9; the larger proportion having been taken by prepayment meter consumers. The gross income on the item of gas sold shows the satisfactory increase of £2692; but this is reduced to a net gain of only £382, or, including public lighting, £541, by the somewhat higher rate of industrial discount earned during the year, and for prompt payment. To this must be added the last, and certainly the greatest, factor in the reduction—viz., the last scale of further discounts to large industrial consumers on the quantity used; the whole showing a total increase of no less than £2310 for the year, or upwards of 26 per cent. The total discounts allowed average nearly 12 per cent. of the total receipts, not including public lighting. The half-penny in the shilling allowed to automatic meter consumers also had a marked effect upon the revenue.

The cost of making coal gas shows a net reduction on coal of £1306 and on stokers' wages of £492. Though the wages for purification were £85 higher, there was a reduction of £297 in the material used. The net reduction on this account is £1876. Carburetted water gas also shows a good result; there being a saving of £1092 on oil, due to better contracts, and £123 on wages; though materials, including coke, and wages for maintenance increased by £88. The expenditure on the maintenance of works was reduced by £174, and on distribution and maintenance of mains by £399; but public lighting shows an increased cost of £193.

Next to the diminished revenue from coke, the item of rates and taxes is perhaps the most important one adversely affecting the past year's returns; the increase amounting to no less than £1315, partly due to payment of disputed income-tax kept back and not included in the previous year's accounts, and partly to increased taxation.

Summing up the accounts, Mr. Meunier says it may be taken that the items of predominating influence on the year's results are, on the diminished receipts and additional expenditure side, coke receipts, £2476; rates and taxes, £1315; and discounts, £2310—total, £6101. As partially counteracting these, are the saving on oil, £1092; on coal, £1306; and on carbonizing wages, £492—total, £2890. The gross profit of £41,077 has been allocated as follows: Interest, £7908; sinking fund, £11,577; stock redemption, £538; in aid of rates, £18,000; and placed to the reserve fund, £3054. A sum of £1288, or £1472 less than in the year 1908-9, was paid out of the reserve fund account, principally on the retort-house roof alterations, &c., and new boilers. The balance now stands at £7227, or £116 more than before.

With regard to the works, Mr. Meunier says the new reinforced liquor-tank is being proceeded with, and, with the new boilers, will be brought into use next winter. The old settings erected in 1892 have now been cleared out of the retort-house, and the drawings for the further extension of inclined retorts to take their place are well in hand. The alterations will increase the gas-making facilities on the same site from 1,250,000 to more than 2,000,000 cubic feet per day.

The Disposal of Profits—Rate Relief v. Reduced Price.

The foregoing report came before the Town Council at the monthly meeting last Wednesday, and gave rise to some discussion.

Mr. J. FERNLEY, J.P., the Chairman of the Gas Committee, in moving the adoption of the report, said the gross profit on the working of the gas undertaking in the past financial year was £41,077, which created a new record; and it had not been produced, as some member of the Council might say, by reducing the illuminating power of the gas, but chiefly by the increased make per ton of coal carbonized—viz., 12,016 cubic feet, against 11,923 cubic feet the preceding year. The Committee were able to purchase coal, of which they used about 50,000 tons per annum, at a reduction of £1306. The ratepayers, who were the owners of this business, would, he felt sure, be satisfied with the dividend they would receive—viz., practically £20,000 in relief of the rates. Yet the gas consumers had no ground for complaint, as the net profit amounted to 8.48 per cent., which could not be considered too much; and the price of gas in Stockport, as he had frequently pointed out, was most reasonable.

Mr. J. WINTER seconded the motion.

Mr. BREWSTER said it was no doubt gratifying to the Chairman of the Committee and the Gas Engineer to see the output of gas go up; but he submitted that the whole of the realized profits were produced by the consumers who paid the ordinary price for gas. He had examined two bills for gas supplied to trade consumers. One came to

more than £200; and after trade and other discounts were deducted, it was actually settled for £66. The other bill was of a similar character. It was contended that if the price of gas was reduced, the rates would go up. Probably this would be so. He, however, found that the more he looked into the question the more aggravating it became. It was not only that the gas consumers were paying a good portion of the rates of the non-consumers, but those who were paying the ordinary price for lighting were actually paying the rates for people who were getting gas at the reduced figures. He considered that tradesmen and others who used a great deal of gas for illuminating purposes in their businesses should have it at the same price as people who had gas-engines. It was difficult to convince a Council composed chiefly of large property owners that an alteration in the system would be right; but it would take the rate from one class and put it on those who owned properties.

Mr. HOPKINS supported these remarks. He said he found that in 1890 the price of gas to ordinary consumers was 2s. 5d. and 2s. 6d. in the borough, and 3s. outside; and it was practically the same now. The profits handed over to the rates in 1890 amounted to £6000; and by improved manufacture and better management they had gone up to £18,000. The cost of gas, however, to the ordinary consumers was the same; and relief was given to large ratepayers from the profits that were made.

Alderman WHITE pointed out that twenty years ago Stockport gas was 21 and 22 candle power, whereas now it was only 17-candle power. The quality was deteriorating in order that the Committee might supply power gas; and the ordinary consumers had to go to considerable expense in obtaining fittings so that they might use the class of gas now supplied. He thought no concern but one having a great monopoly would attempt to make a profit at the price at which gas was supplied for power purposes.

Mr. SIMPSON considered the price of gas supplied to the ordinary consumers was exorbitant. He did not think they should be charged 2s. 6d. per 1000 cubic feet, while other people were having gas at practically cost price. He did not say that all the profits should be given to the gas consumers; but he thought there was a fair and just way of dealing with them. He noticed that during the past year the Gas Department sold some 24 million cubic feet more gas than in the previous year, while coal had cost about £1305 less and oil about £1000 less; but still the profits were not larger. He thought the demand made by the Chairman of the Gas Committee last year for a great reduction in the price of gas used for industrial purposes had not been justified by results. He should like to know how much of the profit was derived from uses of gas for industrial purposes, how much from the prepayment and ordinary meter users, and how much from public lighting.

Mr. FERNLEY said he had replied to the remarks of Mr. Brewster and Alderman White before, as the members of the Council had heard the same tale half-a-dozen times. It was not material to the Gas Committee where the profits went. It was their duty to make as much money as they could in the interests of the town and the ratepayers. Having done this, it was for the Council—who were largely influenced by the demands of the town, and to some extent guided by the Chairman of the Finance Committee—to say what must be done with the profits. A material reduction in price was made twelve months ago to prepayment meter users, and it had led to a large increase in consumption; the consumers by the new method getting their gas at a very low price, considering the extra cost of collection. If the Finance Committee would be favourable to a reduction in the price of gas, he, as Chairman of the Gas Committee, would favour it. But as a member of the Finance Committee, he had to look the other side of the ledger; and this was his difficulty. Replying to Mr. Simpson, he pointed out that while there had been an increased consumption of gas and a reduction in the price of coal, coke receipts had diminished by £2476, their rates and taxes cost them £1315 more (partly due to payment of disputed income-tax not included in the previous year's accounts), and additional discounts of £2310—making a total of £6101. This was the other side, which Mr. Simpson apparently did not see.

The report was unanimously adopted.

PROGRESS OF THE LINCOLN GAS-WORKS.

In recent issues, some particulars have been given of the past year's working of the Lincoln Corporation gas undertaking; and these were supplemented at last week's meeting of the City Council by a statement regarding the progress since the works were acquired, which was made by the Chairman of the Gas Committee (Alderman Wallis).

Alderman Wallis remarked that, on the previous Thursday, it was 25 years since the Corporation acquired the undertaking of the Lincoln Gas Company, and he thought it would perhaps be interesting if he briefly reviewed its history during the period of municipal control. The record of the undertaking had been one of steady progress. He gave figures to illustrate this growth as follows:—

	1885-7	1909-10.
Annual make of gas	162,319,000 cu. ft.	383,852,000 cu. ft.
Coal carbonized	15,804 tons	31,357 tons
Oil used	None	97,855 galls.
Number of consumers	5,611	11,740
Length of mains	37 miles 200 yds.	60 miles 975 yds.
Total income	£25,514 7s. 7d.	£49,470 5s. 10d.
Gross profit	£8,973 18s. 6d.	£14,235 9s. 5d.
Average selling price of gas	2s. 8d.	2s. 0½d. per 1000 cu. ft.

In the year 1886, he said, the Corporation decided to let cooking-stoves on simple hire; and about 4000 had been fixed. The result was a large increase in the consumption of gas during the summer months. In 1895, the sulphate of ammonia plant was erected at Bracebridge; and it had proved a steady source of revenue each year since it was installed. The next important addition was made in 1900, by the erection of the carburetted water-gas apparatus. This plant was capable of producing 500,000 cubic feet of gas in 24 hours; and, with a small

additional outlay, its capacity could be increased to a million feet per day, and so provide for the growing demands of the city and district for many years to come. It cost £15,000. In 1907, stoking machinery was installed at Bracebridge works; and it was proving a very remunerative investment. It cost £3500. In addition to the above-mentioned extensions, the Committee had purchased 32 coal-waggons, at a cost of nearly £2000; and they had renewed the purifiers, at a cost of £3134. During the period under review, the price of gas had been reduced from 2s. 8d. to 2s. 1d. per 1000 cubic feet, the meter-rents had been abolished altogether, and cooker rents for the two winter quarters. Discounts of 7½ per cent. had been allowed to large consumers, and 10 per cent. to users of prepayment meters. The value of these concessions to the public at the present time was no less than £13,700 per year. A total sum of £29,700 had been paid out of profit in relief of the general district rate; and £62,600 had been provided for sinking fund purposes for the repayment of capital. The Gas Committee had always followed the practice of paying for all extensions and improvements of the works and distributing plant out of profits; and to this sound and prudent policy might be attributed the strong financial position in which the undertaking stood to-day. With an annual make of gas approaching 400 million cubic feet, the capital liability was £62,600 less than when the yearly output was only 162 millions. It was interesting to note—and he said it with some pride—that there had been only one change in the chairmanship of the Gas Committee during the 25 years. He thanked Mr. John Carter (the Engineer and Manager) for the trouble he had taken in preparing the statement from which he had given these figures.

HEREFORD CORPORATION GAS UNDERTAKING.

Reduction in Price.

In his fourth annual report to the Hereford Corporation Gas Committee, Mr. W. W. Townsend, the Engineer and Manager, says the sales of gas increased during the past year by over 4½ million cubic feet, of which the ordinary consumers took nearly 2½ millions, and the slot consumers over 2 millions. The amount of gas made was only 3½ million cubic feet more than in the previous year, as the leakage was reduced from 9,293,000 to 8,226,590 feet—from 6·8 to 5·9 per cent. The coal carbonized was 12,262 tons, against 12,314 tons; the yield of gas being 11,540 cubic feet per ton, against 11,254 feet. Compared with the year ending March 25, 1906, the gas made has increased by 7,686,000 cubic feet, while the gas sold has increased by 12,548,000 feet; the other 5,000,000 feet having been saved in various ways. The increase in sales since 1906 amounts to over 10 per cent. on the consumption of that year. The gas sold per ton of coal carbonized stands this year at 10,644 cubic feet, compared with 10,224 feet last year and 9974 feet in 1906. The other working results were about the same as the previous year, and nearly the same quantity of residual products was sold; but the prices obtained for residuals were all lower, particularly in the case of coke, which realized £317 less in consequence. Tar dropped by £7, and sulphate of ammonia brought in £44 less for the same reason. The amount saved through the lower price paid for coal (£380) was thus counterbalanced by the decreased sum obtained for residuals. The gas-rental (ordinary consumers) produced £194 more; and in spite of the extra discount allowed to slot consumers, amounting to £386, the net revenue from this source was only £122 less, and the gross revenue was only £18 less. The amount charged to maintenance of works is even higher than last year's abnormal figure; the Committee having adopted the policy of charging everything possible to revenue. Included in this sum are several exceptional items, such as the renewal of the railway siding, the erection of conveniences for the workmen, the provision of new retort-house plant, &c. The expenditure on the works and mains is gradually bringing them into a condition which enables a high standard of efficiency to be maintained, and will in the end save the Council from a very much greater expense. The same policy is being pursued in regard to meters; £80 more having been spent on the repair of old meters during the past year than in 1908. Rents, rates, and taxes increased by £711. Lamp-lighting and repairs cost £21 less. The gross profit for the year was £4107, against £4388, or £281 less. After payment of interest and sinking fund, there will remain a disposable balance on the year's working of £1448. It should be noted that the profit and loss account is charged with £75 extra for special sinking fund, and that the sinking fund payments for 1908 loans appear in the accounts for the first time.

The season just passed has been the best yet experienced with regard to the business done in gas-fires; and further developments may be expected in this direction.

The quantity of gas made was 138,754,000 cubic feet; the coal carbonized amounting to 12,262 tons. The gas made per ton of coal was 11,315 cubic feet. The gas sold showed an increase of 3·8 per cent. The revenue from the sale of gas and meter-rents was 2s. 7½d. per 1000 cubic feet of gas sold; while the cost price of gas, after deducting receipts from residuals and profit on fittings and stoves, was 1s. 11½d. per 1000 feet. The net profit per 1000 cubic feet, after deducting interest and sinking fund, was 2½d. The cost price of gas in the holder, not including rates and taxes, was 1s. 3d. per 1000 cubic feet made.

The Committee recommended that the price of gas to ordinary consumers (other than gas supplied to slot-meter users or for street lighting purposes) be reduced by 3d. per 1000 cubic feet to 2s. 6d. (with 3d. off for discount); the reduction to date from the quarter commencing Sept. 29. They also stated that, at the request of the Finance Committee, they had agreed to transfer to the borough fund the sum of £1000 from the balance standing to the credit of the gas revenue account.

In moving the adoption of the Committee's report at last Tuesday's meeting of the City Council, Mr. Wits said that in Mr. Townsend they had a Manager in whom they had the greatest confidence, and one who had the business of the undertaking in hand night and day. Mr. Bulmer also congratulated the Committee on the admirable report, and acknowledged specially the work of Mr. Wits and Mr. Townsend. Others members having spoken in the same strain, the report was adopted.

STOKE-UPON-TRENT GAS DEPARTMENT.

The Annual Accounts.

The accounts of the Gas Department of the Stoke-upon-Trent Corporation for the year ended the 30th of March have been issued. They show that the sale of gas for private and public purposes produced a revenue of £16,114, that the disposal of residuals brought in £3,940, and that the total receipts amounted to £20,669. The expenditure on the manufacture of gas was £10,427; on distribution, £2,135; on management, £638; and other items made the total expenses £15,916—leaving a balance of £4,753 to go to the profit and loss account. The total of this account on March 30 was £4,865; and having met the loan repayments and interest (£3,355), &c., there was a balance of £684, of which £642 has been applied in relief of the district rate. The net profit was equal to 1.241 per 1000 cubic feet of gas sold; whereas for the year 1908-9 there was a deficit equal to 1.77d. Appended to the accounts is a working statement which shows that, under the supervision of the Gas Engineer and Manager (Mr. William Prince), 11,754 tons of coal were carbonized and 144,303,000 cubic feet of gas made, inclusive of that in stock. Of this quantity, 132,789,900 cubic feet, or 92.02 per cent., were sold, 1,693,200 cubic feet, or 1.17 per cent., were used on the works and in the offices, and 9,819,900 cubic feet, or 6.81 per cent., were unaccounted for. The make of gas per ton of coal was 12,304 cubic feet, of which 11,291 cubic feet were sold. The production of residuals per ton of coal was: Coke, 12½ cwt.; tar, 10.96 gallons; ammoniacal liquor, 21.95 gallons. The net proceeds of the residuals were 63.99 per cent. on the cost of the coal.

RHYL DISTRICT COUNCIL GAS SUPPLY.

The Past Year's Working.

The Gas Engineer and Manager of the Rhyll Urban District Council (Mr. Leonard G. Hall) has reported to the Gas Committee the results of the working in the year ended the 31st of March last. In this period, the make of gas for the first time exceeded 60 million cubic feet; while the sale showed a considerable increase—viz., 2,943,000 cubic feet. The unaccounted-for gas decreased from 8.39 to 8.21 per cent. of the make. The gas made per ton of coal carbonized was 11,508 cubic feet; and the gas sold, 10,425 cubic feet. These are the highest figures in the history of the undertaking. The gross profit was £4,525; and after paying interest and charges connected with the redemption of loans (£2,743), a net profit of £1,782 was available for the relief of rates. The coke sold per ton of coal carbonized was 9½ cwt.; but the boiler is heated by coke fuel, and if credit be taken for this, the sales were more than 10½ cwt. per ton of coal carbonized. The receipts for tar and liquor increased by £62; the yield of ammoniacal liquor per ton of coal carbonized being exceptionally high. The actual net cost of gas into the holders—including coal, purifying, salaries, carbonizing wages, repair and maintenance of plant, less residuals—works out at a slight fraction over 1s. per 1000 cubic feet of gas made. When Mr. Hall took over the management of the gas-works in 1893, the capital charges per 1000 cubic feet of gas made per annum were upwards of 1s. 6d.; whereas now they are 10.94d.

Accompanying the report is a tabulated statement of the moneys received and paid since 1893. It shows that in the past eight years a net profit of £10,729 has been realized. The working statement shows that the quantity of gas sold to private consumers was 49,108,700 cubic feet, and for public purposes 5,367,100 cubic feet; making a total of 54,475,800 cubic feet. The quantity of coal carbonized was 5225 tons; and the residuals produced were: Coke, 3331 tons; tar, 61,960 gallons; ammoniacal liquor, 190,556 gallons.

MANSFIELD GAS-WORKS EXTENSIONS.

Money for a Water-Gas Plant.

On behalf of the Local Government Board, Mr. R. H. Bucknell last Wednesday held an inquiry into an application by the Mansfield Corporation with regard to the borrowing of £7000 for the purpose of providing a water-gas plant. It was stated that the population served by the gas-works totalled 50,000, made up of 35,000 at Mansfield, 10,000 at Mansfield Woodhouse, and 5000 at Pleasley. The outstanding loans on the undertaking were £97,000.

The Engineer and Manager (Mr. Arthur Graham) said that when he was appointed by the Mansfield Corporation seventeen years ago, the make of gas was a little over 60 million cubic feet. It had increased until for the year ended March 31 last it was over 156 millions—this being an increase of 8 millions on the preceding year. In the past ten years, the increase has been over 61 million cubic feet, or 64 per cent. At the works there was one retort-house with 110 through retorts; and during last winter every retort was in use at the same time. He estimated the yield at about 7000 cubic feet per mouthpiece per day of 24 hours—say, a maximum of 800,000 cubic feet per day. On Dec. 22, there was an output of 746,000 cubic feet; and there was no doubt that 800,000 cubic feet would be reached during the coming winter. The maximum last winter over the previous winter for a day's consumption was 70,000 cubic feet. This would be considerably increased if there was a very severe winter. The Corporation supplied Mansfield, Mansfield Woodhouse, and part of the parish of Pleasley, all of which districts were rapidly increasing at the present time. In Mansfield alone, some 400 new houses per annum were certified fit for habitation. It was absolutely essential that additional gas-making plant should be provided without delay, if the supply of gas was to be maintained. In November last, a Sub-Committee were appointed to deal with the question. They visited several towns, and came unanimously to the conclusion that it was desirable to instal a carburetted water-gas plant;

the capital expenditure being only about half that of putting down an ordinary coal-gas plant of the same capacity. Further, there was at the gas-works a disused building, formerly a purifying-house, which could, with slight alterations, be made suitable for the plant. The recommendation of the Sub-Committee was approved by the Committee and the Town Council, and tenders were secured for the plant—that of Messrs. Humphreys and Glasgow being accepted. He estimated that it would be about seven years before further gas extensions would be necessary.

The Inspector suggested a reduction of the loan by £500, as he thought the amount put down for contingencies was too much, considering that the contracts had already been let. The contingencies allowed for amounted to £620; and he was of opinion that £120 would be sufficient.

Mr. T. Smith (the Chairman of the Gas Committee) urged upon the Inspector the necessity of the loan being granted at the earliest possible moment, and said that not a halfpenny more than capital cost would be expended.

PUBLIC LIGHTING OF OSWESTRY.

Gas Beats Electricity.

At the Monthly Meeting of the Oswestry Town Council, a report of the Watch Committee came up for adoption which recommended that the tender of the Gas Company for the public lighting of the streets of the borough for a period of seven years from Oct. 1, 1910, at £3 per single-burner lamp, and £3 17s. 6d. per double-burner lamp per annum, be accepted, subject to an agreement being entered into.

The Town Clerk (Mr. S. P. Parry), previous to the discussion of the report, read the tenders that had been received from the Gas and Electric Light Companies. The Gas Company tendered to light single-burner lamps for £3 per annum and double-burner lamps for £3 17s. 6d., for a period of seven years from Oct. 1; the times of lighting, candle power, &c., to be as under the present agreement, and in accordance with the Council's specification. The tender of the Electric Light Company was as follows: "This Company will provide and maintain during the seven years beginning on Oct. 1, 1910, 44 double-burner lamps in the main streets, each of such lamps being 100-candle power, for the sum of £3 10s. per annum. Or if the Corporation undertake the cost of installation, the Company will supply current to, and maintain, 44 double-burner lamps of 100-candle power each and 208 single-burner lamps of 50-candle power each, for the sum of £2 5s. per annum for each double-burner lamp and £1 15s. for each single-burner lamp. We estimate that the total annual cost to the Corporation of accepting the alternative tender would not exceed £630 per annum during the seven years; while at the close of that period, the whole of the installation would be the paid-for property of the Corporation, and, if the tender were renewed on the same terms, the annual cost of lighting would then be only £463."

An amendment was moved by Mr. Vaughan to the effect that, instead of accepting either tender, they should ask for fresh offers. He expressed the opinion that they should not renew their agreement with the Gas Company, if it could be shown that they could light the town for less.

Alderman Whitfield said he did not think there was room for more than six large electric lamps in the town. Oswestry, with its narrow streets, could not be compared with Llandudno, Rhyll, and Aberystwyth, where they had wide streets and long promenades well lighted by electricity. Oswestry, with these electric lamps, for the reason he had stated, could not get 50 per cent. of the advantage that they obtained from them in big places. Hence, in his opinion, it would be madness to light the narrow streets of the town with high candle-power lights. Mr. Sheather, too, pointed out that, though the two Companies were asked to tender to a certain specification, only one of them—the Gas Company—complied with the terms. Therefore, however much they would like to see the streets lighted by electricity, it was for the present outside the range of practicability.

The discussion was continued by Mr. Daniel, who remarked that, had the Electric Light Company conformed to the specification drawn up by the Town Council, and submitted their tender on exactly the same lines as the Gas Company, they would have been better able to discuss the matter on its merits, and, without very much difficulty, to settle which of the two tenders was the cheaper. Unfortunately, the Electric Light Company had only tendered to supply 44 lamps; while, as to the remainder, it was suggested that the town should supply themselves, not only with the lamps, but the cable also. To do this would be a costly business; and they had not the money. Further, before they could undertake the work, they would have to apply to the Local Government Board for permission to borrow the necessary money. As a preliminary to this, an inquiry would have to be held; and there could be no doubt that the strongest opposition would be raised to it, while he very much questioned whether the Local Government Board would in the end give them the required permission at all. Then there was the further difficulty—and it was an insuperable one—that, if they did instal this plant, they would be committed to the Electric Light Company for all time. The plant would be theirs; and what could they do with it if they did not continue to use the electric light? Why, their second position would be worse than their first; for they would then be under the Electric Light Company's finger and thumb. Of course, he recognized that the Electric Light Company had rendered the town good service by securing for them better terms from the Gas Company. Having gone into the matter very carefully, he felt sorry to have to say that he considered the tender of the Electric Light Company an impossible one.

Mr. Daniel suggested that the contract be for three years instead of seven years. Mr. Sheather: How can we, after inviting the two Companies to tender for seven years, expect any business concern to entertain such a proposal? The Mayor pointed out that the seven years' period was fixed by the Council before the tenders were invited. They could not therefore go back on it.

The report of the Committee was then adopted.

RHYMNEY VALLEY WATER SUPPLY.

A further conference in connection with the proposed Water Board for the Rhymney Valley was held some days ago at Hengoed, when Messrs. Wilcox and Raikes, of Birmingham, submitted a report on the investigations that had been made to ascertain the best means of providing for the future water supply. They stated that they had considered the existing system of supply, and had examined the various alternative sources from which it seemed possible that a supplementary supply might be obtained. Having regard to the very rapid increase that was likely to take place in the Rhymney Valley, they had based their calculations on the assumption that provision should be made for three times the present population of 75,000. Under the Rhymney and Aber Valleys Gas and Water Act, 1898, the Company obtained power to construct two reservoirs to the north of Rhymney Bridge; but they found one of the reservoirs had not been constructed, and at the time of their inspection reservoir No. 2 was nearly empty. It seemed evident that the demand exceeded the supply available; and they had satisfied themselves that the supply of water obtainable from the gathering ground north of Rhymney Bridge Station was totally inadequate to meet the present and prospective needs. Having ascertained that a supplementary supply is already being obtained from Merthyr, they had investigated the possibility of securing a further supply from the same source. In their inspection, they examined the site of a reservoir that was at one time proposed for the borough of Merthyr, in the lower part of the Taf Fechan Valley. The proposal to construct the reservoir was abandoned owing to the uncertainty which then existed as to whether the large surplus supply could be utilized by neighbouring districts. There could be no question that this was one of the finest sites for a reservoir in South Wales; and the cost of constructing it would be remarkably low in proportion to the supply that might be obtained. So that if the difficulty previously anticipated by the Merthyr Corporation could now be removed, they were confident that it would afford by far the most economical and satisfactory source from which to obtain the additional water that must very shortly be provided for the Rhymney Valley as well as the borough of Merthyr. The works that would have to be constructed to obtain an ample supply of water for the Rhymney Valley would be a dam near Pontsticill Station and a new main to connect with the mains in the Rhymney Water Company's area near Treharris. As the whole of the works would be equally useful to the borough of Merthyr, they had no reason to doubt that the Corporation would be quite ready to co-operate with the Rhymney Valley authorities in their construction for the mutual advantage of all concerned. They ascertained that the estimate prepared by Mr. G. F. Deacon in 1908 for the Taf Fechan reservoir, together with low-level mains and filters approximately corresponding in capacity with those they recommended, amounted to £350,000. If this expenditure were apportioned according to the volume of water taken, the contribution of the Rhymney Valley would amount to about £112,000 for 4½ million gallons per day out of 14 million gallons available. To this should be added about £18,000 for a service reservoir and further mains; so that the total expenditure devolving on the Rhymney Valley would be £130,000. The conference

decided to recommend to the various Councils concerned the adoption of the report; and a Committee was appointed to meet the Merthyr Corporation, with a view to arranging for joint action.

PORT OF LONDON RATES.

Gas Companies' Opposition Withdrawn.

The Port of London (Port Rates on Goods) Provisional Order came before a Select Committee of the House of Commons presided over by Sir LUKE WHITE, on Tuesday last.

The Hon. J. D. FITZGERALD, K.C., in the course of his opening statement on behalf of the Port of London Authority, reviewed the position resulting from the Board of Trade inquiry held before Lord St. Aldwyn* and his report to the Department, and went through the various sections of the Order now before the Committee. He mentioned certain provisions of the Order in favour of exports coastwise; the rates on coastwise goods being limited to half of the rates on goods imported from overseas. It was provided that the port rates charged on coal, culm, &c., exported coastwise should not exceed half the port rates for the time being actually charged for coal, culm, &c., imported coastwise. Bunker coal represented about 1½ million tons a year; and on that imported into the Port of London and used for bunkering purposes, no rate would be charged at all, or, if it was charged in the first instance, it would be refunded if used for bunkering. But with regard to coal generally, the position was this—that whether imported or exported, the maximum rate was 2d. a ton. The parties chiefly interested in the coal trade of London—the waterborne coal to the port—were the gas companies. They got practically all their coal by water. The next parties interested were Messrs. Cory and Co., who had a very large proportion of the coal traffic in the river. They partly dealt with coal imported for the gas companies, and also with that imported for other purposes. He believed it was something like 5 million tons that they dealt with in the course of the year. Neither the gas companies nor Messrs. Cory and Co. were continuing their opposition to the Bill. He thought they recognized that their case was fully and fairly heard at the public inquiry, and that in fixing the maximum rate at 2d. a considerable reduction had been made, because as the original schedule stood it worked out at a maximum rate of 3d. on coastwise coal. There were other opponents in connection with the rates on coal representing northern coalowners; but he was unable to say whether the fair and patriotic attitude of the companies he had named would be adopted by them.

* See "JOURNAL," Vol. CIX., pp. 746, 827.

Suicide by Gas at Royston.—A miner named George Mee, of Royston, who is reported to have been drinking heavily for some time, was found by his son lying on the bed dead. There was a strong smell of gas in the room; and it was found that the deceased had connected a rubber tube to the gas-burner, and apparently inhaled the gas.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 95.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr. 1	5	Alliance & Dublin Ord.	81-83	-1	6 0 6	4,940,000	Stk.	May 12	8	Imperial Continental	178-180	..	4 8 11
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
200,000	5	May 12	7	Bombay, Ltd.	6½-6¾	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122-124	..	4 16 9
40,000	5		7	Do. New, £4 paid.	48-54	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	219-221	..	4 0 6
50,000	10	Feb. 25	15	Bourne- 10 p.c.	29-30	..	5 0 0	718,100	"	"	7	Do. B.	164-165	..	4 4 10
111,810	10	"	7	mouth Gas B 7 p.c.	16½-16¾	..	4 3 7	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10	"	6	and Water Pref. 6 p.c.	15-15½	..	3 17 5	75,000	5	June 29	6	Malta & Mediterranean.	41-41½	..	6 4 8
380,000	Stk.	"	12½	Brentford Consolidated	251-254	..	4 18 5	560,000	100	Apr. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
300,000	"	"	9½	Do. New	183-190	..	5 0 0	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	May 27	3½	Monte Video, Ltd.	123-13	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	Feb. 25	4½	Newcastle & Gt. West'd Con	103-104	1½	4 4 2
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	81-91*	..	3 16 11
246,320	"	"	8	Do. A Ord. Stk.	153-156	..	5 2 7	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	154-154½	..	5 1 10
460,000	20	Apr. 1	10	British	44-45	..	4 14 8	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Feb. 25	6	Bromley A 5 p.c.	118-120	..	5 0 0	60,000	5	Apr. 1	8	Ottoman, Ltd.	6-6½	..	6 8 0
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
82,278	"	"	5½	Do. C 5 p.c.	105-107	..	5 2 10	60,000	50	"	13	Do. B.	126-128	..	5 1 7
54,000	"	June 29	3½	Do. 3½ p.c. Deb.	85-87*	..	4 0 6	100,000	50	"	12	Do. C.	119-121	..	4 19 2
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	96-98*	..	4 1 8	114,800	50	"	10	Do. D and E.	100-102	..	4 18 0
100,000	-10	"	—	Cape Town & Dis., Ltd.	3-4	-½	—	398,490	5	Apr. 29	7	Primitiva Ord.	73-74	..	4 13 4
100,000	10	"	—	Do. 4½ p.c. Pref.	58-60	..	—	796,980	5	June 29	5	Do. 5 p.c. Pref.	54-54½	..	4 10 11
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90*	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99*	..	4 0 10
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	250,000	10	Apr. 1	9	San Paulo, Ltd.	154-164	½	5 10 9
1,513,280	Stk.	Feb. 25	5½	Commercial 4 p.c. Stk.	107-109	..	4 15 5	62,500	10	"	6	Do. 6 p.c. Pref.	111-124	..	4 18 0
560,000	"	"	25	Do. 3½ p.c. do.	103-104	..	4 15 3	125,000	50	July 1	5	Do. 5 p.c. Deb.	49-50*	..	5 0 0
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	80-82*	..	3 13 2	135,000	Stk.	Mch. 16	10	Sheffield A.	234-236	+2	4 4 9
800,000	Stk.	June 10	5	Continental Union, Ltd.	91-95	-1	5 5 3	269,984	"	"	10	Do. B.	234-236	+2	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	523,500	"	"	10	Do. C.	233-235	+1	4 4 9
492,270	Stk.	"	5½	Derby Con. Stk.	121-123	..	4 9 5	70,000	10	May 27	7	South African.	11-14	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	10-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5½/4	South Met., 4 p.c. Ord.	120-122	..	4 9 7
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	1,895,445	Stk.	Jan. 13	3	Do. 3 p.c. Deb.	80-82	..	3 13 2
486,090	"	Jan. 27	12	European, Ltd.	244-244½	..	4 17 0	209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158	..	5 1 3
354,760	10	"	12	Do. £7 10s. paid.	184-184½	..	4 16 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	121-123	..	4 12 0
16,198,671	Stk.	Feb. 10	4½	Gas 4 p.c. Ord.	104½-105½	+½	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	121-123	..	4 1 4
2,600,000	"	"	3½	light 3½ p.c. max.	88-90	..	3 17 9	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122-124	..	4 0 8
4,062,235	"	"	4	and 4 p.c. Con. Pref.	104-106	..	3 15 6	502,310	Stk.	May 12	5	Southampton Ord.	110-112	..	4 9 3
4,531,706	"	June 29	3	Coke 3 p.c. Con. Deb.	80-82*	..	3 13 2	120,000	Stk.	Feb. 10	6½	Tottenham A 5 p.c.	133-135	..	5 1 9
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	..	5 5 3	453,940	"	"	5½	and B 3½ p.c.	113-115	..	4 13 6
80,000	10	Apr. 29	6½	Do. do. 5 p.c.	117-119	..	5 5 3	49,470	"	June 29	4	Edmonton 4 p.c. Deb.	57-59*	..	4 0 10
131,000	Stk.	Mar. 16	7	Hongkong & China, Ltd.	17-17½	..	6 5 9	182,380	10	June 10	8	Tuscan, Ltd.	9-9½	..	8 8 0
65,780	"	"	5½	Ilford A and C	145-147	..	4 15 3	149,000	10	July 1	5	Do. 5 p.c. Deb. Red.	97-99*	..	5 1 0
65,500	"	June 29	4	Do. B	109-111	..	4 19 1	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
				Do. 4 p.c. Deb.	98-100*	..	4 0 0	255,036	Stk.	Feb. 25	6½	Wands-1 B 3½ p.c.	139-141	..	4 14 0
								79,416	"	June 29	3	worth 1/3 p.c. Deb. Stk.	73-75*	..	4 0 0

Prices marked * are "Ex div."

GAS AND ELECTRICITY SUPPLY IN MASSACHUSETTS.

The last number of the "American Gaslight Journal" contains an article by Mr. H. Thurston Owens on the twenty-fifth annual report (for 1909) of the Massachusetts Board of Gas and Electric Light Commissioners. It shows that the number of private companies making returns was: Gas, 42; electricity, 57; combined, 45—total, 144. The municipal plants were: Electricity, 20; combined, 4—total, 24. There were twenty applications to the Commissioners for permission to issue stocks and bonds to the total amount of \$7,398,755; and they were all granted. The income derived from the different plants last year is shown below; the figures for 1908 being given for comparison.

	1908.	1909.
Gas companies	\$10,433,307	\$10,871,534
Electricity companies	10,401,550	10,558,069
Municipal gas plants	251,638	261,217
Municipal electricity plants	503,380	579,406

The increase in the income of the gas companies was nearly three times that of the electricity companies; the major portion of it in the case of the former being in sales of gas by meter, which represent nearly 89 per cent. of the total income, or about the same as in former years. The receipts from sales for public lamps show an increase of upwards of \$11,000.

The expenses connected with the different plants in the two years are shown below:—

	1908.	1909.
Gas companies	\$7,690,012	\$7,668,868
Electricity companies	6,145,599	6,279,046
Municipal gas plants	180,167	186,357
Municipal electricity plants	512,504	544,779

While gas companies show the largest increase in income, they are also the only ones to show a decrease in expenses. In the report, the expenses are divided into 27 items; and of these 11 are smaller than those for the preceding year. They include coals and enrichers, repairs and maintenance of works, and repairs, renewals, and maintenance of mains and services. The principal item of increase was in gas bought, which rose from \$814,000 to \$879,000; whereas the income from gas sold to other companies decreased from \$491,000 to \$450,000.

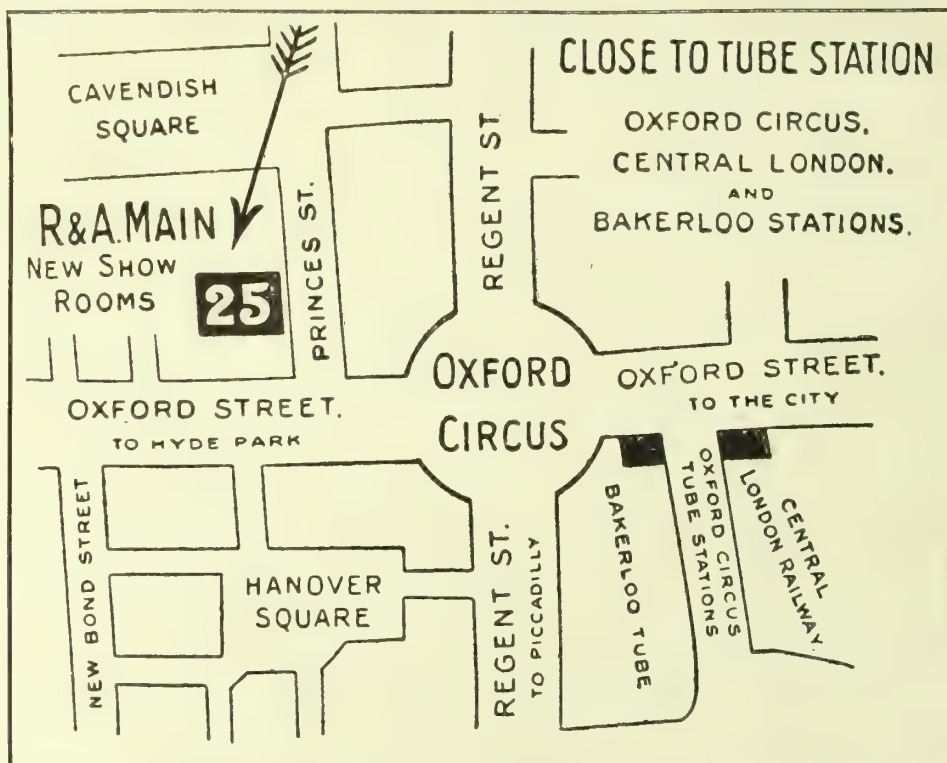
East Surrey Water Company.—At the recent annual general meeting of this Company, the report of the Directors, noticed in the "JOURNAL" for the 28th ult., was unanimously adopted. At a subsequent extraordinary meeting, the Directors were authorized to create and issue by tender 700 ordinary shares of £10 each. Thanks were accorded to the Directors and staff; and on behalf of the latter acknowledgment was made by Mr. A. E. Cornewall-Walker, Assoc.M.Inst.C.E., the Engineer, Manager, and Secretary.

ELECTRIC LIGHTING AT HASTINGS.

The Hastings Town Council recently had before them the annual accounts of the Electricity Department; and, in moving their reception, Mr. Stace said that the public lamps had cost £31 more, but they produced £662 more income; so that this item had been a good investment. The gross profits last year were £7334, whereas this year they were £7923. The deficiency now was £2919, or £882 less than that of last year. The raising of the price per unit had not resulted in the benefit the Committee had anticipated. The average price in 1908-9 was 5d. on 616,269 units. Last year 569,848 units produced an average of 5.55d. The increased price had precipitated economy. Since 1902 they had improved the machinery, and brought it up to date. They had duplicated it, extended and renewed the cables, and improved the public lighting. [Laughter and a Voice: That's risky.] He thought there was no question that it had been very much improved. The electric light undertaking to-day was a far more valuable asset to the town than it was in 1902. Mr. Stace next dealt with the estimates for the forthcoming year, and said an additional income of £1000 was anticipated. Mr. Warner, referring to the increase of 163 consumers, asked how it was the quantity of current used was so much less than before. Mr. Stace suggested that the question should be taken down and put to the Engineer. Mr. Cox asked what was the cost per unit, and remarked that every member of the Council ought to know what it cost to produce electricity. Alderman Tree pointed out that Mr. Cox could easily have answered himself by making a little calculation. The cost of generation was £5590; and if this amount were divided by the number of units generated, the cost per unit could be easily ascertained. In 1908-9, there were 899 customers; and an average consumption of 760 units. Last year there were 1067 customers; but the average consumption was only 534 units. Though the average amount consumed was 226 units less, they had far better illumination than in 1908. Dr. Gray said the total cost of generating current was 1.83d. per unit, and the cost of generation, distribution, and all other expenses, except loan and sinking fund charges, was 4.89d. The total cost per unit was 6.73d. Mr. Cox said if the Electricity Committee adopted his suggestion, and charged a proper price for current, they would not have continued for fifteen months making a loss on the quantity used. They had an increased number of consumers and of lamps, all of which they would have had fifteen months before if the Committee had only been reasonable then. Mr. Stace having replied, the accounts were adopted.

Reduction in Price at Knaresborough.—The Knaresborough Urban District Council have resolved to reduce the price of gas 2d. per 1000 cubic feet, which will mean, with the allowance of 5d. for prompt payment, 2s. 9d. per 1000 cubic feet for lighting purposes and 2s. 4d. for cooking and heating.

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MUNICIPAL ENGINEERS AND WATER SUPPLIES.

Among the subjects before the Incorporated Association of Municipal and County Engineers at their meeting held at Plymouth, under the presidency of Mr. J. Paton, the Borough Engineer of the town, was a paper by Mr. FRANK HOWARTH, M.Inst.C.E., the Water Engineer of Plymouth, on the Plymouth water undertaking.

In his communication, the author sketched the history of the Plymouth undertaking from its foundation in the time of Queen Elizabeth, pointing out that the supply is noteworthy, not only because of its being one of the oldest municipal water undertakings in England, but because of its association with Sir Francis Drake, who constructed the leat by which the water was brought to Plymouth. The present works comprise a storage reservoir at Burrator, five service reservoirs, trunk and distribution mains and leat, and hydraulic ram pump for an outside district. A remarkable feature about the watershed is the large dry-weather flow. Daily gaugings of the River Meavy, from which the supply is derived, show that in a quarter-of-a-century the lowest flow recorded was for seven days in the summer of 1887, when it was at the rate of 2,878,000 gallons in 24 hours, or 1091 cubic feet per second per 1000 acres from an area above the point of gauging of 4885 acres. Mr. Howarth remarked that he had had considerable experience of drainage areas in Yorkshire on the millstone grit and limestone formations, and is well acquainted with areas in Wales and the Thames Valley, &c.; but he has heard of no yield per 1000 acres from any watershed equal to this in the driest summer weather. The only ones within his knowledge to approach it are similar granite areas on Dartmoor and in Cornwall. The explanation given is that the fissures in the granite, assisted by the soft and retentive nature of the surface of the ground, serve to store up the winter rainfall in a natural reservoir, and to pass it out gradually in the summer time. Continuous observations, taken since 1892, show an average rainfall of 55.78 inches; and from July, 1906, to July, 1909, the average flow from the watershed was over 14,000,000 gallons per day, and the lowest flow was at the rate of 3,140,000 gallons per day.

The drainage area above the point where the recording station is fixed is 4554 acres. The quality of the water is excellent, and it is not filtered. It is remarkably soft, having less than 1° of hardness. The capacity of the storage reservoir is 657 million gallons; the water area, when full, being about 120 acres. Under ordinary conditions, the water, before entering the trunk main, passes into a screening chamber fitted with fine screens of copper gauze of 400 mesh. The trunk main, to the first service reservoir at Roborough, is of cast iron, 25 inches internal diameter, and varies in thickness of metal from 0.82 inch to 1.125 inches, according to the pressure it has to bear. The length of the main is 4 miles 662 yards. When laid in 1894, it was capable of delivering 8 million gallons per day; but this has now been reduced, through corrosion and sediment, by over 10 per cent. Between the

first service reservoir at Roborough and the second one at Crownhill, are two lines of mains, each consisting of 3628 yards of 24-inch, 1133 yards of 20-inch, and 373 yards of 18-inch pipes. A 24-inch main conveys the water to the third service reservoir at Hartley; and there is a fourth reservoir at Drake's place which supplies the lower portion of the town. Within the administrative area there are 20 miles of trunk mains and 115 miles of distribution mains. Of these, 70 miles have been added during the last 20 years; and in the same time about 27 miles of the older mains have been renewed.

For the prevention of waste, the Corporation have adopted various means. All new fittings are thoroughly examined and tested free of cost at the water-works yard to a pressure of 350 lbs. per square inch; while no connections are made to new property until the internal fittings have been passed by an inspector who is by trade a practical plumber. Wrought-iron pipes for internal fittings are not allowed by the regulations, as the water very quickly sets up corrosion. All draw taps and ball taps are washered by workmen employed by the Corporation free of charge to the consumer. The administrative area is divided into 70 districts, some of which are governed by Deacon meters, two by Kent meters, and some by ordinary Siemens meters. As a result of night inspections, the consumption has been reduced from 44.20 gallons per head per day in 1902-3 to 37.83 gallons in 1908-9. The charges for water within the borough of Plymouth are among the lowest in the country; the scale ranging from 4s. for a house of the yearly rent not exceeding £5 and 14s. for a house whose rental is between £15 and £20, to 40s. for a house over £80. For trade purposes, by meter, the charge is 3½d. per 1000 gallons. Notwithstanding the very low charges prevailing, it has been usual for a considerable period for the undertaking to hand over a substantial sum in aid of the rates; the amount for the year ending March, 1909, being £5510. During the last six years, the sum given in aid of rates was £28,948. The total capital expenditure to March 30, 1909, including expenses of stock issues, was £392,336, and the total amount repaid or in the redemption fund was £111,888.

Mr. BRODIE, in the course of the discussion, referred to the reduction in the consumption of water at Gloucester, and said that, under Mr. Read's management, it had been brought down from 32 gallons per head per day in 1883 to 20 gallons at present. He thought the time would come when water would be supplied to all houses by meter, and no one would think of supplying on the rateable value of houses.

Mr. T. CAINK (Worcester), referring to the fact that the Plymouth water supply is not filtered, said he had made some investigations with regard to the hygienic quality of water supplies, comparing towns obtaining water from mountain lands or artesian wells with towns getting water from rivers and having perfect filtration arrangements. The net result of his investigations was to show that those towns which got their water supply from rivers had an emphatically lower typhoid case rate than towns deriving their supply from any other source. There was one remarkable exception; and that was Plymouth. While other towns with upland supplies showed a case rate four or five times greater

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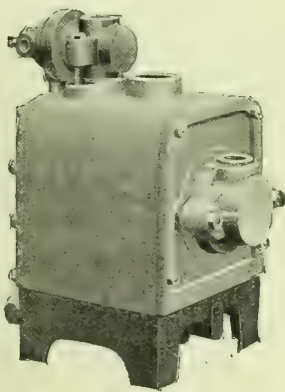
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than towns supplied with river water, Plymouth was as low as any of the river supplied towns. His impression was that Plymouth had one of the finest water supplies in the world. But however pure a water supply might be, he was still of opinion that, when taken from exposed areas, it was not perfectly safe to send it to the consumer without having the safeguard of passing it through efficient filters.

Sir JAMES LEMON (Southampton) compared the charges for water at Southampton with those at Plymouth, and claimed equality of cheapness for his town. He thought the Corporation of Plymouth were in the wrong in making a profit out of the water. They should reduce the charges or allow a liberal scale of discounts.

Mr. HOWARTH, replying to a remark by another speaker, said that, notwithstanding the moorland origin of the water, there was no action by it on lead pipes. As to filtration, he was inclined to agree generally with Mr. Caink; but the supply seemed to be an exceptional one. The Town Council would tell them that the fact that their ancestors had drunk the water for 300 years was a good test of its purity. Filtration would improve it; but it was difficult to get the people who had to find the money to incur the cost. The question of profit was another matter on which the Town Council had opinions. They would like to make enough profit to pay all the rates of the town; and if they charged as much as some towns, they would do it.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The seventy-sixth annual meeting of the Galashiels Gaslight Company, Limited, was held on Tuesday last—Mr. Jas. Dickson, the Chairman, presiding. The report of the Directors showed that the profit for the year had been £2299, and that the reserve at June, 1909, was £7108—making together, £9407. It was recommended that a dividend of 10 per cent., free of income-tax, be paid, which would require £2100, and that £7307 be placed to reserve. The gas made during the year was 74,620,000 cubic feet, the quantity unaccounted for 3,398,328 cubic feet, and that used in works and offices 746,200 cubic feet. The quantity which passed through consumers' meters was 70,475,472 cubic feet—an increase upon the preceding year of 2,733,039 cubic feet. The Directors recommended that the price of gas be retained at 2s. 9d. per 1000 cubic feet. They reported that the ammonia distillery carried on by Messrs. Metcalf, Limited, near the gas-works, had been acquired by the Gas Company. The report was adopted.

The annual report of the Directors of the Kirkcaldy Gaslight Company, Limited, which has been issued, states that during the past year the quantity of gas made was 147,881,000 cubic feet. This is nearly a million cubic feet more than in the previous year. The gross profit for the year, before charging interest on the reserve and depreciation funds, was £6504. For the year ending Nov. 30 last, an interim

dividend of 4s. per share was paid. The Directors recommend that a final dividend of 4s. 6d. per share be paid, which will absorb £2940. The Directors have resolved to continue the price of gas to ordinary consumers at 3s. 2d. per 1000 cubic feet. In regard to the purchase of the Company's undertaking by the town, the Directors report that the books are still in the hands of the accountant employed by the town. If an offer be made which the Directors can recommend for acceptance, they will at once call the shareholders together. If, however, no such offer be received within a reasonably short time, the Directors will have no option but to resort to arbitration.

The annual general meeting of the Lochgelly Gas Company, Limited, was held last Wednesday. The Directors' report and balance-sheet was unanimously agreed to. It was reported that 33½ million cubic feet of gas were manufactured during the past year—an increase of nearly 7 millions over the previous year. The Chairman mentioned that about one mile of the new main pipe and about 3½ miles of service-pipes had been laid during the year. A dividend of 7½ per cent. was declared, £400 is to be put to the reserve, and £490 carried forward. The price of gas has been reduced by 2½d. per 1000 cubic feet.

The Gas Committee of the Dunfermline Town Council have had before them a letter from a firm of solicitors, on behalf of Mary Murphy, a factory worker, of Goldrum Street, with reference to injuries which she had sustained through being poisoned by gas in her dwelling-house. It was pointed out that on more than one occasion complaint had been made at the gas office of an escape, but no attention was paid to it. Damages were accordingly claimed. The Committee deny liability, and point out that there is no obligation on the part of the Corporation to act as plumbers.

The annual meeting of the Anstruther and Cellardyke Gas Company, Limited, was held on Wednesday. The Chairman—Mr. W. Oliphant—said the Company had had a very successful year; the profit having been £752. The balance brought forward from the previous year was £260; making a total of £1012, out of which the Directors set aside £285 for depreciation, and £35 as irrecoverable arrears, reducing the balance to £692. A dividend of 5 per cent. was declared, and the balance of £367 was carried forward.

The Kinross Gaslight Company, Limited, had a profit on last year's working of £404, and have paid a dividend of 7½ per cent. free of income-tax. The Blairgowrie Gaslight Company have paid a dividend of 5 per cent.; and the Coupar Angus Gaslight Company have paid a dividend of 6 per cent., and continued the price of gas at 5s. 7½d. per 1000 cubic feet. The Alyth Gaslight Company have paid a dividend of 6 per cent.

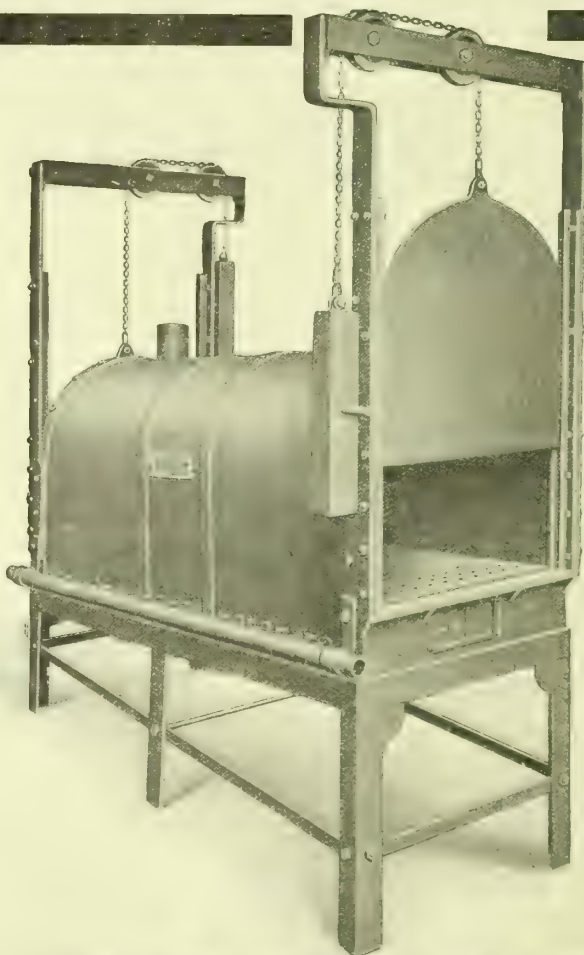
On Monday evening of this week, Mr. Leitch, in submitting the accounts of the Gas Department to the Town Council of Newport, Fife, said the department was in a healthy condition. There had been an increased consumption of gas, and the unaccounted-for gas had been lower than it had been for some years. The total capital expenditure upon the works had been £24,117; and the debt at the present time amounted to £18,675—a reduction of £5442, due to the repayment of borrowed money to the extent of £3625, and the sale of old plant and

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the transfer from the depreciation fund of £1767. Mr. Leitch urged the necessity of continuing their efforts to still further reduce the valuation of the gas-works.

Early this month, the first sod of a new reservoir in connection with the water supply to Paisley was cut by Provost W. Muir Mackean. The reservoir, which is the seventh constructed since 1838, when a gravitation supply was introduced, is to be known as Barrcraigs. It is to be a mile long, half-a-mile broad, and to have a surface area of 182 acres. Its capacity is to be 1100 million gallons, which is more than the combined capacity of the two largest existing reservoirs.

In the "Glasgow Herald" it was reported recently that "satisfactory progress is being made with the Smoke Abatement Exhibition promoted by the Glasgow Corporation, which is to be held in the Victoria Road Skating Rink from Sept. 16 to Oct. 8 next. A large portion of the space available for exhibits has already been allotted, and most of the principal makers of gas appliances for domestic purposes will be represented. In connection with the exhibition, a communication has been submitted by a group of the principal makers to the Special Committee of the Corporation who have charge of the arrangements, urging that the Corporation should supply gas-fire apparatus, as well as cooking appliances, to the public on the hire system. Hitherto only the latter have been offered on hire by the Corporation. The belief is expressed that if the system were extended to gas-fires, these would be generally adopted by householders, and would become an important factor in the solution of the smoke problem."

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, July 9.

There has been no material alteration in the situation during the week, for, though the market has been quiet, prices have been maintained at all points; supplies not being excessive anywhere. The closing quotations remain, therefore, at £11 15s. per ton f.o.b. Hull, £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. Again there has been large inquiry for delivery in the forward position; but there has not been a corresponding amount of actual business done. While makers are firm at £11 17s. 6d. per ton for delivery up to the end of the year, and at £12 per ton for delivery in 1911, buyers are still endeavouring to get in at 2s. 6d. to 3s. 9d. per ton less.

Nitrate of Soda.

This article on spot is quiet; the quotations being unchanged at 9s. 3d. per cwt. for 95 per cent., and 9s. 6d. for refined quality.

Tar Products.

LONDON, July 11.

Business in tar products continues quiet, and prices have not altered very materially during the past week. Creosote remains steady;

but the volume of new trade is not great. There has been considerable business done in crude carbolic acid at an improved price for both prompt and forward delivery. Benzols are weak, and buyers expect to purchase at very low prices. Naphthas still remain steady. The market for pitch has been quiet throughout the past week, and there are sellers at 35s. per ton f.o.b. east coast ports, and at an equivalent on the west coast. Buyers will not, however, pay this price, as they find it impossible to do business on the Continent. In the majority of cases, they offer 31s. 6d. to 32s., which figures are reported to have been accepted for delivery all over next year.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d., ex works. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 32s. to 33s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7½d.; North, 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 3d.; North, 1s. 2½d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, is 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market seems decidedly weak, and buyers are not very plentiful. To-day, outside London makes are quoted at £11 7s. 6d. to £11 8s. 9d. In Hull, £11 15s. is asked; and in Liverpool, £11 13s. 9d. to £11 15s. In Leith, the price quoted is £11 15s. to £11 17s. 6d.; while in Middlesbrough £11 12s. 6d. to £11 15s. would be accepted.

St. Helens and the Standard Burner Bills.—The attention of the members of the St. Helens Town Council was called by Mr. W. A. Brooks to the fact that the Gas Engineer (Mr. Samuel Glover) had received permission to give evidence on behalf of the promoters of the Gas Companies (Standard Burner) Bills. He asked what effect the Bills would have on the interests of the Corporation, and whether Mr. Glover's attendance in London would be at the expense of the town. In reply, it was explained by Mr. Grace that it was in the interests of consumers that the No. 2 burner should be adopted. There was, he said, no doubt there would be some compromise between the different corporations and the gas companies supplying them; but they thought that if there could be one standard for testing gas, it would be better for all concerned. Mr. Glover was supporting the standard they had in St. Helens; and he (the speaker) took it as a great compliment to the Gas Committee and their Engineer that he should have been asked to give evidence on such an important matter. The Mayor pointed out that if Mr. Glover was asked to give evidence, he would be paid; and his doing so would not cost the Corporation anything.

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COAL TRADE REPORTS.

Northern Coal Trade.

There is still a quiet tone in the Northern coal trade; but some collieries seem to have booked orders that give a fair amount of work at the lower prices now ruling. In the steam coal trade, best Northumbrians are from about 9s. 9d. to 9s. 10½d. per ton f.o.b., second-class steams are 9s., and steam smalls are from 5s. 6d. to 6s. 9d. The latter are in rather fuller inquiry, so that the output seems to be well taken up. In the gas coal trade, there is a slow increase in the home consumption, and the deliveries on the long contracts are a little heavier. Durham gas coals are quoted from about 9s. to 9s. 9d. per ton f.o.b. for the usual classes, according to quality, with "Wear" specials up to about 10s. 6d. Among the sales reported are some cargoes for Genoa, for three of the winter months, at 16s. per ton at that port. Several other small orders are reported at about the rates that are current in the market; but some of the gas coal collieries are now fairly well sold forward, and are inclined to stiffen their prices. In coke, the market is quiet; but gas coke is firm, owing to the limited supply at present. Good gas coke is about 15s. 6d. per ton f.o.b. on the Tyne or Wear.

Scotch Coal Trade.

Trade has been fairly active. Ell is plentiful, and the demand has not been sufficient to take up the output. Splint is in steady request, and the outputs are moving off steadily. Steam coal continues depressed. Small sorts are still in demand. The prices quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 359,770 tons—an increase of 38,939 tons upon the previous week, and of 14,017 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,960,324 tons—an increase of 642,934 tons upon the corresponding period.

Water Scheme for Warrington.—The Warrington Town Council have unanimously adopted a recommendation of the Water Committee that application be made to the Local Government Board for sanction to the borrowing of £23,000 for water-works purposes. Alderman Evans, in moving the adoption of the minutes, pointed out that the Council had plenty of water, but not the means of supplying it. In certain parts of the town, it was impossible to give sufficient water for sanitary purposes. The scheme was to provide a new 18-inch main, commencing at Winwick Pumping Station to Sankey Street. By the route he described, they would get a complete circuit. The cost of the new main was estimated at £17,000; and there would be £6000 for the purpose of improving the different systems of pipes. Mr. H. Roberts, in seconding, said they were making a good profit on the water undertaking; and he thought the proposed expenditure would be more than met by the increasing income, and that the reserve fund would in all probability remain intact.

Liquidation of the Automatic Gas-Lighter, Limited.

The Official Receiver in the winding-up of this Company has issued his report and observations to the creditors and shareholders concerned, the statutory meetings of whom were held on the 8th ult., as already recorded in the "JOURNAL." No statement of affairs has been lodged. The Company was registered in England on March 9, 1909, with a nominal capital of £60,000, divided into 58,000 ordinary shares of £1 each and 20,000 deferred shares of 2s. each. The share ledgers show that 30,000 ordinary and 19,500 deferred shares were issued as fully-paid, and 8,410 ordinary and 507 deferred shares for cash. According to the ledgers, the calls unpaid amount to £7438; but the Official Receiver says it is possible that payments have been made which are not entered. The promoter of the Company was Mr. Henri Lucas, who received an allotment of 9000 fully-paid ordinary and 9500 fully-paid deferred shares for "negotiations entered into, steps taken, and expenditure incurred" with a view to the formation of the Company. A prospectus was drafted for the purpose of meeting the requirements of the English law relating to joint-stock companies; but no use was made of it. The Company was formed to purchase the patent rights in connection with an invention for lighting up gas-burners from a distance by means of a switch attachment known as the "Zenith," and also those for an appliance for the automatic lighting of advertisements by means of gas. The patent rights were owned by three manufacturers in France, who transferred them to the Company in consideration of an allotment of 19,000 ordinary and 10,000 deferred shares. The Official Receiver has not been able to obtain any books or accounts showing the extent or result of the Company's trading. On the 3rd of May last, the Tribunal of Commerce of the Seine declared the Company to be in a state of bankruptcy. The whole of the assets are in the possession of the Trustee; and their value is not known to the Official Receiver.

Cost of Public Lighting at Hackney.—An official return shows that the cost per mile for lighting the streets of the borough of Hackney by electricity is £377; while the cost per mile for gas lighting, under the new arrangement made with the Gaslight and Coke Company, will be only £74. At present 20·94 miles of streets are lighted by electricity, and 85·56 miles by incandescent gas.

The New Public Lighting Contract for Westminster.—It may be remembered, in connection with the acceptance by the Westminster City Council of the tender of the Gaslight and Coke Company for the lighting of certain west-end streets, that the Company are under an obligation to complete the installation of the lamps within twenty weeks of the date of the order to commence—viz., May 27 last. The Company have now formally requested permission to start the work of laying the mains in Victoria Street, Broad Sanctuary, Parliament Street, and Whitehall; and the Works Committee of the Council have granted the application subject to the usual sanction, and conditional on the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) being satisfied that the traffic will not be unduly interfered with.

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Gas and Electricity at Manchester.

Some reference was made at last week's meeting of the Manchester City Council to the report of the Gas Committee, in which it was proposed to accede to an application for an extension of the mains to supply gas to certain houses now being erected, "subject to the owner of the property paying the cost of fixing the stoves and meters, and providing one light in the kitchens." Alderman Walker suggested a conference between the Gas and Electricity Committees to meet these cases. Many estates, he said, were being built in which the tenants asked for electric light; it was a great aid to the letting of such property. More and more would the question arise as to what was to be done for the supply of gas for cooking and heating arrangements only, and electricity for lighting. Alderman Gibson (the Chairman of the Gas Committee) said they had arranged that a Joint Committee should go carefully into the matter. It was true the Electricity Committee had arranged with certain builders to put electricity in their houses, and no gas at all. These were Manchester citizens; and they had arranged to supply Manchester citizens with cookers free of charge. But it became a serious matter to supply cookers when no gas was being used. Therefore they were proposing that the owners should pay the cost of fixing the stoves, and should have one gas-light in the kitchen, which would consume a sufficient amount to pay principal and interest on the Gas Committee's outlay. The two Committees were dealing with the same ratepayers' money; and they must work together. The Gas Committee were satisfied that what they were proposing to do would pay.

Not Water-Gas Victims.

When the minutes of the Rochdale Gas Committee were brought up for confirmation at last Thursday's meeting of the Town Council, Mr. Blomley asked the Chairman if there was any truth in the rumour that the deaths of two men who were poisoned in a culvert recently were caused by water gas manufactured by the Corporation. In reply, Mr. Walker said he was glad the question had been put. Carburetted water gas had absolutely nothing to do with the unfortunate accident referred to by Mr. Blomley. On the day in question, and for six clear days before the accident, no carburetted water gas was delivered from the works. He desired to emphasize the point that the public need have no increased alarm on account of the nature of Rochdale gas because of the mixture of carburetted water gas. The products of combustion of carburetted water gas were no more dangerous than the products of combustion of ordinary coal gas. He added that he knew that there was a section of the public who had always been nervous since carburetted water gas was introduced in Rochdale; and whenever there was anything productive of a complaint since then, it had been put down to the water gas. But it was a singular thing that at such times, without exception, they had not been sending out carburetted water gas. It was true that carburetted water gas contained a higher percentage of carbon monoxide; but when the proportion that Rochdale put to ordinary coal gas was added, the carbon monoxide was only slightly greater in the mixed gas than when coal gas alone was being used.

New Joint-Stock Companies.—The Hanwell Pendant Company, Limited, has been registered with a capital of £2000, in £1 shares, to carry on the business of manufacturers of gas-fittings. The Olney Gaslight and Coal Company, Limited, with a capital of £4000, in £10 shares, has also recently been registered.

Water Troubles at Utttoxeter.—The Surveyor (Mr. R. W. Marshall) has reported to the Utttoxeter Urban District Council that on June 19 to 22 the reservoir from which the town is supplied was empty, and the town was practically without water. The residents in the upper parts were the chief sufferers. An investigation showed that some one had gained access to the gauge-chamber, and tampered with the gauges, with the result that the water had passed away as compensation water to farmers and residents in that part of the district, instead of going into the town. He did not know who was responsible for the mischief. The gauge-chamber had been watched; but nothing had been done since. It was resolved to offer a reward of £5 for information as to the offenders.

Prepayment Meter Charges for Gas at Bolton.—At the monthly meeting of the Bolton Town Council last Wednesday, Mr. France moved that the charge for gas supplied through the prepayment meters be fixed at the rate of 1d. per 30 cubic feet, instead of 25 cubic feet as at present, such reduced charge to take effect as from Sept. 30 next. Mr. France complained that he had been unable to get certain particulars from the officials in the Gas Department to support his arguments for the proposed reduction. Alderman John Miles, a Past-Chairman of the Gas Committee, advised Mr. France to let his resolution lie over for the present. The reason he made this suggestion was that probably before the next Council meeting the Gas Committee would have dealt with the matter. Mr. France accepted the suggestion, and the resolution standing in his name is therefore held over until the next Council meeting.

Finsbury Public Lighting.—At the last meeting of the Finsbury Borough Council, the Works Committee reported having had under consideration a letter from the Gaslight and Coke Company with reference to experiments lately carried out by them in certain streets in the borough with inverted burner incandescent gas-lamps. The Company submitted a scheme under which they would, subject to the terms of a contract covering a period of ten years, and providing for payment by the Council of an annual sum of £6913 (including the cost of the necessary installation), provide new all-copper circular lanterns and inverted burners to the whole of the lamps in the borough, and would undertake the painting of the posts, &c., the cleaning, maintenance, and renewal of the lanterns, burners, and mantles, the lighting and extinguishing of the lamps, and the supply of the gas, with all the necessary services. The Committee recommended that the scheme should be accepted. The consideration of the matter was deferred till the next meeting.



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Increased Meter-Rents at Salford.—At their last meeting, the Gas Committee of the Salford Corporation amended the scale of charges for the use of ordinary meters by increasing the rent for 3-light meters from 6d. to 9d. per quarter.

Carlisle Gas Profits.—The accounts of the Carlisle Gas Committee for the past financial year show a net profit of £5513. The Committee have decided to establish a reserve fund; and for this purpose they have transferred the sum of £500 from the profits.

Failure of the Electric Light at Brighton.—A breakdown at the generating station of the Brighton Corporation caused a failure of the electric light early last Sunday evening; and for a quarter-of-an-hour many of the hotels were in darkness, except for the makeshift illuminating arrangements which could be brought into use.

Fatal Gas Explosion at Meaux.—According to a Dalziel telegram received in Paris last Saturday, a serious explosion occurred on the preceding day at the Meaux Gas-Works of the Compagnie Continentale du Gaz, of Paris. Seven men were very badly injured; and we learn that the Manager (M. Charles Maillot) and a smith have succumbed. It appears that some connections were being made between the valve-house and the gasholder; but the cause of the accident is not known, and probably never will be, as those immediately concerned are no longer alive. It is stated that the extent of the catastrophe would have assumed far greater proportions had it not been for the presence of mind of a man in another department of the works, who shut off the gas from the adjoining holder as soon as the explosion occurred.

Meldreth and Melbourn District Gas and Water Company, Limited.—A circular has been issued by Mr. J. W. Barratt convening a meeting of the creditors of this Company to be held to-day (Tuesday), in pursuance of a resolution passed by them on Feb. 22 last—to the following effect: "That this meeting of the creditors of the Meldreth and Melbourn District Gas and Water Company, Limited, having heard the explanation of the financial position given by Mr. J. W. Barratt, the Receiver appointed by the debenture-holders, hereby agree to defer taking any further proceedings in order to give the Receiver an opportunity of realizing or reconstructing the undertaking, on its being understood that the Receiver will convene a subsequent meeting of the creditors and report to them what steps he has taken." Mr. Barratt regrets that all negotiations for realization or reconstruction have failed; and he is now about to negotiate with the Local Government Board with the view of arranging for the undertaking to be taken over by the local authorities. Failing this, the undertaking will have to be sold by auction. But in either event, from information Mr. Barratt has obtained in the course of the negotiations conducted during the past four months, he is of opinion that the amount realized will be insufficient to pay the debenture-holders in full, and that there will be nothing available for the creditors.

The Leeds Fire-Clay (Canadian) Company, Limited, has been registered with a capital of £10,000, in £10 shares, to adopt an agreement with the Leeds Fire-Clay Company, Limited.

The Rochdale Town Council have accepted the tender of Messrs. Freeman and Son, of Hollinwood, for the construction of a service reservoir at Buersil. The cost of the new reservoir and extensions is put down at £14,000.

The Malvern Urban District Council, at their meeting last Tuesday, decided to apply to the Local Government Board for a loan for the purpose of erecting new purifiers. They also accepted the tender of Messrs. R. & J. Dempster, of Manchester, for same, subject to the sanction being received from the Local Government Board.

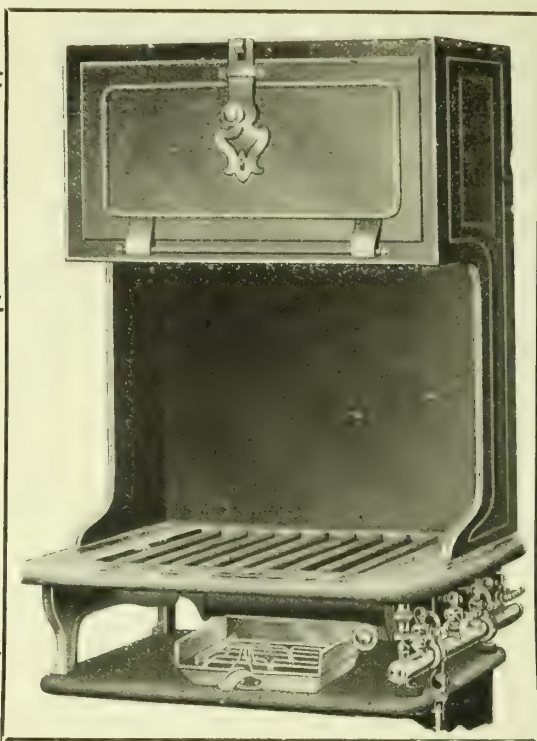
Messrs. J. Stone and Co., Limited, Mechanical Engineers, of Deptford, have installed a suite of soft metal melting furnaces, made by the Richmond Gas Stove and Meter Company, Limited. Each furnace carries about 5 cwt. of metal; and the heat is generated by means of a patented gas and hot air principle. The annual gas consumption for the suite will be from 700,000 to 800,000 cubic feet.

While suffering from ill-health, Mr. J. B. Walker, a man well known in the East Riding, attached a rubber tube to a burner and was found dead in his chair with the other end of the tube resting on his chest. The doctor who was called at the inquest expressed the opinion that deceased died from the effects of coal-gas self-administered; and the jury returned a verdict of "Death from coal-gas poisoning."

It was announced in the "JOURNAL" some weeks ago that Mr. F. E. Pye, son of Mr. T. E. Pye, of Chichester, had been appointed Manager of the Petersfield and Selsey Gas Company, of which his father is the Engineer. At a recent meeting of the Urban District Council, a member referred to the improvement which has taken place in the quality of the gas; and this was testified to by the Council generally.

At a meeting of ratepayers, the Hoyland Urban District Council have been criticized for incurring an expenditure of £400 on negotiations for the purchase of the Elsecar Gas-Works. It was considered that the Council should have consulted the ratepayers as to whether they wished to purchase, before matters had gone so far; and the meeting decided to write to the Local Government Board to ascertain whether the expenditure was legal.

The cookery lectures and demonstrations arranged by Mr. W. Arnott, the Manager of the South African Lighting Association, Limited, to which reference was made in the "JOURNAL" last week (p. 65), were brought to a close on the 17th ult. On the previous evening, there was a competition by five men in the preparation of a breakfast by the aid of a gas-stove. Before it commenced, the lady demonstrator (Miss Mercer) cooked an identical breakfast in 5½ minutes. At the end of 10 minutes all the men had finished, and the prizes were awarded. In the course of her demonstrations, Miss Mercer referred to the interest shown in them. She said a letter received from an up-country lady asked that a stove should be sent to her, and with it a bottle of gas, and an explanation as to how long it would last!



PARKINSON'S HOT CLOSET AND PLATE WARMER

FOR FITTING ABOVE COOKER.

Thoroughly heated by the heat after being used in oven, also by means of the hot-plate burners.

Substantially constructed throughout, and fitted with Fall Door, which is very convenient for use as a rest for plates.

Plates are evenly warmed ready for use, and do not get discoloured or moist from condensation.

See special list for other new designs in Plate Racks, &c.

THE
PARKINSON STOVE CO.,
LTD.

(Incorporating Maughan's
Patent Geyser Co.),

Stour St., Spring Hill, & 129, High Holborn,
BIRMINGHAM. & LONDON.

At the meeting of the London County Council last Tuesday, expenditure not exceeding £650 was sanctioned for the repair and renewal of the gas-mains and the substitution of incandescent for flat-flame burners at the Barking sewage outfall works.

According to the abstract of accounts published by the Doncaster Corporation for the year ending March 31 last, the Water-Works Committee show a deficit of £3928, which is made up from the borough fund. The profit from the gas-works amounted to £6158, of which £5000 has been transferred to the borough fund, and £1158 carried forward to the reserve. There is a surplus on the electricity account of £1222, which has been carried to the renewal fund.

At a meeting of the Teignmouth Urban Council last Tuesday, the Gas Committee recommended that application should be made to the Local Government Board to sanction a loan of £1000 for the provision of slot meters and stoves. Mr. Wheatley stated that in Committee there was a great difference of opinion as to the policy of raising this money. There must come a time when the demand for meters would diminish to some extent; and he would rather wait a little longer and see how things turned out before the Council obtained another loan. He moved, as an amendment, that the matter be deferred for four months, any expenditure incurred in the meantime to be met out of revenue. The amendment was carried by six votes to five.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY. Stretford Gas Company.
MANAGER (SOUTH AMERICA). No. 5261.
LABORATORY ASSISTANT. No. 5263.
FOREMAN. Sunderland Gas Company.

Situations Wanted.

ASSISTANT-MANAGER OR MANAGER. T. E. Shadbolt,
Grays.
INSPECTOR. No. 5260.

Gas Works, &c., for Disposal.

TARPORLEY GAS-WORKS. Tenders by Aug. 2.

Plant (Second-Hand) Wanted.

STREET LAMPS. Alford Gas-Works.
STATION-GOVERNOR. Leigh-on-Sea Gas Department.
Tenders by July 20.

Plant (Second-Hand) for Disposal.

PURIFIERS, &c. Oldbury Gas Department.
PURIFIERS &c. Malvern Urban District Council.

Patent Licences.

GENERATING AND USING HYDROCARBON VAPOURS FOR
HEATING AND LIGHTING. L. Duvinage, Brussels.

Tank-Waggon for Hire.

CLAYTON ANALINE COMPANY.

TENDERS FOR

Coal and Cannel.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by
July 25.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
MARKET HARBOUROUGH GAS DEPARTMENT. Tenders
by July 23.
OLDHAM GAS DEPARTMENT. Tenders by July 26.
ROCHDALE GAS DEPARTMENT. Tenders by July 20.
ROTHERHAM GAS DEPARTMENT. Tenders by July 18.
SMETHWICK GAS DEPARTMENT. Tenders by July 22.
STRATFORD-UPON-AVON GAS DEPARTMENT. Tenders
by Aug. 6.
WINSFORD URBAN DISTRICT COUNCIL. Tenders by
July 25.

Fire-Clay Goods.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Oxide of Iron.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders
by July 25.

Retort-Bench, &c.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Station Governor.

LEIGH-ON-SEA GAS DEPARTMENT. Tenders by July 20.

Tar and Liquor.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

PENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old
Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRIOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London," Telephone: No. 243 Holborn.

FOR SALE.

SYPHON PUMPS

of the very latest improved design.

Apply early

JAMES MILNE AND SON, LIMITED.

EDINBURGH, LONDON, GLASGOW, LEEDS.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.

Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,

7, BISHOPSGATE STREET WITHOUT,

LONDON, E.C.

Telegraphic Address: "Carburine, London."

AMMONIACAL Liquor wanted.

BROTHERTON & Co., LTD., Ammonia Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams:

"DACLIGHT LONDON,"

Telephone:

2336 HOLBORN.

GAS-WORKS requiring Extensions

should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

36, Mark Lane, LONDON, E.C. WORKS: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

F. BOYALL, Contractor for Painting

GASHOLDERS, OIL-TANKS, ROOFS, and all
kinds of LOFT and other PAINT WORK.

70, Balcombe Street, Well Street, HACKNEY, N.E.

OUR DUTY—YOUR PLEASURE.

WHENEVER convenient to you, kindly

ask us to furnish Particulars of

HIGH PRESSURE LIGHTING PLANT.

JAMES MILNE AND SON, LIMITED.

EDINBURGH, LONDON, GLASGOW, LEEDS.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manu-
facturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

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suitable for making Sulphate of Ammonia,
BROTHERTON & Co., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKE-
FIELD.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, **THOMAS HORROCKS,**
Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.

LUX'S GAS PURIFYING MASS.

See Advertisement on First White Page.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

R. & G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

Communications should be addressed to
UNDERWOOD HOUSE, PAISLEY.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

IT is Worth Your While to Buy Direct.

The RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10s.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.

THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

KRAMERS AND AARTS WATER- GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding

Oxide Lightly.

See Illustrated Advertisement, June 21, p. 914.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, and STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, and WAKEFIELD.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

READ HOLLIDAY AND SONS, LTD.,

HUDDERSFIELD,

Are prepared to Supply

BENZOL, TOLUOLE, NAPHTHA, and CREOSOTE
in large Quantities.

ENQUIRIES SOLICITED.

FOR Immediate Disposal.

Manufactured specially for giving Satisfaction.

Any required number of

COKEBREAKERS.

Hand or Power Driven.

Apply, **JAMES MILNE AND SON, LIMITED.**

EDINBURGH, LONDON, GLASGOW, LEEDS.

ADVERTISEMENT No. 5247—Junior

WORKS ASSISTANT.

Applicants are THANKED, and informed that the
Position HAS NOW BEEN FILLED.

SITUATION wanted by a Young Man,

Son of a Gas Manager, as ASSISTANT-MANAGER
or MANAGER of Small Works, or place of Trust.
Has been thoroughly Trained for Gas Management.

Address THOS. E. SHADEOLT, Gas-Works, GRAYS.

INSPECTOR (Age 35), Married,

thoroughly Practical, Seeks ENGAGEMENT,
London or Provinces. Twenty years with late Com-
pany.

Address No. 5260, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

STRETFORD GAS COMPANY.

SECRETARY wanted, capable of Taking

CHARGE of Office Staff, Cash, and Books. Age
from 30 to 40 years. Good References essential.

Apply, by letter, stating Salary required, to the
CHAIRMAN, Gas-Works, STRETFORD, MANCHESTER.

July 7, 1910.

WANTED by a Firm of Ironfounders

and Chemical Engineers, with Established Trade
among Chemical Manufacturers, to undertake the Sole
Rights of Making and Selling Chemical Specialities in
Great Britain.

Apply No. 5262, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

OWING to Promotion, a Gas Company

in Yorkshire require the Services of a Young
Man to ASSIST IN THE LABORATORY.

The Candidate must have had Practical Experience
in the Photometer, and in making the ordinary Tests
of Liquor, Furnace Gases, &c.

Apply, by letter, stating Age, Experience, and Salary
required, to No. 5263, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

MANAGER required for a Gas Under-

taking in South America. Engagement for a
Term of Years. Residence provided. Applicants should
state Age, whether Married, Qualifications, previous
Experience, Salary required, and whether able to speak
Portuguese or Spanish.

Apply, by letter, giving Particulars, with References,
and copies only of recent Testimonials, to No. 5261,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Retort-House Foreman

for the Hendon Works of the Sunderland Gas
Company to TAKE CHARGE of an Eight-Hour Shift.
Must have had Practical Experience of West's or De
Brouwer Stoking Machinery, and a General Knowledge
of Gas Manufacture is desirable. Statement of duties
will be sent on Application. Wages, with Extras,
average about 48s. per week.

Apply, in own hand-writing, to ENGINEER, Hendon
Gas-Works, SUNDERLAND, enclosing copies only of recent
Testimonials, and stating Age, Experience, present
Occupation, whether Married or Single, and when Free.

WANTED, Fifty good, Second-Hand

STREET LAMPS.

Price and Particulars to the MANAGER, Gas-Works,
Alford, Lincs.

GASHOLDERS—Splendid 45 feet dia-

meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap, for
immediate Sale.

FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR HIRE—One Tank-Waggon suitable

for carrying Benzol, and one suitable for carry-
ing Crude Naphtha.
Address THE CLAYTON ANILINE COMPANY, LIMITED,
Clayton, MANCHESTER.

FOR Disposal—10-H.P. Portable Steam-

ENGINE, practically new, by Marshall and Sons,
Gainsborough, insured by National (90 lbs. pressure).
4-H.P. Horizontal STEAM-ENGINE, 5-H.P. Horizontal
STEAM-ENGINE BOILER-TANK $\frac{7}{8}$ in. Plate, capacity
3070 gallons, absolutely sound. Cheap. Stationary
STEAM CRANE, long jib. Offers Solicited.
W. JOHNSON, Junr., New Hythe, KENT.

PURIFIERS FOR SALE.

THE Malvern Urban District Council

are open to receive OFFERS for the following
PURIFIERS: Two 16 ft. by 12 ft. by 5 ft.; Four 16 ft.
by 8 ft. by 5 ft.; and Two Four-Way Valves and Con-
nections.

Permission to View and further Particulars can be
obtained from the undersigned.

The highest or any Tender will not necessarily be
accepted.

By order,
W. J. RENDELL BAKER,
Engineer and Manager.

THE Haworth Urban District Council

are prepared to receive TENDERS for the Supply
of 2500 Tons of GAS COAL (Screened, Unscreened, and
Gas Nuts) delivered at the Haworth Station during the
ensuing Twelve Months. Sealed Tenders, endorsed
"Gas Coal Tender," to be forwarded to me, the under-
signed, not later than the 25th inst.

No Special Form of Tender.

WILLIAM ROBERTSHAW,
Clerk to the Council.

1, Burlington Chambers,
North Street, Keighley.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite

TENDERS for the Supply of GAS COALS during
a period of Nine Months commencing the 1st of
October, 1910.

Conditions and Forms of Tender may be obtained on
Application to Mr. A. Andrew, Gas Offices, Oldham, to
whom Tenders are to be delivered not later than
Tuesday, July 26, 1910.

By order,
J. H. HALLSWORTH,
Town Clerk.

July 7, 1910.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to

receive TENDERS for the Supply of CANNEL
and Best Screened GAS COAL, to be delivered at their
Gas-Works in Lymm, for a term of Twelve Months
from the 1st day of September, 1910.

The probable Quantities required will be about 200
Tons of Cannel and about 2000 Tons of Gas Coal, which
must be freshly Wrought, well Screened, and free from
Sulphurous Pyrites and other objectionable matter;
but the Council reserve the right of increasing or de-
creasing the Quantities named.

The Person whose Tender is accepted will be re-
quired to enter into an Agreement with the Council for
the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by
Boat alongside the Works, to be sent to the undersigned
on or before the 20th of July, 1910, and endorsed "Coal
Tender."

The Council do not bind themselves to accept the
lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to
the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1910

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are

prepared to receive TENDERS for the Purchase
of the Surplus TAR and AMMONIACAL LIQUOR
made at their Gas-Works for a term of One Year from
the 1st day of September, 1910 (or for such longer term
as may be contracted for with the consent of the
Council).

Tar and Liquor will be delivered free into Contractor's
Boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before
the 20th day of July, 1910, endorsed "Tar."

The Purchaser will be required to enter into an Agree-
ment with the Council for the due performance of his
Contract.

The Council do not bind themselves to accept the
highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the
Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1910.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to

receive TENDERS for the Supply of MATERIALS
and Execution of WORK required in Connection with
New RETORT-BENCH and RETORTS.

Specification, Conditions, and all Particulars may be
obtained from Mr. W. L. Donaldson, the Council's Gas
Engineer.

The Council do not bind themselves to accept the
lowest or any Tender or Tenders.

Forms of Tender are not Supplied.

Sealed Tenders, endorsed "Tender for Extensions,"
to be delivered to me not later than the 20th of July,
1910.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1910.

STRATFORD-UPON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COAL or NUTS for delivery during Twelve Months ending Sept. 30, 1911.

Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager. Tenders to be sent in (and will be accepted only on the Forms supplied) not later than Aug. 6, 1910.

The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
Engineer and Manager.

July 2, 1910.

URBAN DISTRICT COUNCIL OF OLDBURY.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council are open to receive TENDERS for the PURCHASE of Six 15 feet square by 5 feet deep PUFFERS, with 10-inch Valves, Bye-Passes, Connections, and Travelling Lifting Apparatus, all Complete and in Good Condition, replaced by larger Plant.

Further Particulars may be had on Application to the undersigned.

The Gas Committee do not bind themselves to accept the highest or any Tender.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury,
July 4, 1910.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas Committee invite Tenders for the Supply of 22,000 Tons of Screened COAL and 2000 Tons of CANNEL up to June 30, 1911.

Tenders to be sent to the undersigned not later than July 18, next, endorsed "Tenders for Gas Coal or Cannel."

Forms of Tender and Particulars can be obtained from Mr. J. S. Naylor, Gas Engineer.

The Committee do not bind themselves to accept the lowest or any Tender.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
July 1, 1910.

BOROUGH OF ROCHDALE.
TO COLLIERY OWNERS AND OTHERS.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of 50,000 Tons of Best GAS COAL (Screened, Unscreened, or Nuts), to be delivered over a period of Twelve Months commencing Sept. 1, 1910.

Forms of Tender and any further Information may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street, Rochdale.

Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than Noon on Wednesday, July 20, 1910.

By order,
WM. HENRY HICKSON,
Town Clerk.

Town Hall, Rochdale,
July 7, 1910.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive TENDERS for the Supply of about 700 Tons of OXIDE OF IRON, suitable for Gas Purification purposes, delivered into Waggon, ex Ship Granton Harbour, free of all Charges, or in Railway Waggon (North British or Caledonian Railways) Granton Gas-Works.

Any further Information may be obtained upon Application to Mr. W. R. Herring, General Manager, No. 15, Calton Hill, Edinburgh.

Tenders to be lodged at or before Ten a.m. on Monday, the 25th day of July, 1910, sealed and endorsed "Tender for Oxide of Iron," and addressed to the undersigned.

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place,
Edinburgh, July 5, 1910.

URBAN DISTRICT COUNCIL OF WINSFORD.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the London and North Western Railway, or at the Council's Wharf on the River Weaver at Winsford.

The Material is required for a term of Twelve Months ending the 31st of August, 1911.

The probable Quantities required will be about 400 Tons of Cannel and about 2400 Tons of Gas Coal, which must be Freshly Wrought, Well Screened, and free from Sulphurous Pyrites and other objectionable Matter; but the Council reserve the right of reasonably increasing or decreasing the Quantities named.

The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of the Contract.

Sealed Tenders, stating Price per Ton delivered as above, are to be received by the undersigned on or before the 25th of July, 1910, and endorsed "Gas Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender and further Particulars may be had on Application to the Gas Manager, F. Sidwell, Winsford; or from

Jno. H. COOKE,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, July 7, 1910.

COUNTY BOROUGH OF SMETHWICK.
TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for the Supply of about 30,000 Tons of GAS COAL and NUTS and 1000 Tons of CANNEL.

Form of Tender and further Information may be obtained of the undersigned.

Sealed Tenders, endorsed and addressed to the Chairman of the Gas Committee, Council House, Smethwick, to be sent in not later than the 22nd inst.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Council House,
Smethwick.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the Supply of the whole or part of 4500 Tons of Best Screened GAS COAL and NUTS, to be delivered during the Year ending June 30, 1911, at the London and North Western or Midland Railways Station, Market Harborough.

Conditions and Form of Tender may be obtained from the undersigned, to whom Sealed Tenders, endorsed "Tenders for Gas Coal," must be delivered not later than Saturday, the 23rd inst.

The lowest or any Tender not necessarily accepted.

ALFRED T. HARRIS,
Manager and Secretary.

Gas Offices, St. Mary's Road,
Market Harborough, July 8, 1910.

URBAN DISTRICT COUNCIL OF LEIGH-ON-SEA.
(GAS DEPARTMENT.)

THE above Council invite Tenders for the Supply and Delivery of a NEW STATION GOVERNOR of approved Modern Type for the Regulation of Gas Supply to the District.

The Governor is to be capable of passing 50,000 Cubic Feet per Hour under a 2½-inch pressure, and is to be complete with suitable connections for working in conjunction with 12-inch Mains.

ALTERNATIVE TENDERS are invited for the Supply and Delivery of a Second-Hand STATION GOVERNOR of similar capacity with the like Connections.

The Governor must be in thorough working order; and a guarantee will be required.

Sealed Tenders, marked "Tender for Governor," must be sent so as to reach me, the undersigned, not later than Twelve o'clock on Wednesday, the 20th day of July, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

Dated this 8th day of July, 1910.

W. CARLYLE CROASDELL,
Clerk to the Council.

Council Offices, Leigh-on-Sea.

GAS-WORKS, FREEHOLD LAND, AND COTTAGES AT TARPORLEY, CHESHIRE.
FOR SALE BY TENDER

THE Tarporley Gaslight and Coke Company, Limited, all that Freehold plot of Land situate at Tarporley, in the County of Chester, together with the Gas-Works erected thereon and known as

THE TARPORLEY GAS-WORKS, and also as a Going Concern, the Business carried on by the said Company as from the 30th day of September, 1910, with the DISTRIBUTING PLANT including MAINS, SERVICES, METERS, COOKERS, and such of the CONSUMERS' FITTINGS as are the property of the Company; and also the benefit of all Pending Contracts and Engagements entered into by the Company.

And also all those FOUR FREEHOLD COTTAGES adjoining situate and numbered 3, 5, 9, and 11, Eaton Road, Tarporley, aforesaid. Gross rentals £34 9s. per Annum.

Tenders to be sent, under cover and sealed, to the Vendors' Solicitors, on or before the 2nd day of August, 1910.

The Vendors do not bind themselves to accept the highest or any Tender.

Forms of Tender and of the Conditions upon which such Tender is received and further Particulars may be obtained at the Offices of the said Company, Eaton Road, Tarporley, or Messrs. THOS. SMITHURST & Co., Chartered Accountants, 26, Pall Mall, MANCHESTER, or Messrs. RICHARD HIGHAM and Co., Vendors' Solicitors, 49, Princess Street, MANCHESTER.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

PATENT.

THE Proprietor of the British Patent No. 10,616/05 for "IMPROVEMENTS IN MEANS FOR GENERATING AND USING HYDRO-CARBON VAPOURS FOR HEATING AND LIGHTING PURPOSES" desires to sell his Patent or to Grant Licences thereof.

All Communications should be addressed, in the first instance, to L. DUVINAGE, Patent Agent, 10, Avenue des Nerviens, BRUSSELS.

NEWBATTLE CANNEL.

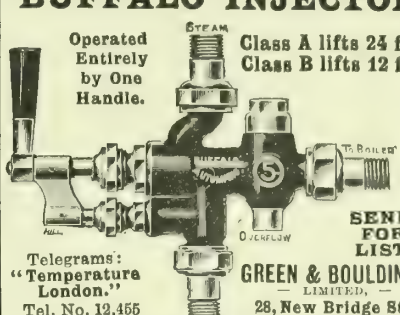
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

'BUFFALO' INJECTOR

Operated Entirely by One Handle.

Class A lifts 24 ft.
Class B lifts 12 ft.



SEND FOR LIST.

Telegrams: "Temperature London."
Tel. No. 12,455 Central.

GREEN & BOULDING,
LIMITED,
28, New Bridge St.,
LONDON, E.C.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of

FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

MIDLAND ENAMELLING CO.,
Manufacturers of
DIALS (Enamelled)
For Gas, Water, Electric, &c., Meters.
DIALS
For Pressure Scales in One Length up to 4 feet.
DIALS

For Clocks, Barometers, Thermometer Indicators, and for every purpose.

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Telephone: "Northern 250." Telegraphic Address: "ENAMELLING BIRMINGHAM."

TROTTER, HAINES, & CORBETT,
BRETTLELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

THOMAS TURTON
AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

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90, CANNON STREET, E.C.

MODERN METHODS OF
SAVING LABOUR IN GAS-WORKS

(With Sixty Illustrations),

By C. E. BRACKENBURY, Assoc.M.Inst.C.E.,
Barrister-at-Law.

PRICE 3s. 6d. NET.

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ARTESIAN BORED TUBE WELLS,

Norton's Patent "Abyssinian" Tube Wells.
Deep Well Pumps and Patent Air Lift Pumps.

LE GRAND & SUTCLIFF,
Artesian Well and Waterworks Engineers,
MACDALA WORKS, 125, BUNHILL ROW, LONDON, E.C.

Special Pressure and
Pressure & Exhaust Registers.



For RETORT-HOUSE GOVERNORS.
For EXHAUSTER HOUSES.
For OFFICES AND DISTRICTS.

Fuller particulars on application to—

T. G. MARSH,
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RETORTS

Of our Manufacture

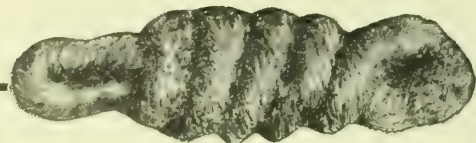
STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not
readily split and fracture but retain apparent
wholeness after a long period of work.

Top Quality FIRE-BRICKS, QUARRIES, &c.

High Grade Silica Bricks and Blocks for Com-
bustion Chambers and Special Work.

WILLIAMSON, CLIFF, LTD., STAMFORD.



LEAD WOOL

Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way
through.
Lead Wool requires no melting and can be used in
water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead
Joints and cost 33½ per cent. less.

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

Telegrams: "STRENGTH, SNODLAND." Telephone 199 SNODLAND.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants,
Retort Furnaces,

Furnaces for Chamber Settings **New Coke Ovens**
(Patent), (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia
Works, and Cyanogen Extraction Plants.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, it occasionally cleaned with warm water, will not become discoloured.

LAMPS.

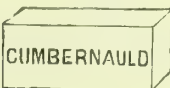
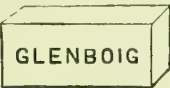
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices. The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c. &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.
THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.
23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.



Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.

Highest Award wherever exhibited.

METROPOLITAN GAS METERS, LIMITED,

SOLE MAKERS AND LICENSEES OF THE

"Simplex" AUTOMATIC GAS LIGHTER AND EXTINGUISHER.

Some of its Special Advantages are:

1. It is instantaneous in Lighting and Extinguishing without shock to Mantle, and can be set to its pre-determined times in a few seconds.
2. The Mechanism will act correctly, even though the Lamp-post and Controller be out of the perpendicular.
3. **THE VALVE.**—As this never leaves its seat, and the gasways being away from the seating, no impurities can collect between the valve and the seating, and by simply removing a small cap, the gasways can be freed of Naphthalene or any other matter.
4. The leakage of gas into the Clock Mechanism and its resultant troubles are entirely done away with.
5. Vibration of any description will not cause the Mechanism to operate prematurely.
6. The "Simplex" Clock also has the advantage of a Lever Escapement.

PRICES AND PARTICULARS ON APPLICATION.

OFFICES AND WORKS AT

Hyson Green, Nottingham.

Telegraphic Address:
"Gasometer Nottingham."

Telephone:
204X Nottingham.

LONDON DEPOT:

Malt Street, Old Kent Road, S.E.

Telegraphic Address:
"Gasometer London."

Telephone:
2044 Hop.

Workmanship and Materials
of the Highest
Quality.

PECKETT'S LOCOMOTIVES.

PECKETT & SONS,
ATLAS LOCOMOTIVE WORKS, BRISTOL.

Built to any
Specification or Gauge.

THE WIGAN COAL & IRON CO., LIM^{TD.}

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address:
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The Outcome of a Practical Gas Engineer's Life Experience.

THE CENTENARY PETROL GAS TURBINE GENERATOR.

FOR
Lighting, Cooking, Heating

FOR
Villages,
Mansions,
Farm Steadings,
Churches, Schools,
Railway Stations,
County Lighting Districts.

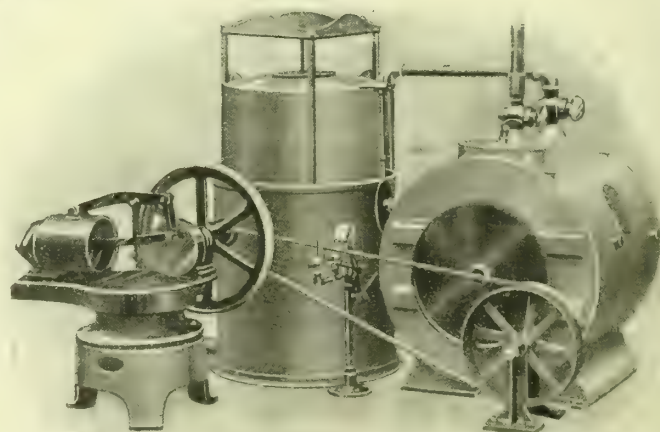
Plants from 100 cub. ft. per hour up to
50,000 cub. ft. per hour for Gas Works.

THE CENTENARY GAS CO. (Dept. M.)

WILLIAM KEY, Engineer.

109, HOPE STREET,
GLASGOW.

11, QUEEN VICTORIA STREET,
LONDON.



NON-EXPLOSIVE and ECONOMICAL.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

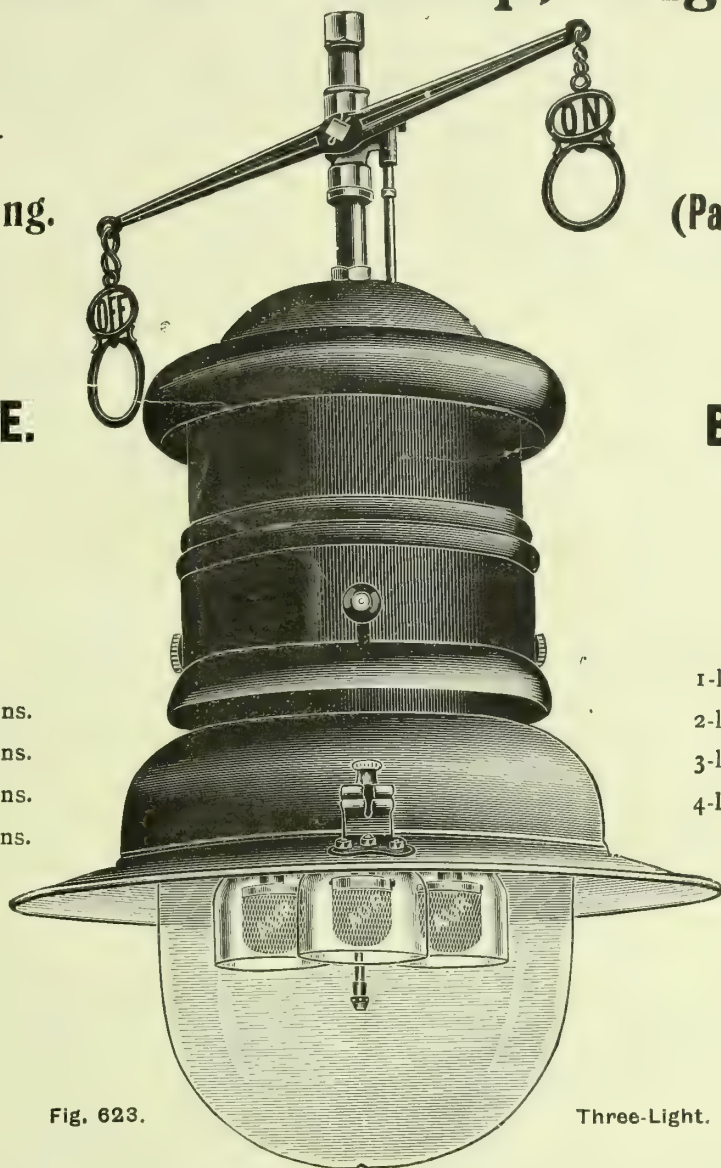


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

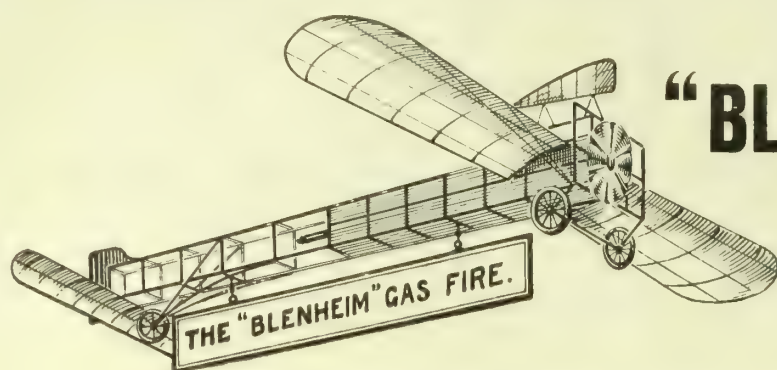
	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains . . .	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON."

Telephone 2410 NORTH.



EDGAR'S "BLENHEIM" GAS FIRE

NOT winning
GOLD CASKETS

but

GOLD MEDALS

and

what is more valuable

GOLDEN OPINIONS EVERYWHERE.

Do you want

GAS

LAMPS, FIRES, RADIATORS, GEYSERS,
FITTINGS, GREENHOUSE HEATERS,
FLASHING SIGNS, &c., &c.?

You do!! Well, I can Supply you.

WRITE, WIRE, OR 'PHONE ME—

W. EDGAR,

BLENHEIM WORKS, HAMMERSMITH, W.

Telephone:
14 HAMMERSMITH.

Telegram:
"GASOSO LONDON."

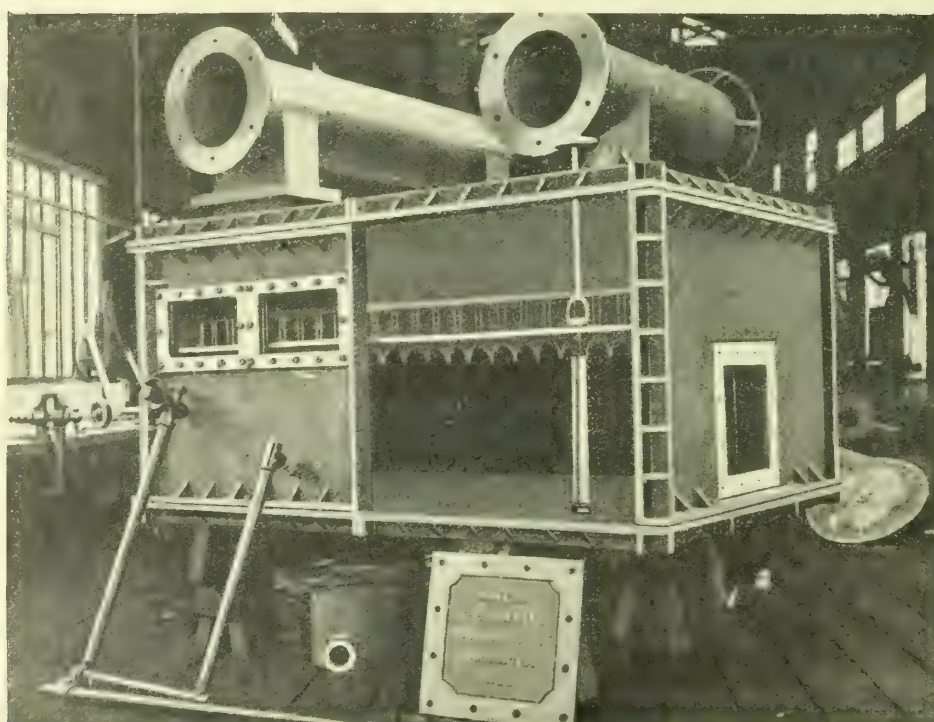
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Works: DARLINGTON.

Gasholders.

Condensers.

Purifiers.



Washer-
Scrubbers.

Steel Tanks.

Cast-Iron
Tanks.

Livesey Washer, in course of construction in our Works.

London Office: 106, CANNON STREET E.C.

LEECH, GOODALL & Co.,

Works—LEEDS.

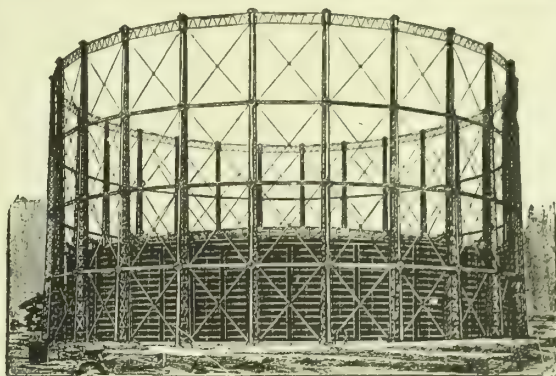
CONVEYING PLANTS,
ROOFS, BUNKERS,
STEEL STRUCTURAL WORK,
ETC.

RETORT INSTALLATIONS
ON THE
HORIZONTAL, INCLINED, or
"DESSAU" VERTICAL
SYSTEMS.

Telegrams:
"VERTICAL LEEDS."

Telephone:
1982 LEEDS.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.



Triple Lift Gasholder, 212 ft. 6 in. diameter by 45 feet. Lifts, erected at Garston, Liverpool.

Manufacturers
and
Erectors of

GASHOLDERS.
GAS PLANTS.
STEEL PIPES.
STEEL TANKS.
CONSTRUCTIONAL STEEL
WORK.

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANTS.

Aggregate capacity of Plant supplied
233,000,000 cubic feet daily.

"RAPID" MANUAL AND POWER CHARGING MACHINES.

SIMPLE AND INEXPENSIVE.



"RAPID" MANUAL CHARGER AND SCOOP CARRIAGE WORKING AT
BRENTWOOD GAS-WORKS, ESSEX.

INCREASED
YIELD OF GAS
and
REDUCTION
OF FUEL
CONSUMPTION.

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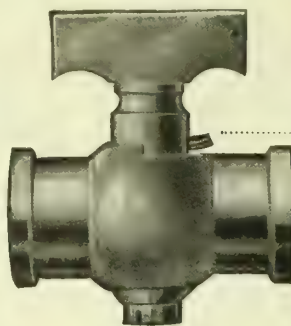


FIG. 1. The Old Style with the Old Trouble. Note the Pin A.

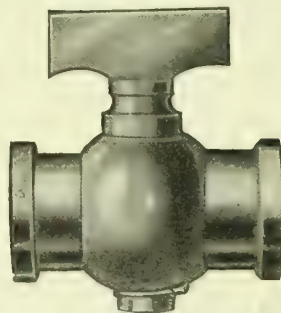


FIG. 2. Evered's Patent "Safety Stop." No Pin. No trouble.

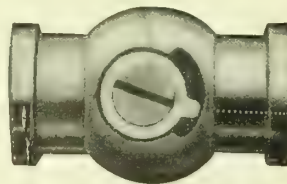


FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

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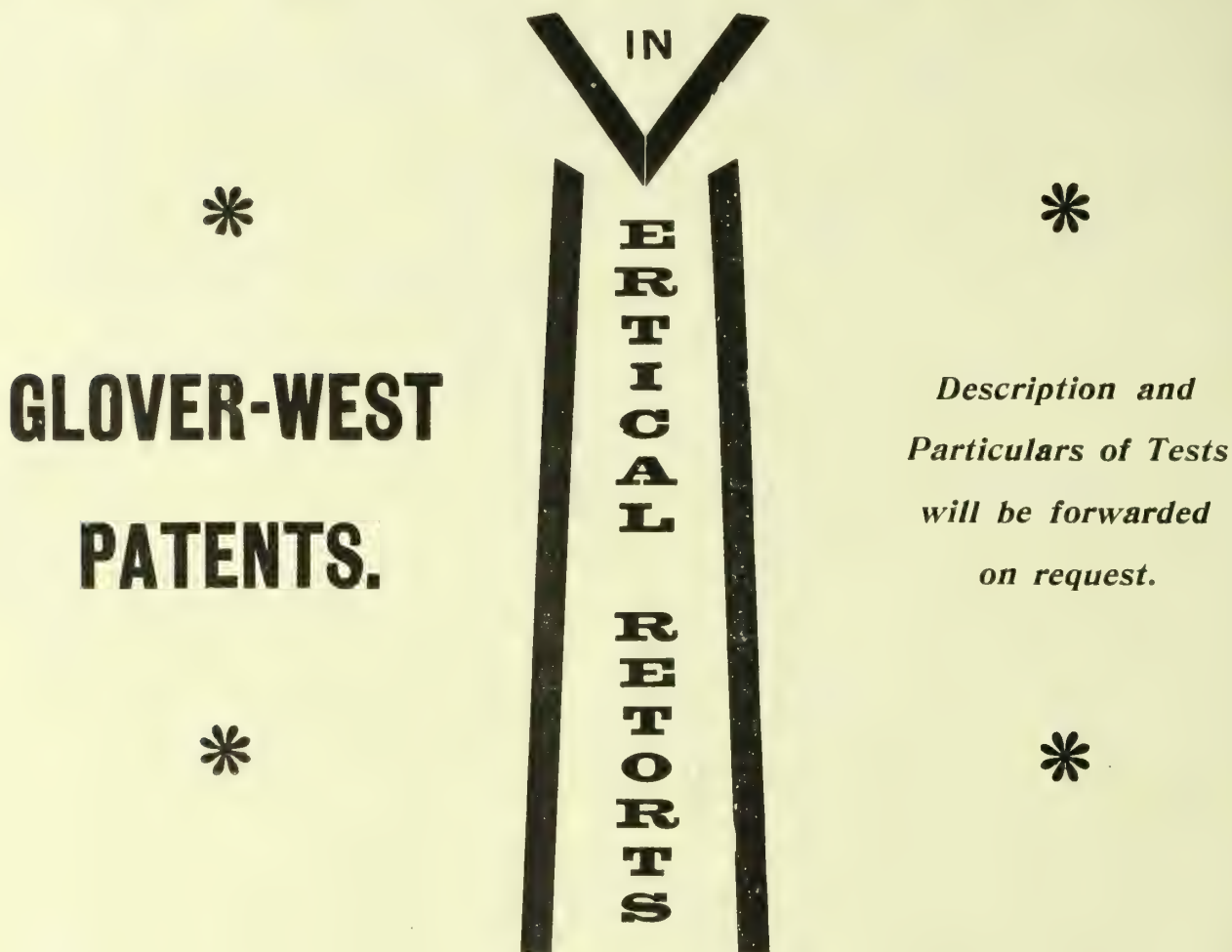
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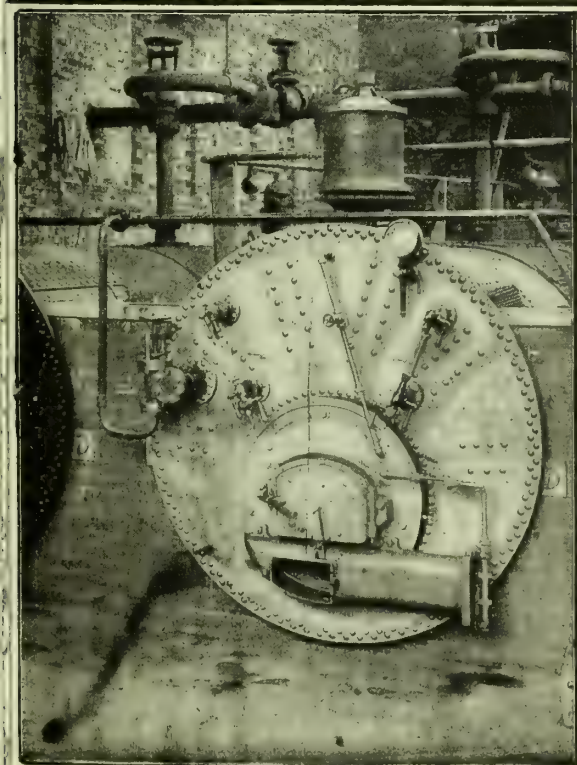
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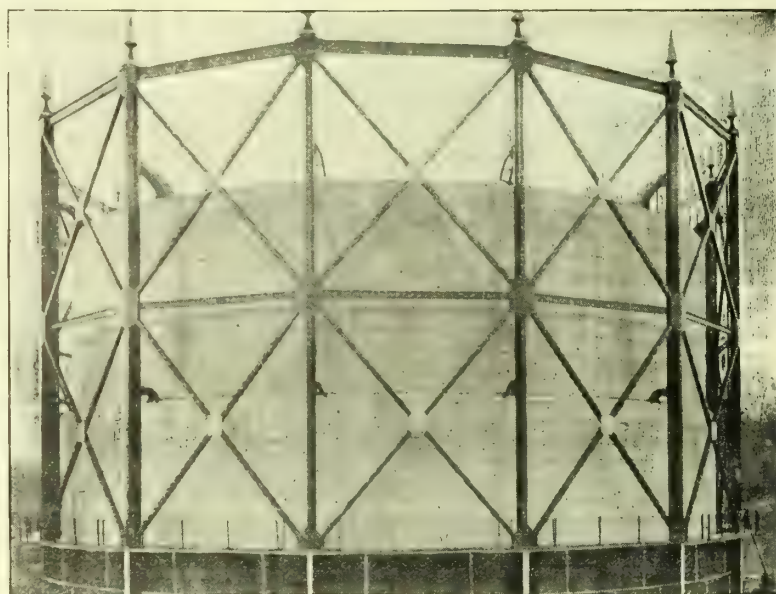
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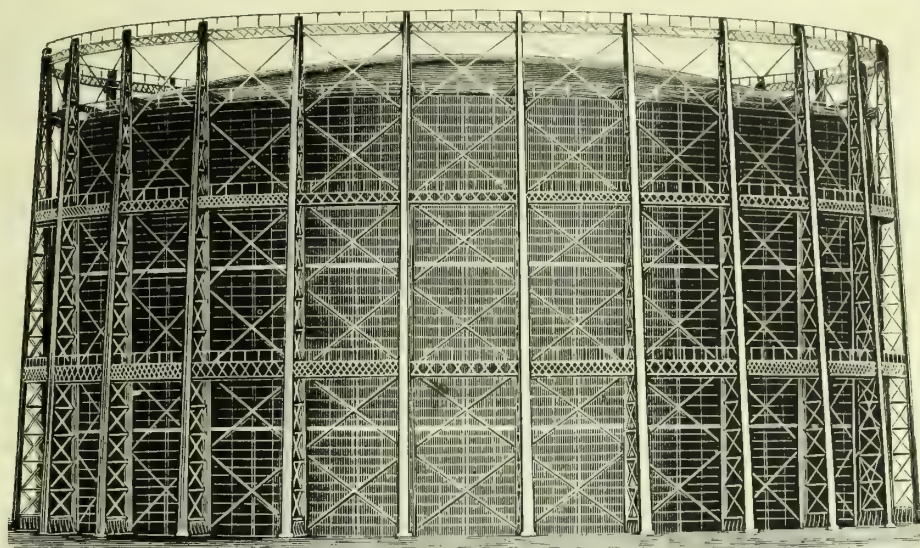
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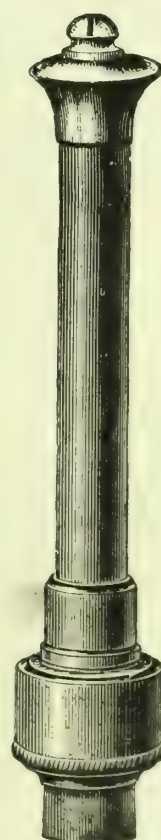
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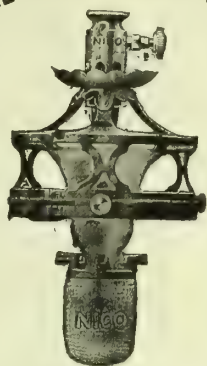
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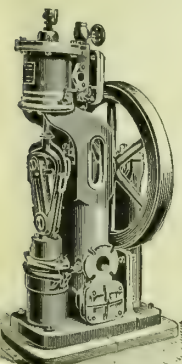


Fig. 709. "SINGLE RAM"
STEAM-PUMP.

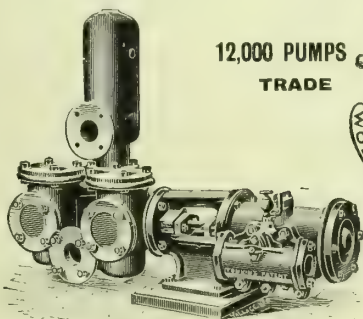


Fig. 598. "CORNISH" STEAM-PUMP FOR
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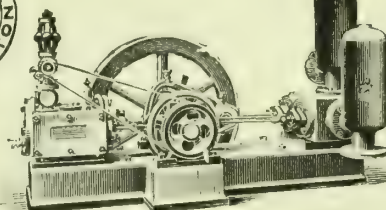


Fig. 685. "RELIABLE" STEAM PUMP FOR
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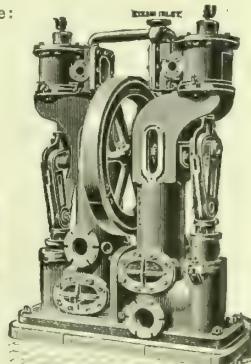


Fig. 712. "DOUBLE-RAM"
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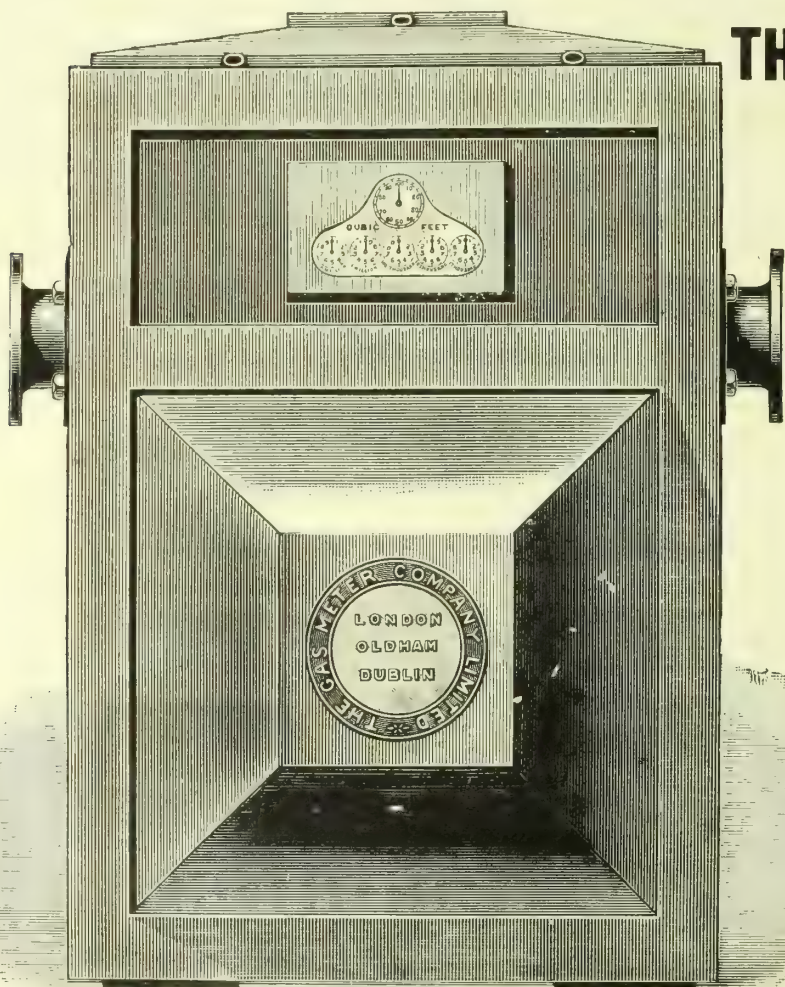
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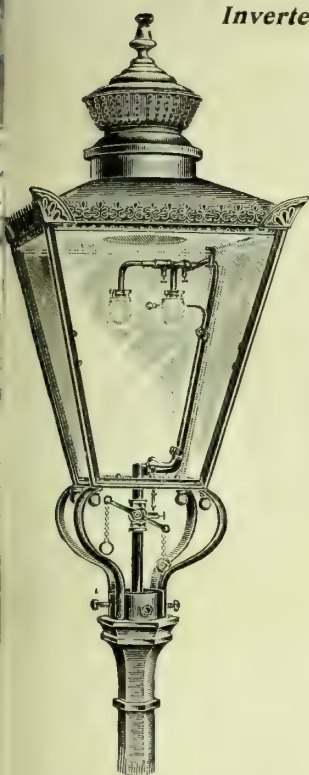
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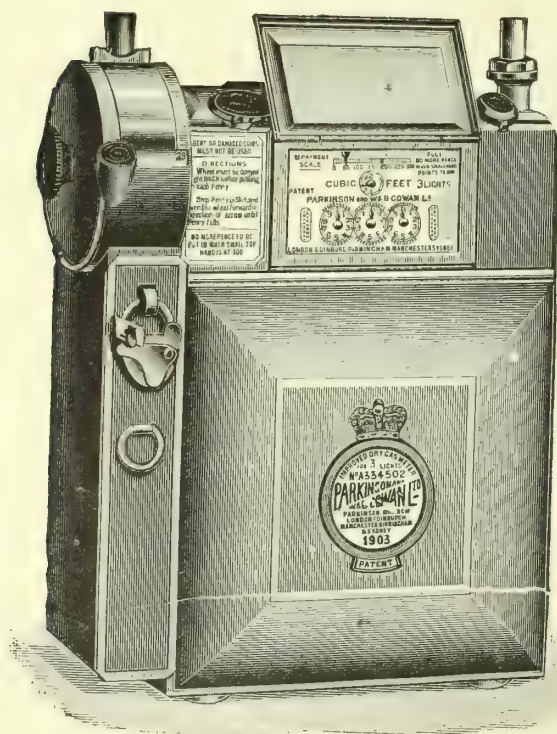
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EDITORIAL NOTES—GAS, &c.

Victory of the New Standard Burner.

THE back of all opposition to the application of the "Metropolitan" No. 2 burner for the testing of gas has been broken by the sweeping and unanimous decision, in favour of the Standard Burner Bills Nos. 1, 2, and 3, of the Committee over whom Sir Henry Kimber has been so ably presiding—a decision that has only been arrived at after a most patient and impartial hearing of all parties, after a critical examination of all contention, and after the application of a broad commonsense to the interpretation of parliamentary intention, and to the determination of the practical issues involved. In the course of the case, the Chairman asked that credit might be given to the Committee for attempting to understand the questions surrounding the change of test-burner; and the decision indeed reflects and concentrates the complete success of the Committee's endeavour to grasp the truth from the complex mass of testimony presented to them. The Chairman did not satisfy himself with merely a formal announcement as to the conclusion at which the Committee had arrived; he gave sound, logical reason for their determinations. And in the comparatively few sentences comprising the decision, there is an inestimable weight of value to the gas industry—a value immensely greater than that of the hundreds of printed pages composing the minutes of evidence and counsel's speeches. After the time expended by both Houses this session upon the question, after the unqualified verdict in favour of the new burner by the House of Lords, and after the judgment of Sir Henry Kimber's Committee with the statement of motives for not imposing any special terms on the change of burner, any hope that future opponents may harbour—if there should be any more (which we much doubt)—of defeating the application of the "Metropolitan" No. 2, or of securing concession as the result of its application, will indeed be built on quicksand. The result has shown that those local authorities who regarded as irrevocable the repeated declarations of Parliament and the Board of Trade regarding the new burner were as wise as the others were foolish—foolish in not accepting the clearly expressed and oft-confirmed parliamentary policy in this matter, and foolish in making a fresh effort to place obstruction in the path of the progress of the gas industry.

The alternative requests of the opponents were the retention of the present test-burners, on the ground that any change would inflict some financial disadvantage upon the consumers of gas; or, in the event of the change of burner being granted, the raising of the nominal candle power, or the bestowal upon the consumers of some definite monetary consideration (through the reduction of standard price or other means) as compensation for the hypothetical losses they would sustain—losses that have not been discovered in practice wherever the new burner has been applied during the past five years or so. As to the retention of existing standards, the opponents' contention was for the perpetuation of a defective burner so as to secure inflated candles, instead of an alteration to an accurate burner giving normal candles. The proposal as to the raising of the nominal candle power was so quixotic that the technical witnesses for the opposition had little (or we think it would be more correct to say "nothing") to urge on the subject, leaving the fantastic idea to be borne solely by counsel. And as to the question of compensation, the Committee's views followed very much the lines of argument time and again presented in these columns. Parliament has never recognized any finality in the test-burner; but Parliament has acknowledged the right of gas suppliers to the substitution by greater perfection of proved defect in the test-burner, and that without even hinting at any special financial consideration accompanying the change.

Let us quote what Sir Henry (in the words we trace

the large legal and commercial training of his mind) had to say, on behalf of the Committee, upon these particular and cardinal points: "The burners hitherto in use have been defective. The burner proposed to be established as the standard burner is, if not perfect, yet as perfect as is at present known for achieving the object of Parliament in giving what Parliament certainly intended to give—that is, a light equal to the light of so many candles." Then as to the contention that the consumers ought to be compensated, the Committee, said Sir Henry, "are unanimously unable to see that, and to recognize that the fact of the burner, which was supposed to be perfect, and has been found to be imperfect—having perhaps done a wrong to somebody in practice—gives any right to compensation further than the legislation applicable to gas companies will automatically give." In addition to which, there is the cheapness insisted upon by exceeding active competition. Even in respect of the Mersey Docks and Harbour Board, who are extensive customers of the Liverpool United Gas Company, the Committee considered the fears of that body would, in practice, be found to be exaggerated, and that any loss and inconvenience they may sustain will be practically compensated by the reduction of price which may be expected from the Company. And so the whole of the opposed Companies—including the Liverpool Company—have obtained, if the Bills now go through the third reading without further challenge (we hardly think that any additional molestation is likely after what happened on second reading, and after the exhaustive inquiry in the Committee rooms), the new test-burner, and what is of no small importance unconditionally. It is a great and an important win for the gas industry—an industry that requires in these competitive times more freedom; and there will be throughout, save in perhaps two places, considerable satisfaction over it. There were some who thought the Liverpool Gas Company would not get through unscathed; there were others who were of the converse opinion. We were among the latter; for if there was a Company who had a right to the removal of defect by something of greater perfection, it was the Company with a high-grade gas and a flat-flame burner as a standard. Between this Company and the others, if there had been any need for discrimination, it should certainly have been in favour of the former.

The fight this session for the standard burner has been a big one—well fought by the promoters, and tenaciously by the opponents. But the latter suffered from many weaknesses, not the least of which was that the constituents of their case absolutely declined to synthesize. They were claimants, too, for the righting of some hypothetical injustice to the consumers, but professed to be wholly oblivious to any grounds on which the claims rested for the rectification of an existing positive injustice to gas suppliers. But it is all at an end; and we anticipate that the Bills will now move forward formally to the Royal Assent. The fight, however, that has taken place will leave behind something more than the right on the part of a number of gas companies to a change of test-burner. Sir Henry Kimber is of opinion that it will form an important step towards the revision of general legislation referring to gas undertakings. We think he is right. It cannot, for instance, be many years before the question of a standard calorific test comes prominently to the front in substitution for the standard illuminating power one. There was an attempt on the consideration of clauses to get a calorific power test inserted in the Bills; but the Committee were immovable in their view that such a test was not germane to the measures before them. Clauses brought up by certain local authorities (who happen to be electricity suppliers) sought to impose upon the companies additional burdens; but the attempt met with its desert of ignominious failure. If the prognostication of the Chairman should prove to be true, as to the revision of general legislation relating to gas undertakings, it must, as an indispensable condition, be prefaced by an inquiry by a competent Committee, when it should also be considered

whether local bodies who are competitors in business are proper controlling authorities, and fit and unprejudiced representatives of the public, in relation to private gas enterprise. We have a growing feeling that they are not; and their attitude over the standard burner question has not done anything to temper that feeling.

Interaction of Methane and Ammonia in the Presence of Carbon.

THE recently published annual report of the Chief Alkali Inspector, to some portions of which reference was made last week, contains a further instalment of the "Studies in 'Coal Carbonization'" carried out by Mr. Forbes Carpenter and Mr. Linder, dealing more especially with the interaction of methane and ammonia in presence of carbon. The results are of great interest; and these are published at length in another part of the present issue of the "JOURNAL." It is a matter for congratulation that, contrary to his expectation when writing the 1908 report, Mr. Carpenter has been able to make opportunity for the continuation of the work; and much gratitude to him for this further contribution will be felt by all concerned in carbonization. We may perhaps express the hope that although, owing to his retirement, no further Alkali Act reports will come from Mr. Carpenter's pen, he may still be able to continue his researches.

It will be remembered that this particular investigation had its origin in the somewhat unexpected observation that, in the Woodall-Duckham continuous vertical retort, the yield of hydrocyanic acid is much higher than is the case with the Bueb intermittent vertical retort, and is approximately the same as that observed with high temperature carbonization in horizontal retorts. This has since been confirmed by tests made with the Glover-West continuous retorts. The suggestion was offered to Mr. Carpenter that the increased yield of hydrocyanic acid in the continuous retort might be due possibly to the action of ammonia on methane, as well as on incandescent carbon, and the investigation was carried out with the object of ascertaining how far this supposition could be supported by experimental evidence. The method adopted was to pass coal gas freed from all hydrocarbons but methane, mixed with varying quantities of ammonia, through a heated tube containing either broken porcelain or wood charcoal, under varying conditions of temperature, and at different rates of flow, and determine in this way the amounts of ammonia respectively decomposed into its elements, converted into hydrocyanic acid, and left unchanged. In the first series of tests, described in the previous report, the relative amounts of methane respectively decomposed into its elements, oxidized to carbon monoxide and carbon dioxide, and left unchanged, were also determined. In the experiments described in the present report, no further tests have been made with porcelain, as the first series showed that this material effects considerable oxidation of the hydrocarbons, ammonia, and hydrocyanic acid at temperatures above 800° C. Determination of the fate of the methane had also to be omitted from lack of time.

In the limits of a short review, it is impossible to deal with all the important observations here made; but, broadly speaking, the experimental results lead to the conclusion that the hydrocyanic acid found in crude coal gas obtained under ordinary gas-works conditions is mainly the product of a reversible reaction between the ammonia and the incandescent carbon, but that secondary reactions occur in which both ammonia and hydrocyanic acid are decomposed into their elements. Even the last-named reactions appear to be reversible to some extent, as certain of the experiments showed a small but distinct increase in the amounts of ammonia and hydrocyanic acid, due apparently to the synthesis of these bodies from their elements. Hydrocyanic acid, however, when once formed, appears to undergo only slight decomposition at temperatures below 1000° C., whereas ammonia undergoes rapid dissociation at much lower temperatures. It was further found that the presence of methane is favourable, though not essential, to a high production of hydrocyanic acid. But as the hydrocarbon yields carbon at temperatures below 755° C., and hydrocyanic acid does not appear until a higher temperature than this, it is doubtful whether the increased yield is due to a direct interaction of the ammonia and methane, or to the action of the former on the freshly-formed carbon due to the thermal decomposition of the methane. Experiments made with addition of ethylene to the gas showed that this hydrocarbon was still more favourable to the production of hydrocyanic acid. Both

methane and ethylene also lessen the amount of ammonia decomposed into its elements; this being probably due to the dilution brought about by the decomposition of these gases—the amount of hydrogen formed from them being greater than that of the original hydrocarbon. Another interesting observation is that the activity of the wood charcoal decreases with use, owing apparently to the surface becoming coated with a film of graphitic carbon from the decomposition of the methane, the catalytic action of which is more sluggish than that of the wood charcoal, and it is most probably this form of carbon which is present in the coke in the retorts during carbonization.

Messrs. Carpenter and Linder fully realize that it is not permissible to assume that, in the actual carbonization of the coal in retorts and ovens, the reactions necessarily proceed in the same manner as in their experiments; the conditions in many respects being very different. Probably the continuous vertical retorts present the nearest approach to their experimental conditions; but even here great differences exist, notably in the variation of temperature at different zones in the retort, and also in the presence of many other substances such as tar vapours and the steam formed from the combined oxygen of the coal. The ammonia itself may be produced in many ways—such as by the action of nascent hydrogen, the direct thermal decomposition of the nitrogenous substances, and even by the action of steam or hydrogen on the hydrocyanic acid. And, in addition to the formation of the latter as a secondary product from the ammonia, it may possibly also be produced by the direct thermal decomposition of the nitrogenous substances of the coal at relatively low temperatures. Indeed, it seems difficult to account in any other way for the presence of hydrocyanic acid in the ammoniacal liquor obtained from coalite gas, as here the temperature to which the coal is subjected is stated never to exceed 850° Fahr. or 454° C., and the lower temperature limit of its production by the interaction of ammonia and carbon or hydrocarbons is found by Messrs. Carpenter and Linder to be more than 250° C. above this temperature.

Standardization by Individual Gas Undertakings.

STANDARDIZATION has its uses and its abuses. There is a point in it up to which there is an accretion of economy, convenience, and efficiency; but beyond that point there may be a wasting away of advantages to the complete vanishing point. We are afraid there are gas undertakings that are going beyond really prudent bounds in standardization at the present time in connection with stoves, and that, by setting up individual standards for apparatus of their own, are working not only against their own interests, but against those of the gas industry generally. We have advocated and commended all work on the part of stove manufacturers that has had for its object the standardization of their own parts, in order to effect interchangeability between one gas-stove and another (equal in size) of their make, with the object of reducing the number of parts to be kept in stock by gas undertakings, and so make maintenance a matter of greater economy. There are not many makers of gas-stoves in the gas industry; and standardization by them individually is an important step towards realizing the economy and conveniences that are growing more and more desirable with the large expansion of the gas cooking and heating business. But what is now being done—true to only a limited extent at present—by gas undertakings is over-riding the limits of practicability and common advantage.

The interests of the gas suppliers and of the gas-stove makers are reciprocal. To both, it is a matter of importance that gas-heating appliances should, consistently with efficiency, quality, and appearance, be as cheap as possible; and that the cost of upkeep should be as low as possible. But when, in working to this latter end, uniformity of type is reduced to special standardization for single gas undertakings, then we cannot help feeling this is going beyond requirement, and is in fact unwise, and that the inevitable result will be the defeat of the desired ends. The adoption of distinctive types by individual gas undertakings cannot be an economical procedure in production either for them or for the gas industry generally. The objections to such a course are several; and they are dealt with in an article elsewhere, as it is important that, at the incipient stages of a disposition on the part of gas undertakings to individualize their own gas apparatus, the matter should be thoroughly discussed and considered in all its practical bearings, in the very interests—those of economy, of convenience, and

of efficiency—that a prudent degree of standardization is well designed to, and will, serve.

But there is a point for the consideration of the manufacturers here. No doubt the comparatively new tendency has had its origin in the difficulty experienced by gas undertakings in, by distributing their patronage among several firms of stove manufacturers, having to stock the parts of each maker for maintenance purposes; and it is a point for the consideration of the stove manufacturers whether in the growing desire for interchangeability by gas undertakings to effect economy, the tendency will not be to (as an alternative to individual standardization by the latter) individual patronage and long contracts, although the objection to this would be that it would largely rule-out the benefits to the gas concerns of competition. On the other hand, we cannot expect, and should not advise (subject to change of view on further argument), any effort being made to bring about standardization and interchangeability as between maker and maker, as such a proceeding would only be obstructive to individual endeavour on the part of firms, and therefore to development of the various essential qualities of a gas cooking or heating stove. For these purposes, it is necessary there should be an open field, and not one hedged in by the rigid limitations of a universal standardization. We ask gas undertakings not to do anything towards contributing to a condition of things that must circumscribe effort and energy and discourage advance, so long as the individual manufacturers work within their own spheres to meet, by interchangeability in their own makes of similar order, the other requirement of economical maintenance.

Rooted Prejudice—A Protest.

WE must protest against the narrow manner in which the inspectors under the Factory and Workshops Acts pursue their duties in regard to the lighting, warming, and ventilating arrangements of the places under their jurisdiction. They seem to be possessed of the one idea that gas is a noxious thing that must be year after year abused, condemned, and got rid of at any cost. We find this all too prevalent spirit once again in the report for 1909 (reviewed recently); and we feel constrained to write in a way that we should not otherwise do in view of the persistence of the attacks that are made, notwithstanding that there is not any definite proof in the report (though we may admit fully the crude conditions under which gas is all too frequently found to be used in factories and workrooms) of any impairment of health or deaths traceable to the particular evils so strongly and so repeatedly emphasized. It seems to be altogether beyond the grasp of some of the inspectors that it is to the misapplication of gas and not to gas itself that they should direct their attention and influences. There is not the slightest reason why gas should not in factories and workshops be applied in a manner—a manner claiming only the consideration of elementary principles, and not the complex and highly technical requirements of electricity—that will be just as free from evil consequences as gas for lighting, heating, and cooking in the home. In gas, the manufacturer has a practical, economical, and convenient means of lighting, of heating in his processes, and of warming for the comfort of his operatives; and all that is wanted in the application of this article of composite utility to the manufacturer is the combination of common-sense. And it is to the securing of this combination that all the inspectors of factories and workshops should alone direct their energies, and not to—consciously or otherwise—doing the gas-supply industry an injustice and an injury in the way they are now doing, to the benefit of a competing industry, which is not slow to take advantage of official reports to the furtherance of their own commercial ends.

We believe that instances are not unknown where there have been recommendations on the part of inspectors for the displacement of gas by the adoption of electricity, when it has happened that the carbonic acid contents of the air of a workroom has been found to have risen a few parts in 10,000—we repeat, in 10,000!—above the limit set as the permissible standard by the department, while the economical change from flat-flame gas-burners to incandescent ones, and an insistence on adequate ventilation (the use of which should not be left to the capricious notions of the workpeople themselves), would have produced the remedy. Certain of the inspectors appear to be animated by the idea that they have only to get rid of one source of carbonic acid (which is relatively unimportant with modern systems of gas

lighting), and there will be a complete change. They apparently lose sight of the fact that where there are human beings congregated, as in workrooms of factories, there is another source of carbonic acid, combined with the organic products of respiration, that is far more dangerous to health; and that the substitution of electricity for gas will not produce an improvement in this direction, but will rather accentuate the noxious effects by the removal of gas, unless an efficient means of exhaust ventilation be introduced and kept in proper order. And if this be introduced, then the heat generated by incandescent gas-burners should be—nay, would be—an aid to the system of ventilation rather than otherwise. Probably the inspectors know as well as we do that 1 cubic foot of gas on combustion only yields 0.5 cubic foot of carbonic acid, while a human being gives off about 0.6 cubic foot per hour. Perhaps they will hardly want reminding that Dr. Pettenkofer found that pure carbonic acid in the proportion of 100 parts per 10,000 of air was not injurious to human beings; while 10 parts of carbonic acid, if derived from the respiration or perspiration of human beings, rendered the air unfit for persons to remain in for any length of time. Perhaps, too, they will remember that Dr. Whitelegge himself has stated that, “where carbonic acid gas is present in excess, it is ‘important merely as an index of the amount of injurious ‘organic impurity contributed by human exhalations.’” The inspectors, if they only think over the matter, must see that, if it requires 7 or 8 cubic feet of gas to produce by flat-flame burners the illuminating power that 1 cubic foot will produce now in a modern inverted burner, they have a ready means of showing factory owners how easily they can bring about improvement in the conditions of their operatives and economy for themselves. In the report last year, there was acknowledgment of improved conditions through such substitution.

So far as the work of the inspectors goes in operating against the general use of flat-flame burners in workrooms and factories, in substituting incandescent gas-burners, and in securing proper ventilation of all warming arrangements using gas, and of the gas-heating devices for tools, &c., we are entirely with them. The present report states, regarding the conditions of the atmosphere, that “better results ‘compared with previous years are noted;’” this being due entirely to improved ventilation. It is distinctly shown that where the ventilation is efficient, there is not an excessive amount of carbonic acid in the atmosphere; and there cannot be where there is a constant change of the air proceeding. The Inspector for Dundee indicates how necessary it is for the ventilation to be maintained in efficient order. In his district, in every case where an excess of carbonic acid was found in factories, a second test proved that the means of ventilation were adequate, but out of order, owing to obstruction in shafts and boxes when the first samples were taken. With the dust and material floating about in the air of most factories, there must be accumulations that choke and so enfeeble the provision for ventilation. But this should not be utilized to the disadvantage of gas. All the efforts of the inspectors in producing and maintaining efficient ventilation, and in securing the application of improvements are to be applauded; but we would ask them not to let any repugnance that has had birth through antiquation and crude method be carried to the length of obstructing in their minds a proper recognition of scientific progress. Prejudice born of old conditions can be excessively blind to new conditions. But it is no part of the duty of public officials whose functions are inspective, advisory, and controlling, and whose services are admittedly desirable and necessary, and of great advantage in many ways, to conduct them in a manner that is unwarranted, and is detrimental to an industry that has an enormous stake in the country. Against this attitude we here protest in the name of statutorily controlled gas industry; and we hope the protest will not go unheeded.

So far as suction and producer gases generally are concerned, they are altogether unidentified with the town-gas industry, and private plants are not subjected to control with regard to purity. The record of such plants, we are afraid, is doing no good to the town-gas industry, so far as factories and workshops are concerned. It is, however, a satisfaction to find that, in respect of the use of town gas in factories and workshops, there has not to be reported the accidents and fatalities that are set against electricity in the report of Mr. Scott Ram, as noticed last week in “Electricity Supply Memoranda.”

Paving the Way in Canada.

THE gas men of Canada are assisting in clearing away the brambles of antiquation and misconception, and preparing the road for the transition from illuminating power to calorific value as the standard of quality for town gas there. The calorific power movement, it will be noticed, is spreading fast geographically. Germany never has paid much attention to illuminating power, and lately has been evincing an increased affection for calorific value. In other Continental countries, the quality that really now matters is being discussed. At home here consideration is being constantly given to it—privately by gas engineers, and publicly more especially by our chemical friends and in the Parliamentary Committee rooms. Our own technical gas organizations, however, have only accorded consideration to the matter through a single paper, and that from America! Nevertheless, in view of the march of events, the gas profession is very closely concerned in the question. The United States has made material progress in effecting the change, though not perhaps in a manner in regard to the standards already fixed that altogether meets with approval here. And now in Canada, the matter has been considered by the Canadian Gas Association, upon a report by a Committee consisting of Messrs. Arthur Hewitt and John Keillor, the last-named of whom Scotland gave to the Dominion in 1906. The data on which the report is based have been compiled in a really painstaking way; and there is no question as to the amount of labour that has been involved in securing the testings of gas of various illuminating powers and of different constitutions to ascertain the relations of candle powers to calorific values, and which relations are proved once again to be altogether indefinite.

There are persons at home who, if they cannot prove the contrary, are in the habit of attempting to disparage by ridicule such estimates as 80 or 90 per cent. of the gas now consumed being applied to purposes other than open-flame lighting. But ridicule standing alone has little negatory value. Here we are in this country positively in a state of seething activity in the development of incandescent gas lighting, and the use of gas for heating, cooking, and industrial purposes; and if what holds good in Canada regarding the proportion of gas that is used solely and unaided for its luminosity does not apply in this country, then we must give front place to Canada for superior efficacious methods in producing among consumers the scientific application of gas. The statistics collected by Messrs. Hewitt and Keillor present the fact that of 4995 million feet of gas sold, 57 per cent. is used for heat and fuel, 32 per cent. for incandescent lighting, and only 11 per cent. for flat-flame burners. In 29 years there has been an entire reversal of figures. The beginning of that period witnessed the nativity of incandescent gas lighting; and then no less than 90 per cent. of the gas sold was consumed in flat-flame burners. This complete change in circumstance has, singularly enough, little weight in some quarters; but we can only marvel, and pass on, impressed ourselves by the superfluity in this country of consideration for illuminating power.

The tests in the report from Canada confirm all that has been disclosed here, by extended study, as to the irregularity of illuminating power in relation to calorific value, and all that has been disclosed, too, as to the differences that exist in the calorific values of coal gas, water gas, and mixed gases. There is one table—the last one dealing with the subject—which shows how low it is possible to run the illuminating power of coal gas without seriously affecting the calorific value. The lowest figure in this table exhibits a candle power, with the Sugg 16-candle burner, of 11·76, with a gross calorific value of 575·28 B.Th.U. However, the reporters conclude that a gas of about 13-candle power, tested by the Sugg 16-candle burner, and containing about 540 B.Th.U. net is sufficiently high for all practical purposes. To us it seems that, in fixing on 540 B.Th.U. net, Messrs. Hewitt and Keillor have overstepped the line of practicality; the figures in the table showing that such a net calorific value would not give sufficient margin, if applied as a standard, with 13-candle gas tested by the No. 1 burner. Unless there is absolute surety, suggestions of figures for calorific standards are best left unmade. The one they mention is higher than the Gaslight and Coke Company's calorific standard, with 14-candle gas, and that calorific standard is higher than we should like to see generally applied. This is a matter that has on former occasions been discussed editorially.

A Diagram and Two Observations.

In last week's issue (p. 129) was published the diagram, showing the results of gas testings by the flat-flame, the No. 1 "London" argand, and the "Metropolitan" No. 2 burners, exhibited by Mr. Isaac Carr in Committee Room No. 6, for the purpose of illustrating his contentions, during the proceedings on the Standard Burner Bills. The diagram (not as exhibited, but as published by us) contained a dotted line which led from a result of 10·4 candles by the No. 1 burner to one of 15 candles by the "Metropolitan" No. 2 burner; and a footnote imparted the information that these figures were derived from observations made by Mr. Carr at the offices of the London County Council, 40, Craven Street, Strand, on the 7th inst. There is no suggestion in the footnote as to anyone else participating in the observations; and it indicates that Mr. Carr took upon himself full responsibility for them. It was necessary that he should do this, as there was no knowledge on our part as to the conditions under which the observations referred to were made. But the publication of these Craven Street figures was the subject of a mild protest before Sir Henry Kimber's Committee on Wednesday last, as it was considered that the conditions under which the observations were effected were not of the order that would constitute a reliable test. The observations were made on the occasion of the visit of Sir Henry Kimber and the other members of the Committee to the Craven Street testing-room; and it is quite clear the Chairman and his colleagues did not regard the readings as being of any comparative value, but merely looked upon what was done as a demonstration to enlighten them as to the use of the burners. But after all the diagram has had a value for the promoters of the Bills, as it intensifies the point as to the unreliability and uselessness of the No. 1 burner for giving a relative value to gases of different candle powers. The figures to which objection is taken as being unfair show an illuminating power of only 10·4 candles with the No. 1 burner and 15 with the No. 2. This is on Gaslight and Coke Company's gas. In the article on "The Quality of London Gas," published last week, the average results of the official testings of the Company's gas in the final quarter of last year, with the No. 2 burner and the flat-flame burner, are given; and it is seen that the average figure using the flat-flame burner (10·10 candles) was almost as high as Mr. Carr's Craven Street observation with the "London" No. 1 burner. In his own diagram, he shows a gas, giving only 5·51 candles with the flat-flame burner that returned 13·32 candles with "Metropolitan" No. 2. Instead of proving anything, the addition of the Craven Street figures only adds to the confusion that arises when one attempts to make any deductions from the diagram. However, those who were present at the time of Mr. Carr's observations at Craven Street are the best judges as to the suitability and fairness of the conditions; but the evidence itself suggests that they were not altogether regular.

The Competitors of the Coalite Company.

Whatever the Coalite Company are able to do in the matter of arresting the temperatures of carbonization at a particular stage, they have been, as our "Correspondence" columns have recently shown, unsuccessful in arresting the grant of a patent to the Scottish Smokeless Coal Syndicate, Limited. The Syndicate mean business; and, in our advertisement columns, they make an announcement which will no doubt lead to inquiries by gas undertakings as to working details of their system and proposals generally. In the advertisement, the Syndicate categorically state that their preparedness now to open negotiations for the adoption of their system and to do business, is due to "the British Coalite Company having failed in their proceedings against us." Their proposition is to grant licences, both at home and abroad, on reasonable terms, to corporations, gas companies, and others, for the manufacture, under their patents, of smokeless coal, gas, bye-products, &c. It is claimed that, by the Syndicate's methods, results superior to other processes can be obtained. There is sufficient in this statement to have a stimulating effect upon those anxious for information as to superiority in carbonization results. The Coalite Company manifestly do not like the Syndicate and their process; and they (the former) are renewing their strenuous efforts to get a number of gas undertakings to incorporate the coalite system in their working. Such correspondence as has been proceeding—spoken of as "negotiations" by the coalite people—with, so the claim runs,

ver forty gas companies, is being made use of, as was seen last week, in the attempt to launch £300,000 of debentures to which attached an alluring participation in profits. To the present has not been noticed that investors have made any violent rush for the debentures. Perhaps the history of the Company and reminiscences of the advertised wonderful potentialities of the system in days that already appear afar off, have not hardened confidence in the concern.

More Municipal Gas-Works Results.

The chronicling of the results of the past financial year's operations of the municipally owned gas undertakings proceeds apace. Among the latest statements published, it is noticed that at Bradford the most striking and satisfactory feature of the balance-sheet is the fact that every item of expenditure on the manufacture and distribution of gas shows an improvement over the previous year. There was a small increase in the quantity of gas sold. The gross profit for the twelve months amounted to £58,405; being £4065 more than for the preceding year. After meeting interest and sinking fund charges, a trifling net loss is shown of £737, which result, however, is £4568 better than in 1908-9. At Bury, there is recorded a profit of £7152, one-half of which is handed over in relief of the rates, while the other half is utilized in directly benefiting the consumers of gas. Darlington exhibits a small falling off in the quantity of gas sold, and a decrease in net profit (£5033) of about £300. A sum of £4500 is transferred in aid of the general district rate, which is equivalent to a rate of 4'877d. in the pound. The percentage of gross profit upon the total capital employed is 6'399. The output of gas at Gainsborough was not quite so large as the year before; but the make per ton was higher, at 11,314 cubic feet. Considering the state of trade, the Committee regard the results as satisfactory. Ordinary consumers at Hereford are to enjoy a reduction of 3d. per 1000 cubic feet; and, at the request of the Finance Committee, it has been agreed to transfer to the borough fund the sum of £1000 from the balance standing at the credit of the gas revenue account. Sales of gas show an increase of 4½ million cubic feet (or 3'8 per cent.), while the quantity made was only 3½ million feet more than during the previous year—the leakage having been reduced from 6'8 to 5'9 per cent. The gas made per ton of coal was 11,315 cubic feet; the quantity sold per ton being 10,644 feet, compared with 10,224 feet the previous year. The disposable balance on the year's working is £1448. A small increase in sales was experienced at Kendal, where the price of gas to general consumers has been reduced from 2s. 8d. to 2s. 6d., and for public lighting from 2s. 7d. to 2s. 4d. per 1000 cubic feet. From a surplus of £1000, a sum of £800 has been voted in relief of the rates; the balance being carried to next year's net revenue account. Larger receipts and a reduction of price are reported from Mansfield. The Committee have decided to pay £1500 over to the general district rate now; and the question of any further payment will be considered later on. The average quantity of coal gas made per ton carbonized at Oldham was 11,666 cubic feet; the total amount of gas manufactured shows a decrease of just over 3 per cent. Private consumers took more; but the demand for mills and workshops decreased, owing to short time among the cotton-spinners and bad trade in machine-making works. The net profit on the year's working is £10,742. Under last year's Act, there is a limitation of the amount of profits which may be applied to the reduction of the borough rate to a fixed sum of £7500 per annum. The power to supply gas without charge for street lighting and other public purposes is, it may be remembered, limited by the same Act to public clocks and the infirmary.

A record make and sale, and decreased leakage, are reported from Rhyl, where the quantity of gas per ton of coal carbonized (11,508 cubic feet) and the sale per ton (10,425 feet) are also the highest figures in the history of the undertaking. A net profit of £1782 is available for the relief of the rates. At Salford, there has been the usual growth in the number of consumers; but the sales of gas show a very slight decrease—which is, no doubt correctly, attributed to the continued trade depression during the year. After meeting interest and redemption charges and allowing £6500 for depreciation, there is a balance of £15,034, which has been transferred to the district fund account. The past year has, on the whole, been a very satisfactory one at Stockport. An average of 12,016 cubic feet of gas has been obtained per ton

of coal carbonized, as against 11,923 cubic feet before. Nearly 24 million cubic feet more gas was disposed of during the past year than in 1908-9—the larger proportion having been taken by prepayment meter consumers. Practically £20,000 is to go in relief of local rates—a policy which, as has happened on previous occasions, gave rise to some discussion in the Council; certain of the members expressing the opinion that the price of gas to ordinary consumers was being kept up to an undue extent. The accounts of the Stoke-upon-Trent Corporation show a balance of £684, of which £642 has been applied in relief of the district rate. The net profit is equal to 1'24d. per 1000 cubic feet of gas sold; whereas for the year 1908-9 there was a deficit equal to 1'77d. The make of gas per ton of coal was 12,304 cubic feet, of which 11,291 feet were sold. There is a net surplus at Tipton, after payment of interest and instalments on loans, of £1238, which shows the satisfactory increase of £966 when compared with the preceding year. This has been added to the accumulated profits account. The total quantity of gas made was 126,368,000 cubic feet, against 118,343,000 feet; the amount of coal gas per ton carbonized being 11,550 cubic feet, compared with 11,211 cubic feet. The Tyldesley-with-Shakerley gas undertaking shows a net profit of £591, which has been added to the reserve fund. A small increase in consumption is practically accounted for by the prepayment meter users—ordinary meter consumption exhibiting a trifling decrease. Depression in the cotton and other trades has, it is pointed out, exercised a detrimental influence on the operations of the department; and a reduction in price has also to be taken into account when considering the results.

A Cool Request.

We have from time to time had occasion to comment upon the attempts made by officials of local authorities to obtain professional advice and information on the cheap by means of the inquiry circular; and our remarks have, it may be hoped, led to the consignment of all such documents to the waste-paper baskets of those who have received them. Possibly the Clerk to the Urban District Council of Wem, in Shropshire, may have been aware of the fruitlessness of the efforts of others in the direction indicated; and so he recently decided to take another course. He availed himself of the "Queries" column of the "English Mechanic" for the 8th inst. to inquire if any reader of that publication could give him "an approximate estimate of the cost of establishing an up-to-date, but not necessarily elaborate, coal gas works, suitable for supplying gas for a small urban district of 2300 inhabitants, with 500 houses, 90 public lamps, about four miles of gas-mains, with an annual consumption of 10 million cubic feet of gas." The site of the proposed works is not to exceed £500. We do not for a moment suppose that there are many readers of the publication named who would be in a position to furnish the required estimate, or, if they could, would be willing to do so without a fee; and therefore it will have to be sought elsewhere. The particulars required correspond very well, allowing for subsequent growth, with the latest published statistics in regard to the town referred to; and this justifies the conclusion that the erection of gas-works by the Urban District Council is in contemplation. If so, they must bear in mind that a Gas Company has been in possession of the field for the last fifty years, and that Parliament would not be likely to sanction the raising of money for the establishment of a competing undertaking at the ratepayers' expense. If purchase of the existing works is in contemplation, and the District Council wish to get (through their Clerk) an idea of the price they ought to pay for them, their proper course would have been to instruct him to put himself in communication with one of the professional gentlemen who give special attention to these matters, and not to the editor of a weekly publication such as the one selected.

An Association of Consulting Engineers.

As the result of a movement initiated about two years ago, a meeting was held at the Caxton Hall, Westminster, last Wednesday, under the presidency of Sir William Preece, to ascertain the views of consulting engineers as to the advisability of forming an Association to improve the status of the profession, and to place it on a more satisfactory basis than hitherto. A Provisional Committee had been formed, upon which were Messrs. Charles Hunt and E. H. Stevenson, as representing gas engineers, and at their suggestion invitations to the meeting were sent out. The accept-

gas undertakings. Apart from coal costs, there is not much room for more economical and efficient working at generating stations fitted with modern plant. Therefore central station engineers who have been making estimates for the current year will have done well if they have not pitched their hopes too high.

Just a few figures, by way of illustration, as to the effect upon the consumption of the heavy price lighting units owing to conversion from carbon to metallic filament lamps. At Brighton, the year saw a decline by 148,926 in the number of units used in private lighting; but there was a good increase for tram and power purposes. From Croydon comes the report that the metallic filament lamp has continued to exercise a marked effect on the output. But although the net increase in consumers in the past two years has been 617, the electricity sold for lighting has only added to the total 18,000 units. We go to Eastbourne, and find the units sold there for private lighting have decreased by 2.6 per cent. Private lighting consumption at Huddersfield dropped down by 126,544 units; while the power business increased by 77,995 units. Leeds made the retrograde movement in the private lighting consumption of 665,566 units; in street lighting, of 51,592 units; while power and heating (at much lower prices) just topped the decline in lighting units with an increase of 743,204 units. Nottingham, too, had a set-back in the number of units sold for private lighting, but an excellent augmentation of the power units. From Rochdale there is the report that the increase in the units sold was practically all due to electricity for power purposes. An interesting and significant feature is exposed by the figures as to the consumption at Canterbury. There the private lighting sale amounted to some 309,800 units. The public lamps (12 arcs and 655 incandescents) absorbed 206,143 units, or the equivalent of two-thirds of the private consumption; and only 172,907 units were sold for power. This is instructive as to how public lighting is made in Canterbury and some other places to swell the volume of units generated, and incidentally the capital expenditure on plant (involving interest and sinking fund) to meet the maximum load.

In presenting a few illustrative figures as to deficits and small net surpluses, we do not suggest the lists are in any way complete; and the confession is repeated that notice is not taken of the undertakings that show a greater financial success. Their successes are due to local conditions just as is the want of success in other cases, though the latter result of much of the municipal management is due also to the want of courage in not making consumers pay on a scale that will yield sufficient revenue for all purposes. Electricity, we understand from electrical literature, has so many virtues that nothing so vulgar as expense should stand in the way of its adoption; so that there is no excuse, on the electricians' own showing, for deficits. Examples of deficits are: Bath, £580; Buxton, £485; Dover, £227; Hastings, £2919; Hove, in respect of Aldington undertaking, £404. Loughborough required for interest, sinking fund, &c., £2311; and there was only a balance of £854 with which to meet it. Deficits were also incurred by Maidstone, £101; Peterborough, £1801 (here a recent arbitration case, however, cost £1016); Sheffield, £2035; Stalybridge, £469; Sunderland, £112; Weymouth, £113; Worcester, £1401; and York, £985. Barnstaple only had a net balance on revenue account of £560. Representative of the net balances of municipal undertakings in various parts of the country are the following: Barrow-in-Furness, £249 (against a net deficit in the previous year of £384); Bexhill, £624; Burton-on-Trent, £1474; Canterbury, £562; Colchester, £414; Epsom, £185; Gloucester, £584; Huddersfield, £710; Ipswich, £1080; Lancaster, £84; Leigh (Lancs.), £112; St. Helens, £1031. At Leicester since 1907, the total revenue has fallen from £33,882 to £28,832—a difference of somewhere about £5000. The net profit has dropped meanwhile by £2600.

There are two or three of the towns mentioned in the previous paragraph to which further reference may be made. The deficit in the case of Sheffield, it will have been noticed, is £2035. But this sum does not disclose the full effect of the metallic filament lamp. As a matter of fact, the lighting current shows a decline from £53,117 to £46,264, or £6853, representing a drop of 312,150 from the number of units sold for private lighting. The year before, the falling off in private lighting income was £4251; and it is anticipated that the decline will continue for some time to come. There were 299 new private connections made in the year, against 217 the year before. There is a point regarding the consumption that should make administrators of electricity undertakings pause. It is seen that the diminution in the sale of private lighting units was 312,150; but, as a matter of fact, there was (including all branches of business) a total increase of 1,288,192 units sold over the preceding year. Notwithstanding this big bulk of additional power business, which swamped by volume more than four times over the loss in the private lighting business, there was the deficit on the year of upwards of £2000. To us there seems something wrong in the administrative policy when an increase of business in one direction that is fourfold the loss in another direction does not produce more than a full measure of compensation for the latter. Then there is the Hastings deficiency of nearly £3000, although there was an increase in the receipts from public lighting from £3088 to £3750. This undertaking is having the unhappy experience of seeing the total volume of units sold shrinking year by year, despite the action of the Corporation to transfer to the concern all business over which it has any disposing power. In 1908, the number of units sold was 821,671, it slid down the following year

to 755,372, and last year to 731,914. But in the same three years the number of consumers mounted up from 899 to 1001, and last year to 1067. Regarding these increases in conjunction with the consumption decreases, they indicate that the consumers who are now being tapped are a less remunerative class than the older ones, and are not by any means of sufficient strength to counter-balance the ravages of the metallic filament lamp. It will also be observed that there is a slackening of the new connections. In 1908-9 there were 102 new ones; in 1909-10, only 66. The poor deluded ratepayers have two other figures over which to meditate and mourn. Since 1898, the net profits have totalled to the paltry sum of £1473; in the same period, the deficits have reached the significant amount of £14,000, to say nothing as to the heavy charges for public lighting, and costs of street-lamp conversions, which unnecessarily the ratepayers have been made to bear—and not in the interests of local government with economy and efficiency. A word, too, as to Maidstone. While the deficit is only £101, the position compared with the previous year is worse by £1173; seeing that there was a net profit the year before of £1073. In addition to the £1173, there have been amounts set against profit appropriation account which bring the financial difference up to £2121. The items include sums which might otherwise have gone to capital, amounting to £258; the cost of converting public lamps from Nernsts to Osrams, £102; and the amounts written off wiring and arc lamp accounts, £459 and £117 respectively. It is not astonishing that there is dissatisfaction in many places over the financial position of the electricity undertakings. But as in the beginning, so now, and we suppose ever will be, prophecy is frequent that the good time is coming when the crooked paths of electrical finance will be made straight, and all will then be well.

It is a curious thing to us why so frequently the electric light goes on strike on Saturday evening. We have often wondered, and have carefully examined the matter, but a satisfactory solution of the problem has never yet resulted. Perhaps it is that the generating machinery is of opinion that it ought to share with humanity generally and the mechanical plant of other industries the week-end rest. Gas-works plant in many places, if it does not get the whole week-end, is enabled, through the gasholder storage, to have off the daylight hours of Sunday. Looking back over only the last two or three numbers of the "JOURNAL," it is seen that Wrexham, Pontypool, and Woking have suffered collapses on Saturday nights; and great has been the inconvenience caused thereby. It is the great shopping evening of the week; the evening, too, above all others when the theatres, music halls, cinematograph shows, and other places of entertainment are being heavily patronized. To buyers and recreation seekers, the inconvenience is considerable; but not so great as to tradesmen and managements of the theatres and so forth, who are harassed on one side and the other, and are losing money and profit the whole time the light is out. Brighton suffered a collapse last Sunday evening week; the extinction synchronizing with evensong at the churches, and dinner time at the hotels; but fortunately a little bit too early to seriously affect the public and the other private lighting. The occurrence was, however, general. There has been an attempt to minimize it by describing it as temporary. But during a twenty minutes' collapse, much may happen, much worry may be occasioned, and many wicked things may be said. The time is quite long enough to seriously disturb the local tide of human affairs and happiness. And yet all the technical skill and foresight of the electricians cannot prevent these untoward occurrences! Still there is this to be said in extenuation. It is not an uncommon thing to find some people more unreliable at the week-end than at other times; and so we must not treat too harshly the week-end backslidings of electrical plant. We can, in fact, afford to be generous in the matter; for such vagaries are good for the gas industry.

The number of applications to the Board of Trade for Electric Supply Provisional Orders and the number granted continue to dwindle. Altogether last year there were 25 applications—14 being made by local authorities, and 11 by companies or persons. But seven of the applications were merely for extension or amendment of existing Orders, and one was a Transfer Order. Nineteen Orders were granted in part or in whole; but six were refused or the promoters determined not to proceed from one cause or another. In three cases—Ballyclare, Brumby and Frodingham, and Templemore—the Board were not satisfied that undertakings could be established without involving the District Councils in a loss; and in these instances they declined to grant Orders. Under the circumstances disclosed by a local inquiry, too, the Board did not approve of the granting of the Radcliffe Order proposed by the Lancashire Electric Power Company. It is satisfactory to find the Board exercising a judicial discrimination in the matter of granting powers to the governing authorities of small places, and protecting ratepayers against the speculative propensities of these bodies. No less than a couple of dozen deeds of transfer of powers to companies—eleven to the Lancashire Power Company—have been approved during the year. It is to be regretted that there was not greater discrimination in granting Orders, and many more transfers from local authorities to companies, in days past; not a few ratepayers would have been better off than they are to-day. Including the figures for 1909, 1361 Orders have been applied for since 1883, 1086 have been made by the Board of Trade, 1069 have been confirmed by Parliament, and of these 309 have since been revoked or repealed, or else have expired.

NOTES FROM WESTMINSTER.

Complete Success of all the Standard Burner Bills.

LAST Friday will stand as a red-letter day in the annals of the gas industry; for on that day Sir Henry Kimber's Committee gave judgment on the cases (to which they had devoted such patient attention for a fortnight) for and against the Standard Burner Bills; and the judgment, as did that of the House of Lords Committee, completely vindicates the action of the promoters, certifies the strength of their case and concurrently the weakness and inconclusiveness of that of the opposition, and maintains unaffected the position that Parliament and the Board of Trade have consistently taken up in regard to this particular question since the sittings of Lord Rayleigh's Committee. Had Sir Henry's Committee decided to the contrary, a grave injury would have been done to the progress and development of the gas industry along its natural highway.

The Week's Proceedings.

Tracing the course of the proceedings before the Committee during the week, it will be remembered that the hearing of the case on No. 1 Bill concluded the previous Friday. The Liverpool Company were included in the Bill; and, by an instruction of the House, as it was considered there were special justifying circumstances, Liverpool was set apart for a special hearing. On the Friday Mr. Honoratus Lloyd opened the case for the Company; and Mr. Charles Carpenter (who has led the evidence throughout, and with unremitting zeal has worked hard, as would his late chief have done in the circumstances, to gain for the gas industry the victory in this critical struggle) and Mr. Edward Allen gave testimony. The proceedings were resumed on Tuesday, and the case was threshed by the parties unceasingly during the sittings of the Committee on that day and Wednesday. Mr. Honoratus Lloyd replied on Thursday morning; and on Friday the Committee took up special points in connection with the opposition to Bills Nos. 2 and 3. Concerning No. 2 Bill, although twenty companies were included (representing twenty-two gas undertakings in all), there were only six authorities opposing; and respecting No. 3 Bill, though there were fifteen promoting companies, there were only five opposing authorities. But there was nothing whatever that was really special in the matters they had to place before the Committee; and they were dealt with very lightly. And really, after a fortnight in refighting fights that have for years now consistently ended in victories for the new standard burner, and refighting them by introducing, as did the opposition, much petty detail and extraneous matter, and bringing witnesses forward again and again to march over the same ground, most of those present were unfeignedly glad when the end was in sight. We will not discriminate as to when the witnesses were called, but evidence was heard during the week for the promoters from Mr. Charles Carpenter, Mr. Edward Allen, Captain Sankey, Mr. Samuel Glover, Professor Vivian B. Lewes, Mr. William Ashmole (the Chairman of the Ilford Gas Company), Mr. William Cash, and Mr. E. Campbell Cooper (Messrs. R. W. Cooper and Sons, the Agents for the Bill). Again too, were heard on the hostile side the inseparables, who have been the constant technical witnesses for the opponents throughout this struggle of the gas industry for the new standard burner—Professor Frankland, Mr. Isaac Carr, and Mr. J. G. Newbigging, and joined to them for Liverpool was Dr. Arthur A. Musson, Assistant Medical Officer of Health. For the Mersey Docks and Harbour Board, who were specially represented by Mr. Balfour Browne, K.C., evidence was given by Mr. A. G. Lyster (the Engineer), Professor Burstall, and Mr. R. D. Holt, M.P.

Points Raised.

In the special case of the Liverpool Gas Company, the Liverpool Corporation, the Bootle Corporation, a number of District Councils, and the Mersey Docks and Harbour Board were arrayed in opposition. The long career of the supply of a high-grade illuminating power gas in Liverpool was the secret of all the opposition in this instance. The opponents seemed to have, or professed that they had, a distinct preference for a high illuminating power gas *per se* than for taking advantage of the higher efficiencies now to be obtained by a lower grade gas used in modern appliances. Not only is Liverpool among English cities and towns exceptional in the height of the illuminating power of its gas, but the burner applied to the testing of that gas is the flat-flame one. If in any place a change of burner is needed, that place is surely Liverpool. When witnesses point, as a reason against a change of test-burner to the number of flat-flame burners in use by consumers in Liverpool, it only shows how the high illuminating power gas has been an obstruction to the application of scientific invention in dealing with the gas. It is a peculiar position in which the opponents found themselves. Fifteen years ago the Lighting Committee of the Corporation were urging the Gas Company, in view of scientific progress, to consider the reduction of the standard illuminating power of the gas supply and the further cheapening of the price by that means. But a fine old-crusted conservatism then prevailed in the Company's counsels, which declined to recognize that anything that had not been customary could be the correct thing in the future. The Mersey Docks and Harbour Board had also been threatening the Company that, if they did not further reduce their price, they would transfer their patronage to some

private producer gas (very low grade gas) plant. In face of these actions, here were the Corporation and the Docks and Harbour Board hostile to the change of test-burner, and predicting all manner of evils if the illuminating power of the gas were interfered with, be it never so slightly. Truly, 'tis a strange world, and there are strange people in it. Dr. Frankland when recalled still persisted in asserting that high illuminating power gas was the best in securing the utmost round of efficiency for the several purposes to which gas is applied in modern times. He is the odd man among scientists on this question. Mr. Carr is against him as to high candle power gas being best; Mr. Newbigging's practice at Manchester is against him; and Professor Burstall—all named being witnesses on Professor Frankland's own side—prefers low illuminating power gas for gas-engines.

Emphasizing the hypotheses and the inconsistencies of the opposition case, some wonderful calculations (with a laboratory and not a practical basis) were put in as to the financial and other effects that would betide the poor benighted flat-flame consumer (who foolishly refuses the economy of the incandescent light) if Parliament grants the No. 2 burner to Liverpool. The opponents did not like any talk about the inaccuracy of the existing test-burners and the accuracy of the new one. Mr. Balfour Browne found the point to be a thorn in his side. But it was impossible to escape from the fact that the flat-flame test-burner does really depreciate the candle power capacity of a gas; and through the inefficiency of the burner, the consumer gets more than that to which he is entitled, and more than he requires, if he will but shake off antiquity and apply that which is modern. The opposition actually asked for the nominal candle power to be raised if the change of burner was introduced. If such a thing as that had been done, then the users of incandescent burners, of heating and cooking stoves, and of gas-engines would have had just cause for alarm and complaint for being given a gas that is not so efficient for their purposes through the difficulty of thoroughly aerating the heavy hydrocarbons of a rich illuminating power gas, and through the choking occasioned in consequence by incomplete combustion. Captain Sankey (for the promoters) and Professor Burstall (for the opposition) showed that a lower grade gas would not affect the working efficiency of gas-engines, and some large-scale practical experience under this same head came from Mr. Carpenter in regard to South London. Professor Lewes put the whole matter in a nutshell when he said that, if the change of test-burner were not widely advertised, there would not be a single consumer who would be aware of it. Moreover, in Liverpool the Gas Company are kept under very strict surveillance both in regard to quality and finance; and being a maximum price concern, with a full reserve, all savings must go to the consumers. The general result is that nobody will be injured by the change of burner.

A Complete Victory. The decision of the Committee was delivered by Sir Henry Kimber in terms and with reasoning that disclosed how thoroughly the Committee had mastered all the principles and interests that lay at the foundation of the confused mass of submissions and contradictions that had been accumulated during the fortnight. Sir Henry announced that the preambles of the Bills had been passed. This was expected on both sides. But there was anxiety to hear if the Committee had decided to impose any conditions, for those were the things that would matter. There was intense pleasure when it was heard that the new burner was to be allowed unconditionally to all—thus confirming the verdict of the House of Lords. Sir Henry went on, calmly and mercilessly, to demolish the whole of the crude structure of the opposition case in a very few weighty sentences. The Committee recognized, he said, that the test burners hitherto in use have been defective, and that the burner proposed to be established as a standard one is, if not perfect, yet as perfect as is at present known for achieving the object Parliament had certainly intended. As to the compensation of consumers for the change of test-burner, the Committee, he remarked, were "unanimously" unable to see that, or to recognize the fact that the use of an imperfect burner in the past gave any right to compensation further than the legislation applicable to gas companies will automatically give. It was agreed by the Committee that the hardest case of all was that of the Mersey Docks and Harbour Board; but they believed also in this case that the Board would be practically compensated by the reduction which might be expected in the future from a Company who had conducted their affairs honestly and with fairness. The officers of municipal bodies who had appeared in opposition to the company promoters of these Bills heard the Committee's view that legislation affecting gas companies had been more strict than legislation affecting local authorities. The Committee would not entertain any suggestion as to the imposition of a calorific power clause, considering it to be outside their purview. The Chairman also expressed the opinion that these Bills formed a step in the revision of general legislation referring to gas. The decision is indeed a complete victory.

Opposition's Total Gain.

The total gain of the opposition, out of the bundle of clauses they placed before the Committee yesterday morning, was that the Bootle Corporation obtained the right to a testing-place at the Linacre Gas-Works of the Liverpool Gas Company. As there is a testing-place at the works already, the Company did not make any serious demur to the proposition; and they acceded to Bootle having the privilege desired. Whether, after the novelty has worn off, the Council will make any considerable use of their

privilege, is another matter. At the close of the discussion, the chairman acknowledged the patient assistance he and his colleagues had received from Counsel; and, with the exchange of courtesies, the proceedings closed. The result has inflicted the most crushing blow on obstructionist local bodies that has been witnessed in Parliament in connection with gas for many a day.

South Hants Water. The Southampton Corporation always are looking with eyes of envy on their neighbours the South Hants Water Company, part of whose district—and the most lucrative part—is now within the borough boundary through the extension of the latter. The Corporation have appeared in opposition to the Company's Bill, primarily with the view of placing themselves in a better position for wallowing the Company's concern if Parliament sanctions that course. The Bill is intended to confirm certain works already carried out by the Company, and to sanction a new well at Twyford. The Bill has passed a Committee of the Lower House; and last Friday week Mr. Balfour Browne, K.C., introduced the measure to the notice of the Duke of Bedford's Committee. He did not get far before the Committee adjourned; and he resumed his speech on Monday morning. The Southampton Corporation are jealous of their Otterbourne Water-Works; and they seem to fancy the Company's operations at Twyford will affect the works. They therefore asked, through the Hon. J. D. Fitzgerald, K.C., for the limitation of the quantity of water pumped to one million gallons a day. This Mr. Balfour Browne strongly resented, but offered a limitation to $2\frac{1}{2}$ million gallons. The Committee were more in sympathy with the little Company than with the big Corporation; and they declined to descend below the $2\frac{1}{2}$ million suggested by the former. Then the Corporation sought a suspensory clause for a year, in order to give them time to promote a Purchase Bill. This again the Committee refused. In fact, they appeared to be disinclined to do anything that would be detrimental to the weaker authority, and confer favour on the stronger Corporation. Thus the Water Company obtained practically all they desired. Mr. William Matthews, who was at one time Corporation Water Engineer for Southampton, appeared in support of the Water Company, to whom he is Consulting Engineer. Among other witnesses for the Company was Mr. Eaton; the Corporation did not call evidence.

Protecting a County. The Breconshire County Council have always an eye to the main chance. The Mountain Ash District Council are proposing by a Bill in Parliament to construct new water-works at Penderyn—a short distance beyond the Glamorganshire boundary in Breconshire. When the Bill was before Earl Donoughmore's Committee, there was no opposition to the preamble, which was passed; but Mr. Talbot, K.C., asked for protection for Breconshire interests. Similar protection has been granted in the case of the water-works of Birmingham, Cardiff, Swansea, Merthyr, Aberdare, Neath, and Pontypridd. In one respect, Breconshire is fortunate. It is rich in water, and has the gratification of knowing it can fill the wants in this respect of many large communities. But it is poor in rateable value, being purely agricultural land. When, however, these large water-works are constructed, as Mr. Wedderburn, K.C., points out, ample compensation for any temporary expense the county is put to during the construction of the works is obtained from the permanent addition to the county's rateable value. But it is the temporary expense against which the county desired to be guarded by special clause. The expense, it is said, is occasioned by the dislocation of local arrangements incidental to the introduction of large bodies of workmen. Additional police have to be provided, the education of the children of the workmen has to receive attention, hospital accommodation is needed, and so forth. The Committee disagreed with the insertion of any clause such as that proposed.

An Agreement. When the Pontypridd and Rhondda Joint Water Board Bill came before the same Committee as the measure named in the preceding paragraph, there was only the Rural District Council of Llantrisant and Llantwit Fardre opposing; and there was a prospect of agreement by a little patience. This was fulfilled; for on Monday, Mr. Freeman, K.C., was able to announce that an agreement had been arrived at, to the effect that until the new works are completed, the Joint Board shall give Llantrisant such supply of water as they have now, and so much more as the Board are able to spare. Further, as soon as the new works are completed, the Board shall give Llantrisant not less than 50 million gallons per annum and so much more as they require, subject to certain restrictions, to reasonable notice being given by Llantrisant of the quantity needed, and to a uniform price of 7d. per 1000 gallons.

Japan-British Exhibition Awards.—The distribution of the first instalment of awards adjudicated by the Superior Jury of the Japan-British Exhibition took place last Friday in the Congress Hall at the Exhibition. His Royal Highness Prince Arthur of Connaught presided, and the awards were distributed to the British exhibitors by Baron Oura, the President of the Imperial Japanese Commission, and to the Japanese exhibitors by the Duke of Norfolk. Among the recipients of Grand Prizes were the Gaslight and Coke Company, for their exhibit of the residual products of gas manufacture; Messrs. Babcock and Wilcox, Limited, for coal-conveying plant; Messrs. C. A. Parsons and Co., for steam-turbines; and Messrs. Read Holliday and Sons, Limited, of Huddersfield, for coal-tar products.

STANDARDIZATION OF STOVE PARTS BY GAS UNDERTAKINGS.

DURING the last year or two, there has been a tendency on the part of several gas authorities to adopt the policy of having a standard pattern of cooker peculiar to themselves, and inviting various manufacturers to quote for the supply of the apparatus, instead of for their individual products. In some cases, the arrangement is that the contractor is furnished by the gas authority with the necessary patterns; in others, he finds them himself, making them to the specification of the gas undertaking.

There are various aspects of this matter that are worth consideration. In the first place, the experience of any one gas department or gas manager, as regards the requirements in a cooker, is only the experience of one particular district; whereas a gas-stove making firm has an experience gleaned from all over the country, and is able to form an opinion of the good or bad results of any particular point in stove construction from the results of trial, not in one district only, but in many. At first sight, there doubtless appears to be a good deal to be said for this policy, from the point of view of the gas authority's interest. Theoretically, it assures them that all competitors for their contract are quoting exactly on the same footing, and for on the face the same article; and where the patterns are furnished by the gas authority, they are also in theory assured of getting stoves interchangeable, part for part with each other, and with those supplied by past and future contractors.

Whatever these advantages may appear in theory, the matter has an altogether different complexion when viewed in the light of certain practical considerations, which, in the nature of things, are liable not to be known, or, at the best, their importance not realized by the gas authority. Yet another point that it is most essential should not be lost sight of is that no two ironfounders carry on their work in the same way. Every foundry has its own methods, its own cambers, &c., its own iron mixtures, and therefore its own shrinkages; and investigation and test will amply show these points to have so immense a bearing on the results that, as a matter of fact, it is, for all practical purposes, impossible to get not merely absolute interchangeability, but even a satisfactory working degree of interchangeability between castings that are made from the same patterns in different foundries. The result of this is that frequent troubles necessarily arise when repairs and replacements are required.

It is also important to remember that as these contracts are for a limited period, and therefore really for a limited quantity, it is not possible for the contractor to go to the expense of the multifarious pattern-plates, jigs, and other tools necessary for producing so large a range of different parts with absolute interchangeability. The contractor who knows he may at the end of its period lose the contract, cannot spend the thousands of pounds necessary to lay down the proper special plant required.

So long as a system of this sort was confined to a few places, manufacturers might do their best to meet the conditions, even at a sacrifice. But if such a policy were to become anything like general over the country, it would mean that manufacturers must either use imperfectly adapted tools and plant, and therefore get defective interchangeability, as already mentioned, or else they must have a number of distinct sets of tools, each applicable to one section of their output only, instead of one series of perfect tools turning out their entire output in one type or design of apparatus, on which they are free to concentrate their energies in perfecting it from time to time by the help of experience gained all over the country. Obviously, this means greatly increased expense of production that is bound to re-act, sooner or later, on the price of the apparatus.

It is an unfortunate tendency that John Bull must have something made to suit his own individual tastes and requirements; whereas, in America and elsewhere, people accept apparatus which is adapted for the average uses of the community. In this way, all the advantage of the resulting cheapness of production from the large output of one kind of article, is preserved.

No matter what precaution may be exercised by the gas authority, it is impossible to tell from appearances, and even from a short trial, whether the real value of material contracted for has been put into various parts of the apparatus. It may be only after continued use that latent shortcomings in this direction may reveal themselves; and by this time the contractor responsible may have been superseded by another. Of course, contracts may be carefully worded so as to make the contractor liable in perpetuity; but experience shows that precautions of the kind are necessarily illusory.

Reference has already been made to the indirect but certain ultimate effect of this movement on the cost of production, and therefore on price. One need hold no brief whatever for the manufacturers, to recognize that what adversely affects their conduct of their own businesses, must, in the long run, re-act unfavourably on the wider interests of the industry. If the manufacturer is to find himself making special stove patterns for each gas authority, it means seriously interfering with the methodical and consistent working of his factory. For example, a great advantage in the production of any article, and particularly in its production on interchangeable lines, is that certain men should

be kept making that particular article until they have become thoroughly trained to it; but if men are taken time after time from one set of patterns to another, from these to a third, and so on, it is necessary to altogether forego this advantage.

The whole present tendency among men of the greatest foresight in the gas industry is toward the movement for perfecting and developing all gas apparatus on scientific lines. The establishment of the Leeds Chair and the work of the Institution Research Committee supply prominent evidence in this connection. It must be obvious, however, that, if this system of standardized cookers were to extend, work of this kind on the part of individual makers would simply be "frozen out." Not merely the incentive to individual initiative and invention, but the possibility of it would be at an end if manufacturers had to direct their energies to the mere turning out of apparatus according to certain stereotyped designs over which they had no control, and in which, as contractors with no continuity of tenure, they could not have any interest. This consideration alone ought to be sufficient to set one seriously reflecting as to whether this tendency to standardization is not unconsciously a distinct reaction against the newer scientific methods. The moment stereotyping is carried to extremes, there is discouragement of development and invention.

PERSONAL.

Mr. GEORGE INGHAM, Assistant-Chemist to the Sheffield Gas Company, has been appointed Works Assistant at the Ash Road station of the Aldershot Gas, Water, and District Lighting Company, in place of Mr. J. URQUHART, who has been promoted to the position of General Assistant.

During the last six months no fewer than four officers of the Metropolitan Water Board have been offered lucrative appointments under other public authorities. The latest addition to the ranks is Mr. W. P. SINCLAIR, who has been invited to accept the post of General Manager and Secretary to the Colne Valley Water-Works Company. Mr. Sinclair has been in the service of the Board since its constitution.

An interesting event took place at the works of the Hornsey Gas Company last Thursday, when Mr. J. W. Buckley, the Engineer and General Manager, presented, on behalf of the staff, a marble timepiece to Mr. KENNETH SPROXTON, on the occasion of his marriage with Marion, only daughter of the late Mr. Edward Butler Hurley, formerly Superintendent of Postal Telegraphs, Ceylon. Mr. Sproxtion is a son of the late Mr. John Sproxtion, who was connected for so many years with the Hong Kong and China Gas Company and with the Colombo Gas and Water Company.

OBITUARY.

ALEXANDER BELL.

WE regret to record the death last Tuesday, at Peebles, in his 74th year, of Mr. Alexander Bell, late Manager of the Dalkeith Gas Company. Mr. Bell was a native of Lasswade, and in early life served his apprenticeship with Mr. James Thorburn, Dalkeith, as a plumber. He came in contact with the late Mr. John Young, who was then Manager of the Dalkeith Gas-Works, and from him gained a taste for chemical and scientific research, which he kept through life. Afterwards Mr. Bell was appointed to the charge of the Lasswade Gas-Works; and after five years' experience, he left in 1863 to take charge of those at Gibraltar. After several years' service abroad, he returned home to take up the position of Manager of the Clippens Oil-Works at Loanhead, where, in conjunction with the late Mr. William Young, he found scope for his energies. He did much to develop the Scottish mineral oil industry, and assisted Mr. Young in working out many of the ideas embodied in his patents for the erection of benches of retorts for the distillation of mineral shale at high temperatures and the recovery of bye-products. On the collapse of the Clippens works, Mr. Bell returned to Dalkeith, and took charge of the gas-works. Under his management, they were entirely reconstructed, with new retort furnaces on the semi-regenerative principle and other incidental works. His reputation as a gas manager spread far and wide; and his knowledge of gas manufacture was largely appealed to by fellow-managers when they were in any difficult position. To these appeals Mr. Bell willingly responded, and both the Waverley and North British Associations of Gas Managers paid him the compliment of electing him to the office of President. He filled the latter office in 1897. Little more than a year ago, acting on medical advice, he resigned his appointment at Dalkeith, and retired to Peebles. Mr. Bell leaves a widow and family. His eldest son, Mr. Alexander Bell, is Gas Engineer and Manager to the Peebles Corporation, and another son—Mr. Laurence Bell—was a few years ago Manager at Inverkeithing, and was President of the Waverley Association in 1902.

With widespread sorrow, the news was received in the town last Friday that Mr. STANLEY HUTCHINSON, the youngest son of Mr. W. W. Hutchinson, the Manager of the Barnsley Gas-Works, had been found in the test-room with his brains blown out. The deceased, who was 28 years of age and unmarried, had not been in the best of health for a few weeks; and it is understood that he was threatened with a nervous breakdown. He was under

medical care, and had been recommended a complete change, with a view to regaining his health. He had been for a period in the Isle of Man, but did not seem better, though his condition was not by any means so bad as to give rise to any fear. On Friday afternoon, when going into the test-room a clerk was horrified to find young Hutchinson prostrate on the floor. In the right hand was a revolver, splashed with blood, containing one spent cartridge. The bullet had entered at the right side of the skull. Further search is stated to have revealed the fact that the deceased had a razor in his pocket; and a note was subsequently found. The inquest was held the following day, when it was stated that deceased had for about three years occupied the position of Chief Clerk in the gas office. The Coroner read a letter, written in pencil, which had been found on the body. It was not addressed, and was as follows: "It is the books. There is no money missing. It does not matter how hard one works, those books will want some balancing and transferring. There is no money in it at all; simply things are too busy, and not the time." The Jury returned a verdict of "Suicide while of unsound mind, caused by worrying about his work."

BELFAST GAS MANAGERSHIP.

A MEETING in committee of the Belfast Borough Council was held last Thursday; and the local "News Letter" understands that the members first of all had before them the list of candidates for the position of Gas Manager and Engineer, together with the recommendations of the Gas Committee, who after going into the applications, which numbered in all 38, and making a selection, had instituted, by means of a deputation and otherwise, careful inquiries as to the capacity and qualifications of the candidates on the short list. Some discussion took place on Thursday regarding the merits of the respective applicants, and ultimately a vote was taken by ballot, which resulted in Mr. James Dunlop Smith, Engineer and Manager to the Stirling Gaslight Company, securing the post, subject to confirmation by the Corporation at the next monthly meeting. It is added that Mr. Smith is a native of Hawick, where he was born in 1872; and after leaving school, he served his apprenticeship as a mechanical engineer with Messrs. James Melrose and Sons, passing through the various departments and completing his indentures in their drawing office. For several years he studied chemistry under the local Public Analyst, and was very successful in Government examinations. In 1891, he was appointed Assistant Engineer and Manager to the Hawick Gaslight Company, under his father, Mr. Joseph Smith, who has since retired; and in 1893 he became Gas Engineer and Manager at Selkirk, where he remained for four years, carrying out in that time extensions and improvements in the Company's works which proved very profitable. In 1897, he was selected for the position of Engineer and Manager of the Stirling Gaslight Company, and had at once to set about the task of reconstructing and extending the works, which were in a dilapidated state. During the thirteen years he has been at Stirling, he has supervised the complete rebuilding of the works and the making of the several large extensions involving an expenditure of about £40,000, and introducing the most modern machinery. He had considerable experience in preparing plans and supplying information in connection with the promotion of the Stirling Gas Act, 1898, and Provisional Order, 1904. When he went to Stirling, the annual consumption of gas was about 60 million cubic feet, and the price was 3s. 6d. per 1000 feet; whereas the consumption has now been increased to 140 millions, and the price reduced to 2s. and 2s. 6d. per 1000 cubic feet.

[FROM OUR SCOTCH CORRESPONDENT.]

Mr. J. D. Smith, the Engineer to the Stirling Gas Company, has been appointed, out of a list of 38 applicants, Manager of the gas undertaking of the Belfast Corporation. Mr. Smith is 38 years of age. He is a son of Mr. Joseph Smith, the retired Gas Manager of Hawick, and brother of Mr. W. A. Smith, the present Manager there. A Stirling newspaper, referring to Mr. Smith's appointment, publishes the statement that "the office is regarded as one of the plums of the profession, and the commencing salary is, it is understood, £1000 per annum; being exactly double that paid in Stirling. Mr. Smith came from Selkirk to Stirling about a dozen years ago, with the very highest of testimonials in his favour; but experience has shown that the man was rather better than his credentials. He took entire charge of the undertaking at a critical period in its history; and under his direction the whole gas-works have been remodelled and nearly doubled in size. At the present moment, the plant is one of the most efficient installations in the country; and in recent years Stirling has been a sort of gas Mecca, to which engineering experts have made pilgrimages. The output at the gas-works has more than doubled during Mr. Smith's tenure of office; and the dividends of the Company have never been so high as at the present moment. Mr. Smith has the entire confidence, not only of his employers but of his brethren in the gas engineering profession; and last year they conferred upon him the highest honour in their power, by electing him President of the North British Association of Gas Managers. He is to be heartily congratulated in having been selected to fill such a high office as that of Gas Manager under the Belfast Corporation. The Stirling Gas Directors are genuinely sorry at the prospect of parting with Mr. Smith.

THE QUALITY OF LONDON GAS.

In the Year 1909.

PARTICULARS have been given in earlier articles of the results of the testings made in the official testing-places of the London County Council of the quality of the gas supplied by the three Metropolitan Companies, for each quarter of the year 1909.* A review, however, of the average, minimum, and maximum results for the whole year may be convenient for reference; and the figures will accordingly be given in the following tables, in which the corresponding figures for the two preceding years are added for comparison.

Illuminating Power.

Table I shows the average illuminating power for each year of the gas supplied by the three Companies, both in regard to the testings made with the standard argand burner (No. 2 "Metropolitan"), and those made for "information" only by the flat-flame burner prescribed by the Gas Referees. The prescribed flat-flame burner in 1907 was Bray's "No. 7 Economizer," fitted over a Bray's "No. 4 Regulator," and in 1908 and 1909 Bray's "G-5 ft. 15/10." Table II. shows the minimum results reported for the testings of illuminating power with the standard argand burner for each of the three Companies.

Throughout the three years, the prescribed illuminating power as tested by this burner has been 14 candles for the South Metropolitan and Commercial Companies and 16 candles for the Gaslight and Coke Company. No forfeiture is, however, incurred by the Companies for a deficiency of less than 1/2 candle in illuminating power. Moreover, the illuminating power of the gas for any day on which the average result of the day's testings shows a deficiency not exceeding 1 candle is, according to the London Gas Act of 1905, defined as the average of the results of all the testings made at the same testing-place on that day and on the preceding and succeeding days. Hence, it is only when the minimum result of the testings of illuminating power at any testing-place on one day shows an illuminating power of 1 candle less than it ought to be that the Company are liable forthwith to incur a forfeiture in respect of the deficiency in the illuminating power on that one day. If the deficiency is less than 1 candle, they have the benefit of any excess of illuminating power on the preceding and following days to raise the average above the figure which is the minimum to which they can work without liability to forfeiture. Owing to the complexity introduced by this provision, which was inserted in the London Gas Act of 1905, to prevent the Gas Companies incurring a forfeiture for a mere momentary drop in illuminating power, it is impossible to say from the figures given in the official returns of testings by the London County Council that the Companies have in any case in which the deficiency is less than 1 candle rendered themselves liable to forfeiture.

It may, perhaps, be mentioned that the number of testing-places controlled by the London County Council is as follows: For the Gaslight and Coke Company, eleven; for the South Metropolitan Gas Company, six; and for the Commercial Gas Company, two. There are also three testing-places for the Gaslight and Coke Company's gas controlled by the Corporation of the City of London. The results of these testings are not generally accessible, and are not included in the summaries given in this article. The number of testings of illuminating power with the standard argand burner is three daily, taken at intervals of not less than an hour; and the illuminating power for the day is defined as the average of the results of the three testings.

TABLE I.—Average Illuminating Power (Candles) over the Whole Year.

Company.	Argand.			Flat-Flame.		
	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke .	16.72	16.93	16.52	11.82	12.14	11.30
South Metropolitan	16.39	16.57	16.34	11.03	11.25	10.70
Commercial . . .	15.35	15.11	14.75	9.21	9.42	8.96

TABLE II.—Minimum Illuminating Power (Candles) over the Whole Year (Argand).

Company.	1907.	19 8.	1909.
Gaslight and Coke	14.83	15.79	14.03
South Metropolitan	14.30	14.06	13.93
Commercial	14.00	13.59	13.00

It will be seen from Tables I. and II. that the average illuminating power of the gas supplied by the Gaslight and Coke Company was, during the three years, very nearly 1/2 candle above the standard prescribed by the Company's Acts. It would have been 0.8 candle above the prescribed standard, but for the fact that

* See "JOURNAL," Vol. CVI., p. 81; Vol. CVII., p. 304; Vol. CVIII., p. 101; and Vol. CXI., p. 98.

in the last quarter of 1909 the Company, by arrangement with the London County Council, worked to a 14-candle standard, thereby anticipating by a few months the drop from 16 to 14 candles which the Company's Act of last year sanctioned as from Jan. 1 last. In all the quarters of 1907, there were returns more than 1/2 candle below the prescribed illuminating power, and in two quarters more than 1 candle below it. In 1908, a deficiency of 1/2 candle was not reported on any occasion. In 1909, a deficiency of as much as 1/2 candle was not reported in the first quarter; but deficiencies exceeding 1/2 candle and exceeding 1 candle were reported in the second and third quarters respectively. In the fourth quarter of 1909, the minimum result was 14.03 candles, which is above the standard to which, as already stated, the Company were then working. The maximum results of illuminating power reported were 18.8 candles in 1907, 18.98 in 1908, and 19.32 in 1909. The flat-flame testings were made for "information" only; and there is no prescribed standard or liability to forfeiture in respect of them. The minimum results reported for the flat-flame tests on this Company's gas were 8.5 candles in 1907, 9.95 in 1908, and 7.93 in 1909 (the last quarter corresponding to a 14-candle standard of illuminating power).

The illuminating power of the gas supplied by the South Metropolitan Gas Company during the three years was on the average 2.43 candles above the 14 candles which it was required to be by the Company's Acts. The average for the year 1909 was very little lower than that for the year 1907—indicating that up to the end of last year the Company had not found it expedient, or perhaps practicable, to manufacture coal gas of lower illuminating power on the average than about 16.4 candles. The other two Metropolitan Companies were in a position to supply gas of lower illuminating power through the employment of water-gas plant, which the South Metropolitan Gas Company have never adopted. The maximum results reported for the illuminating power of the latter Company's gas were 18.7 candles in the year 1907, 19.66 in 1908, and 18.79 in 1909. The 1908 maximum figure indicates that even in London the No. 2 argand burner has been found practicable for use for testing gas of an illuminating power approaching that prescribed for Liverpool—a point on which there seemed to be some difference of opinion among the experts recently called in opposition to the Standard Burner Bill (No. 1). In no case in any of the three years did the illuminating power of the gas supplied by the South Metropolitan Company show a deficiency of as much as 1/2 candle; so that this Company have at no time been within measurable distance of incurring a forfeiture for deficiency of illuminating power. In fact, throughout all the three years there has been only one return of a result below the prescribed illuminating power of 14 candles, and that return was only 0.07 candle below it. The minimum results of the flat-flame testings made on this Company's gas were, in 1907, 8.9 candles; in 1908, 9.0; and in 1909, 7.65.

Omitting the results for the last quarter of 1909, when the standard to which the Gaslight and Coke Company were working was reduced, it will be seen that the 16-candle power mixed gas supplied by that Company has averaged for the three years pretty consistently 1/2 candle higher in illuminating power in the standard argand than the coal gas made by the South Metropolitan Company, who were working to a 14-candle standard. The average of the testings in the flat-flame burner was, however, higher for the Gaslight and Coke Company than for the South Metropolitan Company by 0.79 candle in 1907, 0.89 candle in 1908, and 0.89 candle in 1909. It would seem, therefore, that the mixed gas shows a slightly higher duty relatively to coal-gas in the flat-flame burner than it does in the standard argand burner; but the difference is not very great. It may be surmised that if the No. 1 "London" argand had been used in place of the No. 2 "Metropolitan," the relation between the results obtained with it and those of the flat-flame testings with the two different descriptions of gas supplied would have been totally different.

The results for the Commercial Gas Company are interesting, because the gas supplied by that Company is a mixed gas which is required to have an illuminating power of 14 candles, and is therefore comparable with the gas which the Gaslight and Coke Company have been empowered to supply since Jan. 1 last. On the average of the three years, the illuminating power in the standard argand has been 15.07 candles, which is 1.36 candles below the average illuminating power of the coal gas supplied to a 14-candle standard by the South Metropolitan Company. The mean illuminating power in the flat-flame burner is 9.20 candles, which is 1.8 candles below the mean illuminating power in the flat-flame burner of the South Metropolitan Company's coal gas. In no quarter of 1907 did the Commercial Company's gas fall below the prescribed standard of illuminating power; but in two quarters of 1908 results were reported which were below it to an extent of less than half-a-candle. In 1909, results were reported in all the quarters below the prescribed standard—in one quarter to an extent of less than 1/2 candle; in two quarters to an extent exceeding 1/2 candle, but less than one candle; and in the fourth quarter to the extent on one occasion of exactly one candle. The maximum results reported have been, in 1907, 18.8 candles; in 1908, 17.55; and in 1909, 17.82. The minimum results with the flat-flame burner have been 7.4 candles in 1907, 7.3 in 1908, and 7.52 in 1909.

Calorific Power.

The testings for calorific power have been made for "information" only on the gas supplied by all three Companies; and one test has been made at each testing-place daily, except that

Sundays are excluded by the London Gas Act of 1905 in so far as these "information" testings are concerned. The average, maximum, and minimum results of the testings of the net calorific power of the gas are shown in Table III. for each year for each of the three Companies. The gross calorific power has only been reported since the last few weeks of 1908. The average, maximum and minimum results of all the testings for gross calorific power in 1909 are shown in Table IIIA.

Since the Companies have not been required to work to any standard of calorific power, and have not been liable to any forfeiture in respect of low returns of the calorimetric testings, the results reported are interesting mainly in their bearing on the standard of calorific power to which gas undertakings may subsequently be required to work. In regard to the Gaslight and Coke Company, readers of the "JOURNAL" are well aware that, in their Act of 1909, the Company accepted, as from Jan. 1 last, the imposition of a standard of calorific power with liability to forfeiture in the event of a deficiency being proved. The standard prescribed in the Act is nominally 125 calories net per cubic foot; but the Company incur no liability unless they supply gas of less than $112\frac{1}{2}$ calories net per cubic foot. If one testing at any testing-place gives a result below the latter figure, a second testing has to be made after an interval of not less than one hour; and the average of the two testings is taken as the calorific power of the gas on that day. If this average is less than $106\frac{1}{2}$ calories, the Company are forthwith liable to incur forfeiture; but if the average for the day is between $106\frac{1}{2}$ and $112\frac{1}{2}$ calories, the average of the results obtained on that day and on the preceding day and on the following day is to be taken as representing the calorific power of the gas on that day, instead of the actual average of the testings made on the day. Hence, if the deficiency shown by the testings made on any one day is less than 6 calories, the Company have the benefit of any surplus of calorific power on the preceding and following days, in computing the statutory calorific power which is to be taken in assessing the Company's liability to forfeiture. It is only when the net calorific power of the gas falls below $106\frac{1}{2}$ calories that the Company are liable to forfeiture on the "catch-penalty" testings made on any one day.

TABLE III.—*Net Calorific Power (Calories per Cubic Foot) over the Whole Year.*

Company.	Average.			Maximum.			Minimum.		
	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke	132.8	131.7	128.8	157.4	158.4	144.6	119.3	118.3	116.0*
South Metropolitan	133.3	133.6	132.1	152.2	151.3	152.7	120.9	121.6	117.3
Commercial	127.6	126.5	125.6	143.4	139.2	136.5	116.2	114.6	115.2

* During the last quarter of 1909, the minimum result at one testing-place was omitted in one weekly report.

TABLE IIIA.—*Gross Calorific Power (Calories per Cubic Foot) for 1909.*

Company.	Average.	Maximum.	Minimum.
Gaslight and Coke	144.3	162.0	129.9
South Metropolitan	148.9	170.3	130.3
Commercial	140.8	151.7	130.0

It will be seen from the results shown in Table III. that the South Metropolitan Gas Company have consistently supplied their coal gas to an average calorific power about 8 calories above the standard now named for the 14-candle gas of the Gaslight and Coke Company. But it must be remembered that the average of 133 calories on the South Metropolitan Gas Company's supply over the three years corresponds to an average illuminating power of 16.43 candles; and if it were found feasible to produce coal gas of 14-candle power no doubt it would have a rather lower calorific power than that of the gas supplied by the South Metropolitan Company. Excluding the last quarter of 1909, the average net calorific power of the gas supplied by the Gaslight and Coke Company was about 131½ calories, which corresponded to an average illuminating power for the mixed gas supplied of 16.8 candles. On the other hand, the average net calorific power of the mixed gas supplied by the Commercial Company to a 14-candle standard was 126.6 calories, which corresponded to an average illuminating power of 15.07 candles. Thus, comparing the figures for the Gaslight and Coke Company and those for the Commercial Company, it will be seen that a difference of very nearly 1½ candles in illuminating power is, with mixed gas, attended by a drop of almost 5 calories in the net calorific power. If, therefore, the Gaslight and Coke Company were to supply gas to exactly 14 candle power (as their present Act requires), it may be estimated from past results that the average net calorific power would fall to about 123.8 calories per cubic foot, which is a lower figure than is named in their Act as the nominal standard of calorific power. It is the minimum result, however, which will determine the liability to forfeiture of any gas company who have a prescribed standard of calorific power. It will be seen that in none of the three years was there a minimum result reported for either of the three Companies lower than $112\frac{1}{2}$ calories, which is the forfeiture standard of the Gaslight and Coke Company. It may be that in the fourth quarter of 1909 a result lower than this figure was obtained, but not reported, as the minimum is omitted

in one week's report for one testing-place. Some of the figures, however, were not much above this standard. It will be noticed from Table IIIA, that there is a difference of about 8 calories in the gross calorific power between the coal gas supplied by the South Metropolitan Company and the mixed gas supplied by the Commercial Company, though both the Companies were working to a 14-candle standard of illuminating power.

Sulphur.

The average of the results of the sulphur testings and the maximum results are shown in Table IV. for the three Companies for the three years. It will be seen that the average shows an appreciable decrease in the past year as compared with previous years so far as the Gaslight and Coke Company and the South Metropolitan Company are concerned. The maximum results, however,

TABLE IV.—*Sulphur (Grains per 100 Cubic Feet) Contained in Gas.*

Company.	Average.			Maximum.		
	1907.	1908.	1909.	1907.	1908.	1909.
Gaslight and Coke	41.2	40.7	35.4	81.6	74.9	58.8
South Metropolitan	47.1	48.0	43.1	97.2	98.7	107.3
Commercial	32.3	28.5	34.0	61.1	57.2	72.2

continue to be erratic; and an exceptionally high figure was reported in the course of last year for the gas supplied by the South Metropolitan Gas Company. The other two Companies, having the benefit of the comparative freedom of water gas from sulphur, naturally are always able to work to a lower standard of sulphur impurity than the South Metropolitan Company, who do not use any water gas.

IN THE FIRST HALF OF THE YEAR 1910.

The figures for the first half of the present year are specially interesting, because of the reduction in illuminating power from 16 candles to 14 candles of the gas supplied by the Gaslight and Coke Company which was sanctioned as from Jan. 1, 1910, by that Company's Act last year. Actually, as already mentioned, the London County Council had agreed to the reduction being effected in the last quarter of 1909, so that it may be supposed that the Company had already, by Jan. 1, had sufficient time to accommodate their working arrangements to the new conditions, and that the supply during the last six months is really representative of their settled practice in these conditions.

Illuminating Power.

The illuminating power of the gas supplied by the three Companies during the first half of the present year is shown in Table V., in which are also given, for the sake of comparison, the figures for the corresponding halves of the years 1908 and 1909.

TABLE V.—*Illuminating Power (Argand) for the First Half of the Years 1908-1910 (Candles).*

Company.	Average.			Minimum.		
	1908.	1909.	1910.	1908.	1909.	1910.
Gaslight and Coke	16.84	16.74	15.27	15.79	15.37	13.88
South Metropolitan	16.39	16.50	15.93	14.06	14.50	14.00
Commercial	15.12	14.85	14.60	13.90	13.07	13.59

The actual periods referred to are the twenty-six weeks ending in 1908 on June 27, in 1909 on June 26, and this year on the 2nd inst. It will be seen that the fall of 2 candles in the standard of illuminating power enacted for the Gaslight and Coke Company has been translated in practice into a drop in the average illuminating power of the gas of only 1.52 candles. This is a good illustration of the fact, well known to gas managers, but hardly appreciated by opponents of gas undertakings, that a company rarely are in a position, even if they so desire, to take full advantage of any measure of relief they may secure in their statutory obligations in regard to the quality of gas to be supplied. The average illuminating power of the gas of the South Metropolitan Company shows a drop of about half-a-candle as compared with 1908 and 1909; and while it still remains 1.93 candles above the 14-candle standard, it is worth notice, as showing that the Company are at last effecting an appreciable reduction in the illuminating power of the coal gas which they supply. Hitherto the returns have indicated that it was not feasible to produce coal gas averaging less than 16-candle power, as tested by the No. 2 "Metropolitan" argand; but now that a definite reduction has been achieved, gas men will watch subsequent reports with interest to see if it is progressive until coal gas more nearly conforming to a 14-candle standard shall be produced. The Commercial Gas Company have succeeded in manufacturing mixed gas with an average illuminating power less in excess of statutory requirements than formerly. In the first quarter of the present year, of the three Companies only the Commercial had a minimum return below 14 candles; and in their case the deficiency was less than half-a-candle. In the second quarter, only the Gaslight and Coke Company had any return below 14 candles; and the deficiency shown by that return was less than half-a-candle. It will be seen, therefore, that all three Companies amply fulfilled their statutory obligations in respect of illuminating power during the past six months.

Flat-flame gas-burner testings have not been carried out daily by the London County Council during the present year, as was formerly the case; and consequently the average results of the testings made spasmodically with the flat-flame burner are not strictly comparable with the average results of the more frequent argand burner testings. For this reason, and on account also of their constantly declining importance, we are not collecting them in tabular form as previously. The average results of the few testings made with the flat-flame burner on the gas supplied by the Gaslight and Coke Company were 9.56 candles in the first, and 9.07 candles in the second quarter of this year. The corresponding figures were for the South Metropolitan Gas Company, 10.08 and 10.35 candles, and for the Commercial Gas Company 8.48 and 8.74 candles. In all cases, these testings show a drop on those for the corresponding quarters of previous years rather greater than the fall in the illuminating power of the gas as ascertained by the No. 2 "Metropolitan" argand.

Calorific Power.

The averages of the results of the testings of calorific power are shown in Table VI. Both the gross and net values are given, except for the first half of 1908, when the gross calorific power was not reported. The most noteworthy feature in the table is the fall in the calorific power of the gas supplied by the Gaslight and Coke Company, contemporaneously with the drop in the statutory illuminating power from 16 to 14 candles. The net calorific power now averages 123.2 calories per cubic foot, or

TABLE VI.—Average Calorific Power (Calories per Cubic Foot) for the First Half of the Years 1908-1910.

Company.	Gross.			Net.		
	1908.	1909.	1910.	1908.	1909.	1910.
Gaslight and Coke	145.9	138.6	131.7	130.3	123.2
South Metropolitan. .	..	150.0	147.2	132.7	132.9	130.9
Commercial	141.2	138.0	127.3	126.0	123.0

practically the same as that of the similar mixed gas supplied by the Commercial Company. This is lower than the returns for the latter Company in the past would have led us to expect (*vide supra*, where it was estimated from earlier returns that mixed gas of 14-candle power would have a net calorific power of 123.8 calories), and lower by nearly 2 calories than the nominal standard prescribed in the Gaslight and Coke Act of 1909. The 123.2 calories of the Gaslight and Coke Company, however, corresponds with an actual average illuminating power of 15.27 candles (*vide* Table V.), and the 123.0 calories of the Commercial Gas Company with an actual 14.60 candles. Careful comparison of these figures with those published in previous years for mixed gas of higher quality indicate that in present conditions of manufacture the average net calorific power of mixed gas of exactly 14-candle power would be about 117 calories per cubic foot, or some 8 calories below the 125 calories which was named in the Gaslight and Coke Company's Act as a sort of standard to which it was hoped 14-candle gas might aspire. It is clear from these considerations that the statements made by Mr. Corbet Woodall and Mr. W. J. A. Butterfield in their evidence recently, that the standard of calorific power enacted for the Gaslight and Coke Company was considerably higher than corresponded with mixed gas of 14-candle power, have been more than justified by the results of recent testings in the County of London.

The calorific power of the coal gas supplied by the South Metropolitan Company shows a slight fall in the past half year as compared with previous returns. It remains, however, some 8 calories higher than that of the mixed gas of the two other London Companies. The minimum returns of calorific power in the first half of the three years are shown in Table VII. It will be seen that the Gaslight and Coke Company, with a minimum return of 112.6 calories net, just escaped falling below the 112½ calories, which is the lowest figure to which the gas may fall without the Company becoming liable to incur a forfeiture (*vide supra*).

TABLE VII.—Minimum Calorific Power (Calories per Cubic Foot) for the First Half of the Years 1908-1910.

Company.	Gross.			Net.		
	1908.	1909.	1910.	1908.	1909.	1910.
Gaslight and Coke	132.2	126.6	121.0	117.5	112.6
South Metropolitan. .	..	134.3	135.8	121.6	122.3	120.8
Commercial.	130.0	118.3	114.6	115.2	106.1

The Commercial Company, on the other hand, had a return of 106.1 calories, which is lower than the 106½ calories which constitutes the one-day "catch penalty" limit for the Gaslight and Coke Company. The lowest return of illuminating power for the Commercial Company in the week in which the return of 106.1 calories net occurred was 14.08 candles. The Company do not become liable to incur a forfeiture in respect of a deficiency in illuminating power unless the average of three consecutive days' testings is not above 13½ candles, or of one day's testings not above

13 candles (*vide supra*). Yet with a margin of over 1 candle in respect of illuminating power, the Company would, if they were bound by the provisions of the Gaslight and Coke Company's Act of last year in regard to calorific power, have become liable last quarter to a forfeiture for deficiency of calorific power. Here, again, we have conclusive proof that the standard of calorific power fixed by that Act is too high for gas which is required to have an illuminating power of only 14 candles.

The standard of calorific power to which German gas undertakings are now generally working (voluntarily) is 5000 calories gross per cubic metre at 0° C., 760 mm., and dry. This is just equivalent to 522½ B.Th.U., or 131.6 calories gross per cubic foot measured in English conditions. It will be seen that the gross calorific power of the mixed gas supplied in London during the last half year averaged 6½ to 7 calories per cubic foot above the German standard, and that of the coal gas averaged 15½ calories above it. The minimum return for the coal-gas supply was also well above this standard; but the mixed gas of both the Gaslight and Coke Company and the Commercial Company fell appreciably below it on occasions. The view previously expressed in these columns, that the calorific standard provisionally recognized in Germany is too high for application to English conditions of working and of penalty-testing, is therefore fully upheld by recent returns of the testings made in London.

Sulphur.

The average and maximum figures for the results of the testings for sulphur are shown in Table VIII. for the first two quarters of the present year. There is a slight fall in the average amounts

TABLE VIII.—Sulphur (Grains per 100 Cubic Feet) Contained in Gas for the First Half of 1910.

Company.	Average.		Maximum.	
	First Quarter.	Second Quarter.	First Quarter.	Second Quarter.
Gaslight and Coke	34.9	35.0	68.5	59.3
South Metropolitan. . . .	36.2	32.8	70.7	68.6
Commercial	29.5	28.9	43.2	52.7

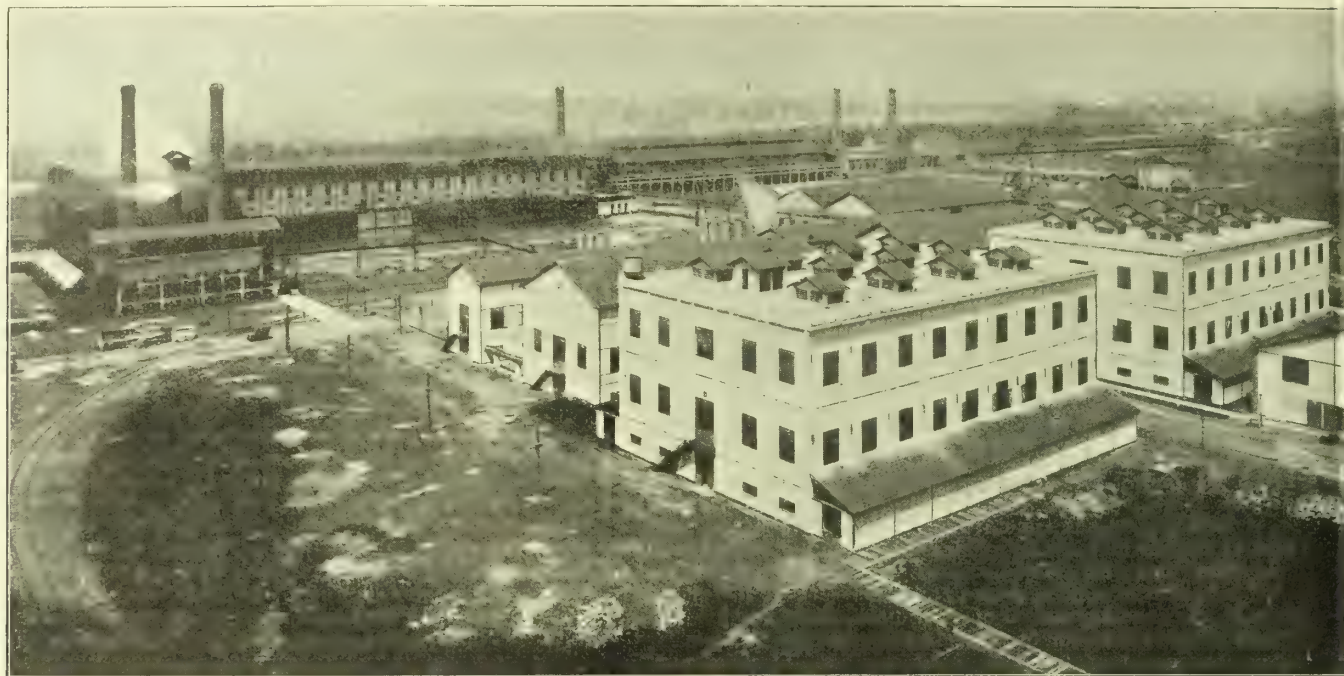
of sulphur found in the mixed gas of the Gaslight and Coke Company and the Commercial Company, as compared with the corresponding quarters of previous years. The coal gas of the South Metropolitan Company, however, shows a remarkable diminution in sulphur. The fall in the case of this Company set in about a year ago, and has been steady and continuous, as the following averages for the last six quarters show:—

Quarter . . .	1909.				1910.	
	First.	Second.	Third.	Fourth.	First.	Second.
Sulphur. Grains per 100 cub. ft. .	46.5	46.2	41.0	38.6	36.2	32.8

It will be seen that this coal gas now contains on the average no more sulphur than the mixed gas of the two other Companies. It would be interesting to know to what change in methods of purification or of working the decline in the average proportion of sulphur in the gas is due. The maximum sulphur returns for this Company are also commendably low as compared with those of previous years.

A Visit to the Glenboig Fire-Clay Works.

On the occasion of the recent annual meeting of the Society of Chemical Industry in Glasgow, a party consisting of members interested in the manufacture of fire-clay visited the works of the Glenboig Union Fire-Clay Company, Limited, at Glenboig. They were received by Mr. James Dunnachie, the Chairman and Managing-Director of the Company, and were shown over the works by Mr. Douglas, the Manager, and Mr. Allan, the principal of the office staff. An inspection was first made of the chemical laboratory, and a description was given of the sampling and testing of the raw material preparatory to its selection and preparation for use in the making of bricks, blocks, retorts, &c.; and the particular method of manipulation required for each product was explained. A tour of the works was then made; the visitors inspecting the moulding, finishing, drying, and firing of the goods. Much interest was evinced in the building and handling of gas-retorts, and in the special character and composition of the clay used. Another prominent feature of the visit was witnessing in operation the burning of fire-bricks by producer gas in the Dunnachie patent regenerative gas-kiln; the method of attaining the necessary high temperature; the quality of the goods fired, and the efficiency and economy of the system being readily recognized. Light luncheon was provided, after which Mr. Eustace Carey, on behalf of the members, thanked the Glenboig Company and their officials for the facilities given for inspecting the works, and expressed the pleasure afforded by the visit. Mr. Douglas replied on behalf of the Company.



General View (taken from the Gasholders) of the Gennevilliers Gas-Work.

TWO PARIS GAS-WORKS.

IN the review of the proceedings at the recent Paris Congress of the Société Technique du Gaz which appeared in the "JOURNAL" for the 28th ult., it was mentioned that visits were paid to the new gas-works of the Société d'Éclairage, Chauffage, et Force Motrice at Gennevilliers and to the works at Le Landy of the Paris Gas Company. We now give some particulars of each of these works, for the photographs to illustrate which we are indebted to M. René Masse, the General Manager of the former Company, and to M. Rouland, the Managing-Director of the latter.

THE GENNEVILLIERS GAS-WORKS.

The Société d'Éclairage, Chauffage, et Force Motrice commenced operations on Jan. 1, 1906, at which date they had to supply 68 of the suburban districts of Paris, having a population of 851,000. Previously, 60 of these districts had been served by the old Paris Gas Company, whose concession expired on Dec. 31, 1905. The 68 districts covered an area of 86,500 acres, and their outer boundary line was about 108 miles long. On Jan. 1, 1910, the Society's concessions extended to 83 districts, having a superficial area of 105,700 acres, and a population of 1,031,400. When the Society started, they had 48,841 consumers, served from 625 miles of mains, on which were also 14,390 public lamps. On Dec. 31, 1906, the figures were: Gas consumers, 65,357; length of mains, 937 miles; public lamps, 18,652; and gas consumption, 1819 million cubic feet. At the close of last year, the figures stood as follows: Consumers, 138,652; length of mains, 1194 miles; public lamps, 27,346; and gas consumption, 3067 million cubic feet.

The manufacture of gas is carried on in works which are equally well situated for access by rail or river, and are sufficiently large and are equipped with plant powerful enough to meet future development. There are, in fact, two exactly similar gas-works; but they are so arranged that, should necessity arise, they can act independently. At the commencement, their productive capacity was 7 million cubic feet per day. But it is now 14 millions; and this could be doubled with the plant and land at disposal. They occupy an area 142 acres in extent, and are situated just below Paris, at the intersection of the new line of the Northern Railway and the Seine. This line connects with the Girdle Railway, so that coal-trucks can be easily run into the works; and the river brings up colliers from the North and the Pas de Calais and lighters from the steamers at Rouen.

In order to ensure the regular distribution of the gas, which is manufactured at a place outside the area to be served, three supply stations have been established. One is at Gennevilliers, and consists of two gasholders, each of rather more than 2 million cubic feet capacity*; and the others are respectively at Alfortville and Boulogne-sur-Seine, at each of which places there is a holder of similar capacity to those at Gennevilliers. To feed the latter holders, which are situated 11½ and 16½ miles from the works, compressing plant has been erected there, and also suction plant in each of the holder stations, in case of any mishap at the point of output of the gas. These three centres of distribution are connected by two mains—one a trunk main running from Gennevilliers to the two holder stations without being tapped on

the way; and the other the principal supply main serving the branches leading to the network of pipes in each district. The chief distributing mains, which are of cast iron and have special india-rubber joints, are all 24 inches diameter; and their length is 38½ miles.* The principal west trunk main is a 28-inch one at Gennevilliers, and is reduced to 20 inches at Boulogne; the east main starts at 40 inches, and is reduced to 20 inches at Alfortville. The total length of these mains is 39 miles. In addition to the principal mains there are, of course, a number of secondary trunk and distributing mains. For an hourly output of about 176,000 cubic feet of gas, the pressure in the trunk mains does not exceed 28 inches of water. By means of compressing and other plant, the holder stations can be supplied at the rate of about 353,000 cubic feet per hour.

Having given some general particulars in regard to the Society, we will describe the leading features of the works.

COAL UNLOADING AND CARBONIZING PLANT.

Parallel with the River Seine there has been constructed in reinforced concrete a landing-stage 1000 feet long, which allows of the mooring at one time of seven lighters of 280 tons capacity, or five large colliers capable of carrying from 800 to 1200 tons. On the landing-stage are three electric cranes of 40 tons and one of 60 tons per hour, with a steam crane in reserve. There are likewise an arrangement of movable shoots for filling boats with coke; a towing-vessel of 25-H.P.; a pump-room containing a centrifugal pump of 150 tons capacity per hour and a force-pump of 10 tons capacity; and a small general room, with store, an office containing a weighing-machine, clothes and refreshment room, &c. The men engaged at the landing-stage are trained to plunge into the water cork-jacketed in order either to save life or to execute repairs to the structure or the boats.

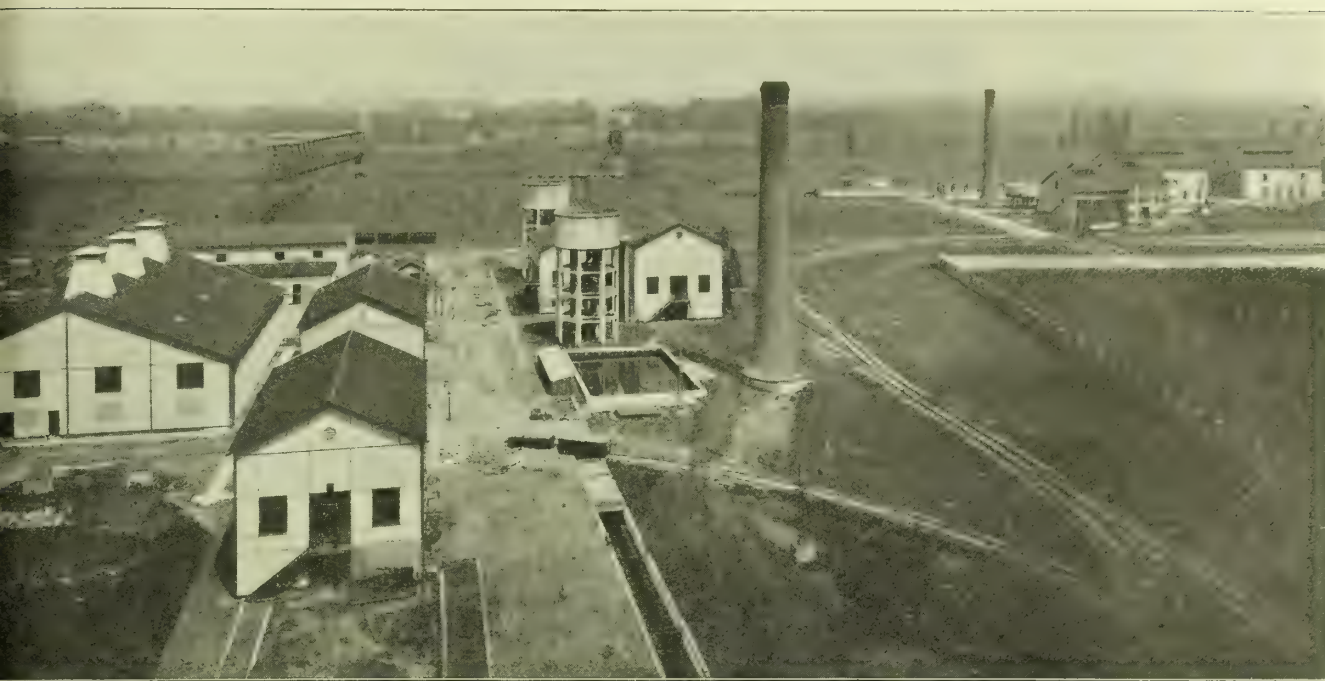
There are four retort-houses. Nos. 1 and 2, which were constructed in 1905, are alike, each having eight benches of three settings of nine 20-foot horizontal retorts—a total of 216 per house, or 432 for the two houses. No. 3, erected in 1906, contains four benches of six settings of nines similar to those in the other houses, giving a further 216 retorts. The furnaces in these three houses are all on the recuperative system. No. 4 house is equipped with inclined chamber settings of the Munich type, comprising two benches of ten furnaces erected in parallel, with three chambers, or 60 chambers in all. They were put up in 1908-9, and brought into use towards the close of last winter.

Nos. 1 and 2 retort-houses are parallel, and separated from each other by a passage 41 feet wide and 395 feet long, in which are the coal-bunkers. No. 3 house is similarly served; and provision is made for No. 4. The capacity of these bunkers is 5000 tons per house, or sufficient for about ten days' work. The charging-machines employed in Nos. 1 to 3 houses are of the De Brouwer, Sautter-Harlé, and Cabrier types; the two former also discharging. In Nos. 1 and 2 houses, the coke is removed by a band conveyor to inclined hoppers located outside, where it is quenched. Each of these houses is furnished with a skip elevator, which transfers the coke, after cooling, to storage hoppers of reinforced concrete constructed parallel to the retort-houses. These hoppers are of sufficient capacity to contain 36 hours' production of coke.

The fourth retort-house, as already stated, is equipped with inclined chamber settings on the Munich system. The charge for each chamber is 3½ tons; and the carbonization period is 24 hours.

* One of these holders was illustrated in the "JOURNAL" for Jan. 23, 1906 (p. 223).

* The joint referred to was illustrated in the "JOURNAL" for Jan. 8, 1907 (p. 87).



the Société d'Éclairage, Chauffage, et Force Motrice, of Paris.

The chambers are charged and the furnaces attended to outside the house; they are discharged in the space between the two benches, in which, of course, provision is made for the removal of the coke. As the Munich chamber settings have been fully described in the "JOURNAL," it is unnecessary to give details of them again. The installation at Gennevilliers, however, has some features of interest, in connection with the extinction and removal of the coke, to which attention may be directed. On leaving the chamber the coke falls into a quenching tower, where it is subjected to a short, but very heavy, shower of water. In order to avoid the use of flexible tubing or the making of connections on the position of the tower being changed, the supply of water is obtained by means of movable syphons in troughs which are kept filled in the upper part of the house. The tower moves above a De Brouwer conveyor, on to which the coke falls after only a few minutes' interval. By this it is carried to a bucket conveyor which rises perpendicularly. The coke is finally cooled in the open air, and the buckets are made to discharge their contents at any determined place on a movable platform of a special kind, which is the subject of a patent taken out by the Society in 1908.*

COKE-HANDLING PLANT.

The coke is conveyed to its destination either in skips mounted on trolleys or in hopper-waggons. If it is to go to the coke-ground, the former are used. If, however, it is to be screened and sorted, it is conveyed in waggons to bucket elevators, by which it is raised into the sorting-house, which consists of a series of receptacles constructed of reinforced concrete, having above them two "jigger" tables. This installation will deal with about 27,500 bushels of coke per day. The ground is nearly to acres in extent. The coke-handling plant includes some large inclined screens for separating the breeze from the coke, and movable dredgers by which the classified coke can be taken from the stack and put into sacks for sale.

PURIFYING, MEASURING, AND STORAGE PLANT.

On leaving the retort-houses, the gas is conveyed by air-cooled foul mains to the condensers, from which it passes successively through the exhausters, washers, purifiers, and station meters to the gasholders. The condensers are built about 38 feet high, and 39 inches external and 24 inches internal diameter. The gas circulates in the annular portion, the air in the centre; the supply of the latter being regulated by clock-valves in the base. Each of the two exhauster-houses has a total capacity of 530,000 cubic feet per hour; the equipment being three groups of two exhausters, each group operated by a steam-engine, but arranged also for electric driving in case of need. Each of the two washer-houses contains a Pelouze and Audouin condenser, a cyanogen washer, two sets of refrigerators for bringing the gas down to suitable temperature, and an ammonia washer. There are three purifier-houses, each of a capacity of from 5½ to 7 million cubic feet of gas per 24 hours. The two houses first constructed, dating from the starting of the works, each contain eight boxes about 30 feet square with hydraulic seals. They are located on the first floor; the purifying material being prepared on the ground level and revived on the second floor, to which it is raised by skips worked by a travelling crane. The third purifier-house, finished this year, contains eight purifiers, 48 ft. 9 in. by 17 ft. 9 in., with dry joints. These purifiers are on the ground level, and occupy half the house; the other half being utilized for the preparation and revivification of the material. The two station-meter houses each contain two meters of rather more than 3 million cubic feet

daily capacity, with room for a third. The two holders (referred to at the outset) have each three lifts; the last rising above the guide-framing. They work in wrought-iron tanks. Between the two there is plant for heating the parts of the tank liable to be affected by frost.

EMISSION, COMPRESSING, AND ENRICHING PLANT.

The gas is sent out from the works in three trunk mains in the direction of Alfortville, Boulogne-sur-Seine, and St. Denis. Some particulars of these mains have already been given. The compressing plant occupies a special building. It consists of three groups of rotary compressors, of a capacity of 176,000 cubic feet per hour. Each group comprises two compressors coupled to one steam-engine, but arranged for being separately driven by electric motors. One group compresses the gas going to Alfortville, another that for Boulogne, and the third is kept in reserve. Two return governors complete the installation.* The gas is benzolized at Gennevilliers, Alfortville, and Boulogne. At the first-named station there are complete experimental gas-works of a capacity of about 210,000 cubic feet per day.

TRANSPORTING PLANT, ROLLING STOCK, AND MOTIVE POWER.

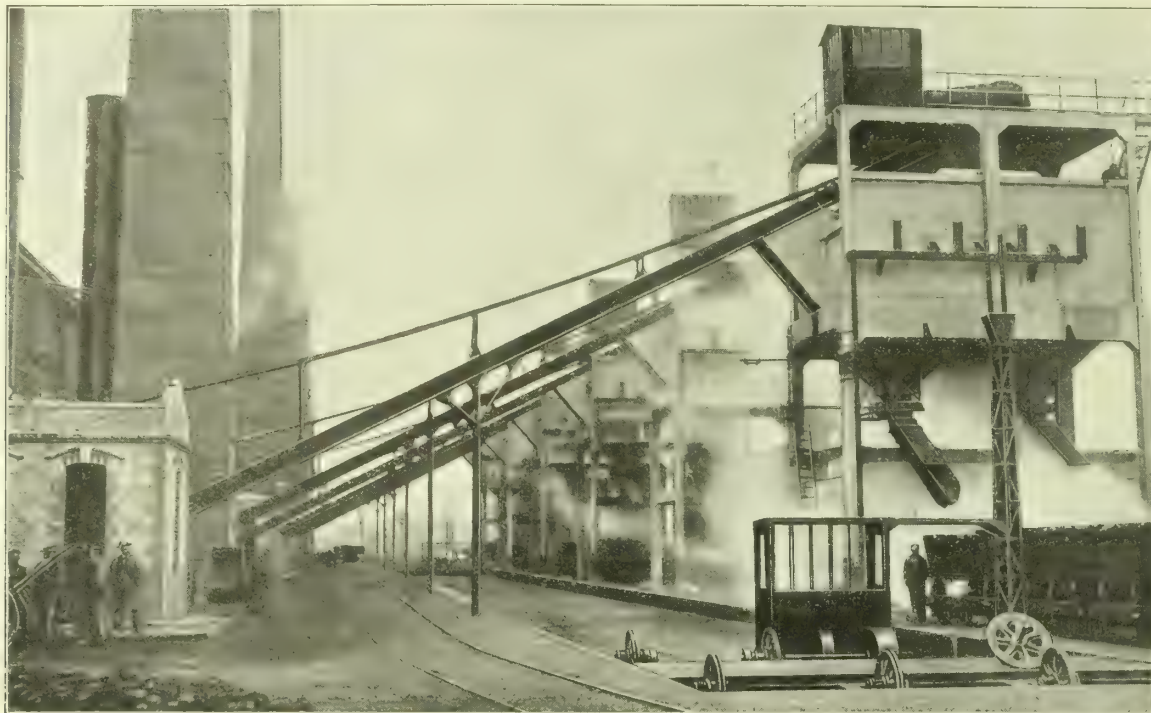
The transporting plant was shown in the views of the works given in the "JOURNAL" for the 1st of March last, which were taken when the place was under water. There are four transporters—two for the coal and two for the coke ground—each of a capacity of from 600 to 800 tons per day of ten hours. The coal-transporters have one crane only; while those used for moving the coke have two, each about 50 feet long. There are at the present time something like 15 miles of lines upon the works. The rolling-stock comprises five steam locomotives, each of 150-H.P. effective, and equal to a load of 21 tons; 25 hopper trucks, opening at the bottom; and 30 large and small trolleys. The motive power consists of two sets of plant—one consisting of three boilers placed near the retort-houses; and the other of six boilers, located in a building situated behind the engine-room. The boilers are heated exclusively by coke breeze. The continuous current at 500 volts which is utilized in the works is produced by three turbo-generators, each of 400-kilowatt power at 2000 revolutions. The current is distributed by a switchboard placed in the engine-room. The water for the supply of the works is drawn from wells or from the Seine, and is distributed by means of electric pumps.

PRODUCTS WORKS.

The works for the treatment of the residual products comprise a sulphate of ammonia house, tar distillery, sulphuric acid plant, and laboratory. The sulphate plant consists of two sets of apparatus exactly alike (the saturator being of the Society's own special design), each capable of dealing with some 26,500 gallons of liquor per 24 hours. The salt is stored in receptacles constructed of reinforced concrete, capable of holding about 800 tons. The tar-distilling plant is also in two sets, each consisting of one preparatory boiler and two stills, each of 40 tons capacity. The heavy oils are run into four vats of reinforced concrete, which will hold about 440,000 gallons; and there are three small sheet-iron reservoirs for the light oils. There are four pits for the reception of the pitch, and they will contain altogether 3500 tons. There is nothing special about the sulphuric acid plant.

* The compressing and exhauster plant was illustrated in the "JOURNAL" for Jan. 29, 1907 (p. 278).

* See "JOURNAL," Vol. CIV., p. 213.



Coke Towers and De Brouwer Conveyor at the Paris Gas Company's Station at Le Landy.

OTHER FEATURES OF THE WORKS.

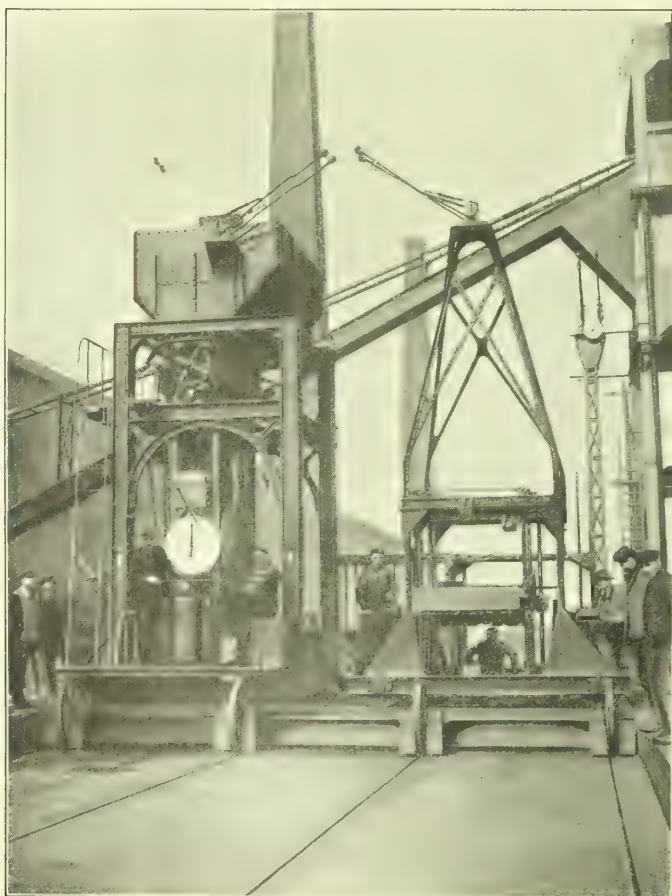
A feature of the Gennevilliers works is the collection of motor-waggons used for the delivery of coke sold by retail. There are fifteen of them of 24-H.P., with four twin cylinders, weighing when empty rather more than $3\frac{1}{2}$ tons, and taking a load of nearly equal weight; and one, of the Society's special type, of 30-35-H.P., weighing $4\frac{1}{2}$ tons empty, and carrying a load of 5 tons. These motor-waggons ensure deliveries of coke within a radius of eight to nine miles of the works, and they dispose of as much as 150 to 180 tons a day. There are, in addition, three similar waggons for outside service, located at Alfortville and Boulogne. One of these vehicles is ready for use, night or day, in case of accident.

It only remains to say that these very fine works include dwelling-houses for the Engineer (M. Raoul Frère) and the principal officers, who have the use of a plot of land outside the boundary wall for cultivation; an infirmary; a fire service of 40 men; and a musical society with a like membership. There are also benefit, provident, and pension funds for the employees.

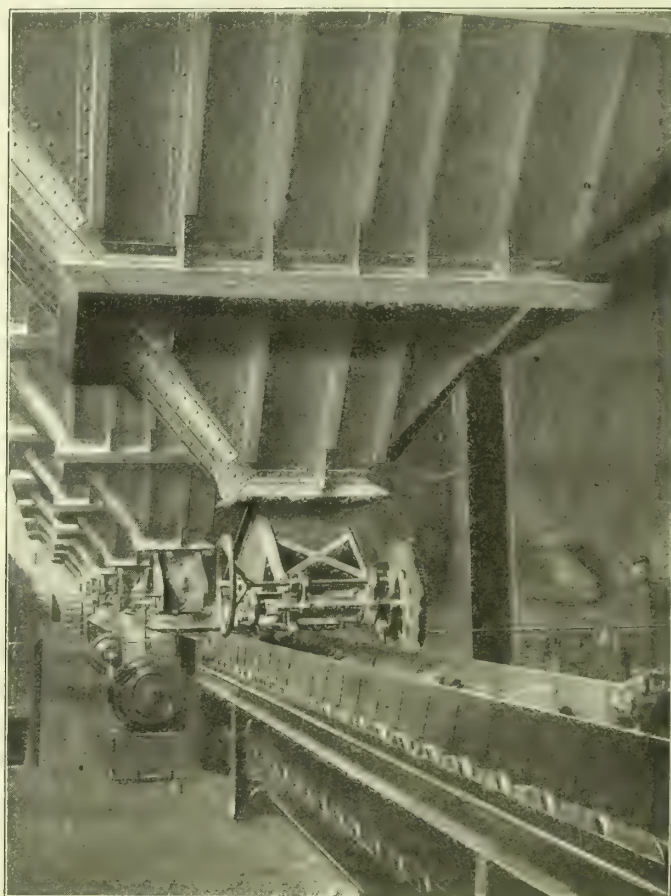
On the occasion of the visit of the Société Technique members last month, the firemen and musicians afforded them an opportunity of judging of their efficiency; and both displays evoked well-merited approbation.

THE PARIS GAS COMPANY'S WORKS AT LE LANDY.

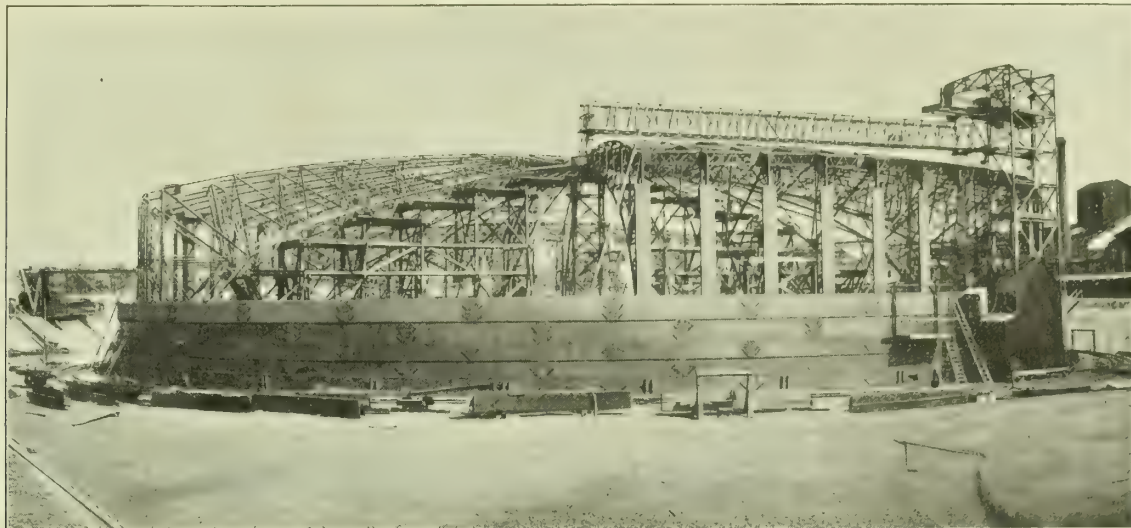
The gas-works at Le Landy, a north-eastern suburb of Paris, are the most recent of those constructed by the old Paris Gas Company—having been erected in 1889. Their superficial area is about 118 acres. Up to within the past few years, there was only one retort-house, containing 648 ten-foot hand-stoked retorts; the daily production of gas being rather more than 6 million cubic feet per day. The Company's concession expired on Dec. 31, 1905; and their successors, the Société du Gaz de Paris, put up in 1908 a second retort-house of similar capacity to the other, but equipped with mechanical stoking appliances. Last year they altered the



Charging and Drawing Machines at Le Landy.



Coal Hoppers and Conveyor at Le Landy.



One of the 5½ Million Cubic Feet Gasholders in Course of Construction at Le Landy.

old house to machinery; and by the end of the current year the works will possess four houses all alike, with a total productive capacity of nearly 24½ million cubic feet of gas per day. Shortly afterwards, sister works, of like capacity, will be commenced on a contiguous site, almost as extensive as the other; and they will include products works and a tar distillery.

COAL SUPPLY AND CARBONIZATION.

The coal is delivered into the works by rail and water—the former being a branch of the Northern Railway, and the latter the St. Denis Canal. It is removed from the barges by means of two steam-cranes of a capacity of 300 tons per day of ten hours. When the works in hand are completed, the quantity of coal carbonized per annum will be 600,000 tons. It is stored in the open and also in bunkers before the retort-houses; their total capacity for the four houses being about 10,000 tons. Thence it is carried by band conveyors to the breakers, from which it is raised by a Hunt conveyor to the coal-hoppers placed at the end of each bench for the supply of the charging-machines. Their capacity is 100 tons each, or sufficient for 24 hours' carbonization.

Each of the retort-houses—two of which are at work and the others in course of equipment—contains six benches of six settings of nine 20-feet through retorts, taking 11½ cwt. of coal in eight-hour charges, which are inserted by De Brouwer machines and withdrawn by those of Sautter-Harlé. The coke is quenched and removed by a De Brouwer chain conveyor, which carries it into hoppers of reinforced concrete, whence it is taken by trains to the coke-shed. All these machines are worked by electricity.

CONDENSING, PURIFYING, AND OTHER PLANT.

On leaving the retorts, the gas passes into the hydraulic mains. The benches in No. 1 house have two independent mains, one on each front; but those in No. 2 house have only one, in the middle, with two ascension-pipes to each retort. In connection with these two houses there are two vertical atmospheric condensers; but the other houses have those of the water-cooled tubular type, two to each bench, and they are placed as close as possible to the settings. There are three rotary exhausters, two of 3 million and one of 2½ million cubic feet capacity; and three of Beale's exhausters of 4½ millions capacity. A new building will contain four more of them, so as to correspond with the future increase in the carbonizing plant. Battery condensers and Kirkham and ammonia washers prepare the gas for the purifiers. In four houses these are of the old type, and allow of three consecutive passages of the gas. Houses Nos. 5 and 6, in course of construction, will contain two groups of four boxes—that is, eight boxes in all, of which six will be in use simultaneously, and they will be changed in rotation. These boxes will be furnished with Jäger grids.

There are thirteen station meters—four old ones, of 1,400,000 cubic feet capacity, and nine "Duplex," equal to passing 2,100,000 cubic feet. But only three of the latter are in use. There are eight gasholders—five old ones, of the single-lift type, of about a million cubic feet capacity, and three new three-lift ones, capable of storing 5½ millions; making a total, in round numbers, of 21 million cubic feet. On the occasion of the visit of the Société Technique, much interest was displayed in the two new holders under construction; many of the members descending into one of them to inspect the work going on.

COMPRESSING AND DELIVERY PLANT, ETC.

The gas can be sent from the works either at the pressure given by the holders, through station governors, or at high pressure, by means of Rateau compressors. M. Laurain, the Chief Engineer of the Company, explained to the visitors that the pressure at which gas is supplied in Paris had been raised, and was generally 36-roths; only falling to 30-roths in the early hours of the morning. This has given much satisfaction. There are two outlet mains, each 30 inches diameter—one being for ordinary and the other for either ordinary or high pressure. Other outlet mains are in contemplation. A 28-inch main is used to convey high-

pressure gas to the holders at La Villette; and another, of similar size, will eventually feed those at Clichy.

The electric energy required at the works is generated at a central station equipped with eight Niclausse boilers, worked by coke breeze, and two engine-rooms, each containing two groups of generators, horizontal compound tandem engines of 650-H.P., continuous-current compound dynamos of 400 kilowatts per 250 volts, as well as a pressure-raiser for the service of a battery of accumulators.

ASSOCIATION OF CONSULTING ENGINEERS.

A New Organization.

A Meeting was held at the Caxton Hall, last Wednesday, to consider the desirability of forming an Association of Consulting Engineers; the object being to constitute a recognized group of *bonâ fide* independent consultants for the protection of their own interests and those of the public generally, and to improve the status of the profession. Sir William Preece, a Past-President of the Institution of Civil Engineers, presided. Invitations had been issued to a number of consulting engineers, at the instance of a Provisional Committee, of which Mr. Charles Hunt and Mr. E. H. Stevenson are members, representing gas engineers, and Mr. A. H. Dykes is the Hon. Secretary.

In explaining the object of the meeting, Mr. Midgley Taylor said the question of forming an Association such as the one proposed had been before several consulting engineers for the past two years; and as some initial step had to be taken, the members who originally considered the subject formed themselves into a Provisional Committee and had held a large number of meetings, with the result that the present gathering had been called to confirm or otherwise the action taken in the past. He wished to emphasize the point that the Committee had not been working in any antagonism to the Institution of Civil Engineers, but had been endeavouring to "go one better" than was possible for that body. It was felt that the public required protection. At present, if municipal authorities erected works, even of large magnitude, they were not compelled to employ a qualified man to advise them; and there was nothing to prevent an absolutely unqualified one going to the particular authority, touting for the work, and being employed. Under these circumstances, he felt they should endeavour to form an Association such as would not only protect themselves, but would protect various public bodies and persons in this country.

A resolution in favour of the formation of the Association was then proposed by Mr. James Swinburne, and seconded by Mr. E. L. Mansergh. A general discussion followed, in the course of which Mr. E. H. Stevenson said he wished such an Association had been started twenty or thirty years ago; and though it might not now affect the older consulting engineers, like himself, it would be of the very greatest assistance to the younger ones. Sir William Preece said he was entirely in sympathy with the movement. What they wanted was to band themselves together as brothers in a similar profession, with a strong Committee and a strong Chairman. He then put the motion to the meeting, and declared it carried unanimously.

The list of names of the suggested Committee was then read, as follows: As representing Civil Engineering—Messrs. Baldwin Latham, S. R. Lowcock, E. L. Mansergh, Henry Rofe, and Midgley Taylor. Electrical and Mechanical Engineering—Messrs. Robert Hammond, B. M. Jenkin, W. M. Mordey, W. H. Patchell, Sir William Preece, J. F. C. Snell, and James Swinburne. Gas Engineering—Messrs. Charles Hunt, E. Herbert Stevenson, and Henry Woodall. No further names being forthcoming, the Committee were elected as above, with power to add to their number; and Mr. A. H. Dykes was elected Hon. Secretary, with offices at No. 1, Victoria Street, Westminster.

EXAMINATIONS IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

[THIRD ARTICLE.]

It has previously been pointed out that it is a most difficult problem to ascertain accurately the relative competence of students during an examination extending over only four hours. Adequate preparation for such an examination has occupied a student for many leisure hours extending over a period of something like 30 weeks. Such a system of examination always involves a slight element of luck or ill-luck for those candidates who come to the examination room inadequately prepared. They may be fortunate enough to secure a diploma which is more than they deserve; but this will be due to "striking" a set of questions upon most of which they have had the good fortune to acquire either theoretical or practical knowledge. The enthusiastic and really ambitious student will leave nothing to the caprice of luck or ill-luck. If he be an Ordinary Grade candidate, he will begin at the beginning of the syllabus, taking the items enumerated therein one by one and master thoroughly to the best of his ability the essential principles and practice underlying such items. If he is an Honours Grade student, he will first of all refresh his memory, and, if possible, his practice, in the Ordinary Grade syllabus, and then carefully attack the subjects mentioned in the Honours Grade. If the candidate is of the right metal, he will set as his ambition one of the medals which are offered for the particular grade in which he is studying. Not that the be-all and end-all of preparation is the securing of an award in the shape of a medalion, but that it is emblematical of thoroughness, and of studies which have been complete and adequate to the subject concerned. It is difficult to believe that any student can possibly secure the highest awards without the highest degree of assiduity in both his studies and his work.

Honours Grade Questions.

- 1 (A). Describe fully the operation of fixing a service clamp or clamps to a high-pressure main, and give sketches of the type of clamp or clamps you would employ. What tools and fittings will be required to complete the service connection?

The form of service clamp shown in the sketch is Mueller and Co.'s "Improved National" (fig. 1). The body is of malleable cast

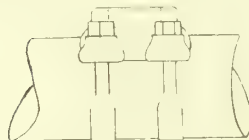


Fig. 1.

Fig. 2.

iron, with a rib cast on to strengthen it. The boss is made thick enough to give a full, deep thread for the service attachment. The clamp is kept firmly in position on the main by two bands or straps. These are secured by nuts at each corner, and are made of the best soft steel screwed at each end, and bent to exactly fit the main. A groove is left in the bed of the clamp to receive a moulded lead ring (fig. 2), the lugs of which are bent over the side of the clamp to prevent lateral movement.

To fix a service, the main is thoroughly cleaned where the clamp and service is to be attached. The lead ring is placed on the main, the straps passed underneath, and then the clamp put on the main, the groove in the bed of the clamp fitting over the lead ring. The whole attachment is then firmly secured to the main by means of the nuts. A short piece of tube is next screwed into the boss of the clamp to hold the Mueller drilling apparatus. The drill spindle passes through a stuffing-box, which keeps the apparatus gas-tight until the drill is withdrawn.

The tools required would be: Pipe-wrench, pipe-cutters, vice, hammer, chisel, spanners, screwing machine, and Mueller's patent drilling apparatus, with the usual excavating tools.

- 1 (B). Give sketch and description of governor suitable for reducing the gas in a high-pressure main to normal pressure, and state the precautions necessary to ensure satisfactory working.

The Johnson-Reynolds service governor (see fig. 3), is an efficient type for the purpose. X is the gas inlet, and Y the outlet. A screw W is inserted, as shown, to adjust the spring V. R is an air-vent in the top of the governor, and carried outside the premises. The diaphragm S is connected to the valve T by a lever.

The pressure from the high-pressure main

is adjusted by the screw W, which works the spring and, consequently, the diaphragm and lever; thus adjusting the valve as required.

The diaphragm must be kept well softened

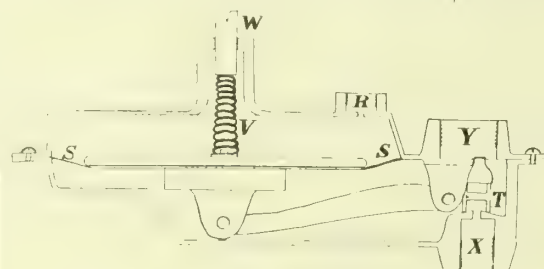


Fig. 3.

by pouring in oil at the air-vent; the dry nature of the compressed gas tending to cause the diaphragm to crack.

The valve should be kept perfectly clear of dirt or grit, as this would soon interfere with the working of the governor. As a safeguard,



Fig. 4.

a mercury seal (fig. 4) is used, and is fixed between the governor and meter; and excessive pressure which may be thrown on the meter through failure in action of the governor is in this way avoided.

2. Show, by means of sketch in elevation, a circulating gas water-heater, with the connections to compensating tank and a hot-water radiator as used in public buildings. What fixing precautions are necessary when a complete installation is carried out. Give calculation of the gas required to heat, by hot water system, the air in a hall of the following dimensions: Total length 150 ft., width 60 ft., height to apex 25 ft., and to eaves 13 ft., assuming the rate of air change to be five times per hour and the average increased temperature required 10° Fahr.

The precautions necessary are: Water-heater (A) should be of sufficient size to meet requirements. The burner should be well constructed,

Looking for a moment over the examination questions which were set in April last, it is to be observed that there is no preponderance of questions in any one phase of "Gas Supply." The last-issued programme of the Department of Technology contained, in the Ordinary Grade, ten sub-sections; and in every one of these sub-sections at least one question was set at the examination. In the Honours Grade, there were eleven sub-sections; and the questions set had relation to at least nine of these sections, as well as more advanced knowledge of certain subjects included in the Ordinary Grade syllabus. When an examiner traverses a syllabus in this way, a candidate will be more than ordinarily gifted with faith if he expects to go through the ordeal of examination with inefficient preparation.

These remarks are offered as a word in season to those students who contemplate taking the course during the coming winter, with the object of offering themselves as candidates next year. Certain coaching courses are being offered to candidates; but the most efficient coaching cannot guarantee good results unless the candidate is prepared to work. The chief advantage of a coaching course is that it tends to continuity of study in those cases where some such exterior influence is necessary to keep the student with his "nose to the grindstone." Given the practical opportunity of acquiring knowledge and the availability of suitable textbooks, a student imbued with proper enthusiasm may "plough his lonely furrow" with success. Such enthusiasm, is unfortunately, rare, and as a general axiom it may be laid down that most students will be well advised to attend a regular series of lectures, or else adopt a coaching course of good repute.

Subjoined are answers to the questions set in the Honours Grade this year.

and the supply of gas regulated with a thermo-valve. An adequate flue pipe should be provided, broken as shown at B, to prevent draughts or excessive up-draught. The pipes from the circulator (A) to the radiators (C) should be of adequate size, and sharp turns avoided.

The first radiator should be the lowest of the system, if the flow-and-return pipes can be fitted under the floor. A vertical air-pipe D should be fixed at the highest point to allow air bubbles and any generated steam to escape. The radiator, both inlet and outlet, should be fixed to the flow pipe, with a valve on the inlet so that the heat can be regulated. A pipe E should be branched from the return pipe and carried above the height of the

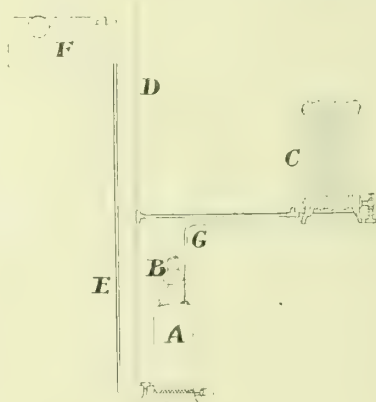


Fig. 5.

radiators, at the top of which should be a cistern F for filling in the water, and to provide room for expansion when heated. All joints must be sound, and the pipes laid with a slight fall. The hot-water pipe (G) from the circulator must be taken from its highest point; the connection being formed with a bend, not an elbow.

The gas supply pipe must be of ample size, and even pressure must be maintained.

Cubical contents of room:

$$\begin{aligned} 150 \times 60 \times 12 &= 117,000 \\ 150 \times 6 \times 60 &= 54,000 \\ \text{Total} &= 171,000 \text{ cubic feet,} \end{aligned}$$

multiplied by the number of times the air is changed per hour—viz., 5—which gives 855,000 cubic feet of air passing through room per hour. $855,000 \times .08$ (weight of 1 cubic foot of air in pounds) gives 68,400 lbs. 1 B.Th.U. will heat 4 lbs. of air 1° Fahr. Therefore the number of

cubic feet of gas required to heat the air 10° and of 600 B.Th.U.'s net will be $\frac{68,400 \times 10}{4 \times 600}$ equals 285 cubic feet of gas per hour. Allowing an efficiency of 90 per cent. for the circulator, 31 cubic feet must be added to this, or a total consumption of 316 cubic feet per hour.

- 3 (A). What tests should be employed to ascertain the thermal efficiency of gas cooking-stoves and the hygienic effect upon the air of rooms?

Boiling Burners.—A copper pan with a good-fitting lid is used. Through a hole in the lid is passed a delicate thermometer, with the bulb near the top. The lid is then put on, and the temperature of the water in the pan noted; moving the thermometer about before reading. The flame is then regulated, so as not to play up the sides of the pan, which is placed over the burner. Gas burnt is measured through a test meter; the register being taken simultaneously with the placing of the pan on the burner. The temperature is raised to a certain point, which is noted, along with the consumption of gas. It takes 1 B.Th.U. to raise 1 lb. of water 1° Fahr. Therefore, by calculation, the calorific value of the gas being known, the B.Th.U. imparted to the water in the pan is obtained, and the efficiency of the burner, by comparison with the total B.Th.U. in the gas used.

Grill Burners.—A series of $\frac{5}{8}$ -inch copper tubes, all connected together, are taken and formed in such a way as to give as much surface as possible to the heat thrown off by grilling burner. At each end of the series, thermometers are fixed. A test meter is used, as before. Water is caused to pass through the series of tubes at a slow rate; the tubes being placed underneath the grilling burner, as in actual use. The temperature of the inlet and outlet water is taken; the difference noted along with the consumption of gas; and the efficiency calculated as before.

Oven Burners.—Thermometers may be inserted at a number of points through holes in the top of the cooker. The gas consumption is adjusted to a definite amount; readings of thermometers being taken each minute until a maximum is reached.

Then a sample of the flue gases may be taken and analyzed for carbon dioxide, oxygen, and nitrogen, to ascertain whether the ventilation is excessive or deficient.

In pure air, there is 20.7 per cent. of oxygen and 79.3 per cent. of nitrogen. The difference between 20.7 and the amount of oxygen found by analysis will be the quantity of oxygen used for combustion. Approximately, the degree of ventilation may be arrived at by dividing the figure of free oxygen by the figure of oxygen used. In the upper part of a gas-oven, just as in the waste travels of a regenerative setting, the analysis should show only a trace of oxygen. If amount is considerable, the damper should be decreased and test repeated.

By taking (1) atmospheric temperature, (2) temperature of flue products, (3) analysis of products to ascertain how much is passing per hour, (4) gas consumption, (5) calorific value, the relation of heat generated to heat lost in flue may be ascertained by calculation.

The information thus obtained will only be of practical service where cookers are fixed without flues. Where cookers are attached to

flues, only a practical cooking demonstration *in situ* and careful observations will indicate the correct amount of ventilation required. This may be repeated for different cookers.

The efficiency will depend on the quantity of matter in the oven; but to obtain the best results, over-ventilation must be reduced to a minimum. It is obvious that the greater the quantity of matter in the oven, the greater the surface to arrest the heat, and, consequently, less proportionate waste.

The chief hygienic effect of cooking stoves on the air of rooms is the substitution of carbon dioxide for the oxygen of the air. The extent to which the carbon dioxide in the air is increased may be ascertained by means of a saturated solution of barium hydrate introduced into a Wanklyn's bottle previously filled with a sample of the air to be tested. Phenol phthaleine is used as an indicator; and the contents of the bottle, after being well shaken, are titrated with a standardized solution of oxalic acid.

3. (B.) What are the advantages and disadvantages of flue-pipes used in conjunction with gas cooking-stoves?

Advantages.

- (1) Ensures smell of cooking, steam, and products of combustion being carried away (provided flue is clear and no down-draughts).
- (2) Ensures ventilation of oven; thus preventing "smothering out" of burner flames by carbon dioxide.
- (3) Prevents rise in temperature of room, and therefore more pleasant to the occupants.
- (4) Healthier surroundings—i.e., purer air.
- (5) Avoids discolouration of walls, by condensed products, &c. (heated products, steam, &c., ascending the flue).

Disadvantages.

- (1) Possible unsightliness.
- (2) Cooling effect through over-ventilation, the rate of "pull" varying with the alteration of outside temperature, strength, and direction of wind. A damper is therefore necessary.
- (3) Possibility of down-draughts, with the "smothering" or blowing out of flames, and consequent risk of explosion if light is applied.
- (4) If flue gets made-up, it is sometimes difficult to clear.
- (5) Dirt and soot may be blown down flue into oven.
- (6) Condensation of products may take place in the flue and run back into the oven carrying dirt, &c., with it, rapidly corroding the flue, particularly if made of galvanized iron or tin.

The best and safest arrangement is a hood over the hot-plate, and the oven flue-pipe carried under it; a pipe out of the hood carrying all the products away from the oven and the hot-plate.

4. Assuming either of the two following types of gas compressors are equally convenient for lighting business premises, which would you prefer, and why: (a) Gas-driven rotary; (b) hydraulic? If a compressor of the last-named type failed, how would you proceed to ascertain the cause, and remedy defect or defects?

Gas-Driven Rotary.

Points For.

- (1) Certain in action.
- (2) Less risk of deposits clogging mechanism than in hydraulic type.

- (3) Less time taken in overhauling.
- (4) Less intricate parts to go wrong.
- (5) Working depends strictly on gas supply—i.e., the aid of water supply not required for motive power.

Points Against.

- (1) Initial cost greater unless a gas-engine has been previously installed.
- (2) More space required.
- (3) Rather more costly to run.
- (4) More attention required.

Hydraulic.

Points For.

- (1) More compact.
- (2) Less initial cost.
- (3) No noise.
- (4) Less ground space required.
- (5) No skilled attendant necessary.
- (6) Apparatus works automatically.
- (7) Cheaper to run.

Points Against.

- (1) Not as certain in action.
- (2) There are a large number of intricate parts which may go wrong.
- (3) Difficult to overhaul.
- (4) Depends for its working on water pressure, which is not as convenient to correct as gas.

From the above, it would almost appear that the points for the hydraulic type outweighed those of the gas-driven type; but the writer, from experience, prefers the gas-driven rotary type, because he has found the working much more certain and accurate. It will be noted that the advantages claimed for the hydraulic type are, in the main, more trivial and of a more theoretical nature than those of the gas-driven rotary; while the disadvantage No. 2 of the hydraulic is of a serious nature. The disadvantages of the gas-driven rotary after the installation has been fixed and working are few and trivial.

The causes of failure and remedies for hydraulic compressors are as follows.

Cause.

- (1) Stoppage of motor probably through too little water pressure, main valve too stiff, worn leathers, auxiliary valve out of stroke, deposits on piston rod.
- (2) Flooding of gas-valves owing to over-taxed compressor, worn leathers, deposits in overflows, shortage of gas supply.
- (3) Fluctuation in high-pressure gas owing to shortage of water pressure, a gas-valve sticking, water in the gas ports or pipe to burners.
- (4) Gas passing at low pressure when motor is working.
- (5) Motor working when gas is turned off at outlet.

Remedy.

- (1) (a) See that water supply is adequate; (b) Loosen main valve; (c) Repack and adjust auxiliary valve; (d) Clear out deposits; (e) Replace all worn leathers.
- (2) (a) See that compressor of adequate size is fixed initially; (b) See (1e); (c) See (1d); (d) Have an adequate gas supply to compressor.
- (3) (a) See (1a); (b) Scrape and grease leathers; (c) Adjust water control valve.
- (4) (a) Compressor too small; (b) Leathers may want renewing.
- (5) (a) Leathers at auxiliary valve may want renewing; (b) See (3b).

(To be Continued.)

North British Association of Gas Managers.—The forty-ninth annual general meeting of the Association will be held at Dunfermline on the 28th and 29th inst. The business will be transacted in the Council Chambers, under the presidency of Mr. Alexander Waddell, the Engineer and Manager to the Gas Commissioners of the town, the Provost and Magistrates of which will give the members a cordial welcome. In addition to the usual routine business on the first day, the President will deliver his Inaugural Address, and there will be two papers—one on "Gaseous Fuel and the Duty of Gas Supply Authorities to the Public," by Mr. J. W. Napier, of Alloa; and the other on "The Checking of Working Costs in Small Gas-Works," by Mr. James Dickson, of Forfar. At an interval during the meeting, luncheon, to which ladies are invited, will be provided by the Town Council in an adjoining room. In the afternoon, the Carnegie Dunfermline Trust will entertain the members and their lady friends at tea in the Glen, after which the Pittencrieff Museum, Aviary, and Garden may be inspected. Dunfermline Abbey (the burial-place of King Robert the Bruce), which is adjacent, is also open to visitors. In the evening, the annual dinner will take place in the City Hotel. Next day the famous Carnegie Baths and Gymnasium will be free for inspection by members and their lady friends; and arrangements have been made for an excursion in brakes to Kinross, going round Loch Leven.

Long Cast-Iron Water-Pipe.—A new cast-iron pipe-line about 19 miles long has recently been laid between Skaneateles Lake and the Woodland reservoir, the impounding and distributing reservoirs respectively of the water-works of Syracuse (N.Y.). According to some particulars in "Engineering Record," the new line is 30 inches diameter for most of its length, and parallels an existing 30-inch pipe-line which was completed in 1894, and has been carrying practically all the city's water since that date. The population was then about 100,000, and the supply carried by the conduit amounted to about 13,600,000 gallons per day. But it has since increased to about 134,000, not including some 10,000 residents in the suburbs, most of which, it is thought, will be annexed before many years. The present water consumption of about 15 million gallons per day is in excess of the carrying capacity of the old conduit, so that it was necessary to supplement its flow by building the additional line. The combined capacity of the two conduits, when the new one is discharging into the stand-pipe near the distribution reservoir, is about 23 million gallons daily. But provision is made for turning the flow, when the stand-pipe is full, into the existing distribution reservoir; and under these conditions the combined daily capacity of the two pipe-lines will be about 28 million gallons. On the basis of the forecasts made by the Bureau of Water, the present works will serve the city until about 1931.

PROMOTION OF THE SALE OF GAS.

Reference was made in our special representative's review of the proceedings at the recent meeting of the German Association of Gas and Water Engineers at Königsberg to an account given by Herr Lempelius, of Berlin, of the new German Central Organization for Promulgating the Sale of Gas. The text of the paper from which that account was given by him has been published in the "Journal für Gasbeleuchtung;" and a fuller abstract of its contents than it was possible to furnish in the review of the proceedings at the meeting is now given.

The title of the paper as published is "The Question of the Central Organization for Promulgating the Sale of Gas, Considered Mainly from the Standpoint of the Advances and Attainments of the Gas Industry," by Herr K. Lempelius, Manager of the Central Organization. The question before gas engineers at the present time is, he says, What is the present real position of the gas industry? Is it on the down-grade, or is it at the moment standing still, or is it now experiencing one of the advances in prosperity which it has constantly experienced in the past? Electricians would reply that it was on the down-grade. They would advise the gas industry to adopt this view, and to restrict its activities to the supply of heat for industrial purposes and for heating and cooking in households. Many electricians would go even farther, and prohibit the use of gas for cooking. People of the highest position and persons who have done the greatest service in the industrial development of Germany have recommended such limitation; and weight is being given to their utterances. A brilliantly written article in the daily Press by Herr Rathenau, the Manager of the General Electricity Company, naturally took this line. The same view, however, has been expressed to the author by one of the leading Westphalian coal magnates. He said frankly that, in his opinion, the function of gas was to do away with the transport of coal through the streets, and to carry the heat required in houses through mains, while lighting would in the future be reserved for electricity. This speaker, whose interests are not inimicable to the gas industry, and whose judgment carries great weight, therefore speaks in favour of a limitation of the scope of the use of gas, while opening up a prospect of most extensive activity for it in the transport of heat and the displacement of coal as a fuel, with the consequent abolition of the nuisance of smoke and soot.

Some gas men, on the other hand, will take the view that gas is at present standing still because in the places where they work the consumption of gas has recently not advanced. Such places are, however, in a small minority; and towns in which, without some special reason, the consumption of gas has receded, are almost unknown. If we wish to answer the question ourselves in the sense of stating unhesitatingly that the gas industry is now, as in the past, experiencing constant development, we ought to be able first of all to answer a subsidiary question. We shall best gain a clear impression on the present position and prospects of the utilization of gas if we ascertain whether the appliances for the employment of gas are as technically perfect as possible for their respective purposes, and whether technical advances have been achieved with them. The establishment of this proposition is a preliminary condition of progress in the use of gas. It must be ascertained that the technical advances in the application of gas present new advantages to fresh circles of users. In regard to this question, an article published by the "Elektrotechnischen Zeitschrift" of June 16 last comes very appositely. It reports the displacement in the City of Westminster, in London, of electric street lighting by high-pressure gas. After mentioning that the district referred to includes the busiest and finest streets in London, and that the greater part of the street lighting therein has been allotted for the next five years to the Gaslight and Coke Company, the article states that the decision has attracted much attention, and is calculated to stimulate the competition between gas and electricity. As a consequence, the electricity works will be again thoroughly roused, and this cannot be in any way harmful to them. The agitation, however, in electrical circles, is more specially pronounced because the former very satisfactory lighting of the aforesaid important thoroughfares is to be displaced by high-pressure gas-lamps. The figures quoted by the gas and electrical undertakings for the lighting of the streets for the next five and ten years are then stated; and the article goes on to sound a note of alarm for electricians, who, it says, must concentrate their powers to resist the advances of gas, which is being advertised with extraordinary skill.

The foregoing statement will sound to many like advice from another world. Is it a fact that electricity cannot hold its own against the advance of gas? The news does not come, however, from another world, but from a neighbouring country with which Germany is most intimately correlated industrially. It is true for German conditions also that electricity must be on its guard against high-pressure gas lighting. The use of gas in this manner has come to England, like much else, from Germany. The far-seeing management of the municipal gas-works at Berlin has for years past been securing its increased adoption there on account of the excellent experiences gained with it. At the present time, the number of high-pressure street lamps in Berlin is many times that of the number of electric arc lamps. It is eminently desirable that this great achievement of the gas industry should be

given the widest possible publicity. It will be found that persons who are, generally speaking, extremely well informed on other matters, are in complete ignorance of the fact that the brilliant lighting of many of the finest thoroughfares in Berlin is not electric. According to the author's observations, not one in a thousand of the inhabitants in Berlin is correctly informed in regard to it; and in the Provinces the proportion is even lower. Among gas men, also, many are in no way fully acquainted with the extraordinary results now being obtained by the high-pressure gas lighting in the streets of Berlin.

The article in the "Elektrotechnischen Zeitschrift" proceeded to say that the Westminster City Council had taken a retrograde step, as electric lighting was really more advantageous because, forsooth, a 3000-candle power high-pressure gas-lamp had not so far been achieved for practical use. A single nominal 3000-candle gas-lamp installed in London had, according to repeated measurements, not shown more than 2500 Hefners; whereas the 3000-candle power flame-arc lamps showed about 3500 Hefners. On this point, the Central Organization for Promulgating the Sale of Gas addressed a letter to the "Elektrotechnischen Zeitschrift," with a view to correcting the error in this statement quickly, and before it could injure the gas industry. The letter pointed out that the implication that 3000-candle power high-pressure gas-lamps were in practice under 3000-candle power, because gas-lamps of this power had not yet been achieved for practical use, was unfounded, since there were in Berlin alone 345 high-pressure gas-lamps of 4000-candle power employed for public lighting, many of them having been in continuous use for several years. The illuminating power of these lamps had been constantly checked by Professor Drehschmidt; and they were employed for lighting the principal streets in that city. The continuously increasing use of these high-pressure gas-lamps for street lighting in Berlin indicated the complete satisfaction of the municipal authorities with them; and there was only one opinion on the part of the public with regard to their brilliant effect.

High-pressure gas lighting has, the author argues, extended and advanced somewhat tardily and cautiously, as becomes good solid German methods, as opposed to those which at times are displayed in American practice. The progress made with high-pressure gas lighting seems to him to be typical of the German national character; but the system has now passed beyond Germany, and is becoming extensively employed abroad.

The question whether gas has attained to new technical uses which constitute an advance on its former employment, may be answered by reference to what has been done in the direction of high-pressure lighting, which is a brilliant advance in every sense of the word. It may be said that each high-pressure gas-lamp embodies a portion of the light of the sun, whereas each electric arc lamp embodies a portion of the light of the moon. Wherever the brilliant "sunlight" of high-pressure gas lighting comes side by side with electric arc lighting, as in Berlin, the latter has to be improved and intensified by the adoption of a more suitable type of arc lamp, or, more probably, it has to be replaced by gas, as in the case of Westminster. No further extension of electric arc lighting in the streets of Berlin is either desired or contemplated there. Even a professor at an electro-technical college has expressed the opinion to the author that electricity is not comparable with high-pressure gas for street lighting. Gas now provides a light of practically the same power as the electric arc lamp, but with the advantage of a warmer tone. The opinions, therefore, of the prominent persons already referred to—to the effect that lighting should be left exclusively to electricity—cannot be regarded as of any significance in respect of street lighting, in view of the present position and the experiences which have been reported from Berlin and London.

The gas industry, however, is not content with this result. In high-pressure lighting, so much air is drawn into the bunsen burners by the high pressure of the gas that no secondary air supply is required, and there is no cooling of the mantle by secondary air. The great economy of the high-pressure burner, which gives a duty of 55 candles and over per cubic foot of gas consumed, is now being aimed at in low-pressure gas-burners, by avoiding the cooling of the mantle due to the inflow of cool secondary air. In the more recent types of low-pressure burner, the heat of the products of combustion is utilized for warming the mixture of gas and air which is burnt; and the advance thus secured is producing results almost comparable in value with those due to the introduction of the Welsbach mantle. The low-pressure gas-burner has been so improved that lamps of 1000-candle power are on the market, in which the duty attained is about 47 candles per cubic foot, while lamps of lower candle power show only a slightly lower duty. These lamps are therefore economically almost equal to the large high-pressure gas-lamps. That finality has been reached in the development of gas-burners in the direction of economy in the conversion of the gas into light cannot be contended. The progress in economy has continued up to the most recent time. There has never been a period of more vigorous and continuous progress in the perfecting of gas-lamps than the present. The output of burners from the leading factories is also phenomenal.

The question of whether a continuous development in the use of gas is taking place must, therefore, be answered with an emphatic affirmative. Gas engineers of the present day may well rejoice that it has been their lot to live in times when these new industrial results are being achieved. The advantages of gas as a competitor for the supply of heat have been well proclaimed in

Germany. The article in the "Elektrotechnischen Zeitschrift" already referred to speaks of the activity displayed by a few firms in publishing broadcast through the agency of the whole of the gas industry pamphlets promulgating the advantages of gas. It is not clear what is meant by this statement; but gas engineers will first call to mind the name of Herr Schäfer, the Chief Engineer of the German Continental Gas Company of Dessau, who has many times been regarded as a great mischief-maker by electricians. Lately, in a very valuable paper, which the Central Organization has distributed, he has set forth for gas men the more recent applications of gas in art and industry. Another valuable paper in the same direction is that of Dr. Schilling. [An abstract translation of this has recently been given in the "JOURNAL," ante, p. 35.]

These communications show that it is the business of the gas manager to further the introduction of apparatus for the use of gas wherever the conditions are favourable; and in regard to Germany, it may be said that the cases in which there are not favourable conditions for the use of gas for heating and lighting are quite exceptional. In particular, the less well-to-do sections of the population should be invited to participate in the advance in civilization which the extended use of gas implies, just as much as they have established their right to the use of soap. This may be done by the introduction of prepayment meters and the provision of services and cooking apparatus free of charge. These sections of the population have no capital which they can apply in this way themselves; and even if they had the capital, they would not install the appliances in rooms which they rent only for short periods. To these classes, gas appeals particularly as a source of heat for cooking, because of the economy it effects in time, labour, and effort, thereby permitting the housewife to give greater attention to her children and other household duties. There is no doubt that, as indicated by the Rhenish Westphalian coal magnate already quoted, the coal traffic must eventually disappear from the streets, and the damage done by smoke from coal-fires vanish from the houses. But petroleum oil also—with its smoke and danger and the outflow of money abroad which its purchase involves—must disappear from the dwellings of the poorer classes, just as it has from those of the well-to-do. They have now a cheaper light in the modern types of inverted incandescent gas-lamps, which entail an outlay of little more than one-twentieth of a penny per hour for a light of 50 candles.

If we consider the grounds which are the bases of the extraordinary economical capacity of the gas industry to resist competition, we may, with advantage, refer to a further statement of Geheimrat Rathenau, who points out that, since coal cannot be won and transported below a certain cost, other ways must be looked for in order to produce electricity cheaply. The problem is not new; for gas-works would not be able to sell gas at present prices if it were not that valuable products are withdrawn from the coal in addition to the gas. Unfortunately, it has not yet been found possible to obtain similar valuable products from coal when it is burnt under the boilers or in other furnaces in electricity and other works. If the cost of fuel in such plant could be either wholly, or to a large extent, covered by the value of the bye-products obtained from it, the industrial and business life of the country would be revolutionized, and people would be enabled to let electricity play the prominent part which he thinks it should play in modern civilization.

Geheimrat Rathenau is quite right in that he shows that the gas industry has solved the problem of obtaining from the coal more valuable products than are obtainable in any other method of applying coal for heating purposes. We may appropriately take Geheimrat Rathenau's own words in respect of electricity, and apply them by merely substituting the word gas for electricity. "Manufacturing stations must be established in considerable numbers which will supply 'gas' to consumers at extremely low prices when consumption and production are regulated in a proper manner. Theoretically, this problem presents no insuperable difficulties. Without entering into details of this method of 'gas' supply, it is enough to point out that a distributing system throughout the country serves as a reservoir into which 'gas' is pumped, according to the requirements of the consumer, from suitably distributed manufacturing stations." In this manner, the town of Lübeck has already undertaken the supply of gas as far as Travemünde, and the City of Berlin the supply to suburbs at considerable distances. Barmen is about to obtain its gas from the Ruhr coal-fields over 30 miles away. The industrial conditions are clearly favourable at the present time for the spread of the use of gas. The question whether we are now in a period of expansion in the gas industry, not alone in respect of technical construction, must be answered with an emphatic "Yes." In regard to this commercial part of the business of gas supply, the leaders of the industry have struck out on lines which were foreign to their predecessors; and the results are very promising. The gas industry has now for the first time to unite against competing and opposing interests, in order to further the cause of the extension of the use of gas. Municipal undertakings as well as gas companies have supported this object in an extensive measure. It should be impressed upon them, however, that the Central Organization for Promulgating the Sale of Gas should be given by them the necessary moral and financial support. It is the object of this organization to impart to all and sundry a knowledge of what can be done for them by the gas industry, and to do this by means of explanations addressed to the public, the press, and authorities, and by means of trade exhibitions. It will

endeavour to combine the hitherto disjointed efforts of individuals in the same direction, in order to give their various efforts a wider application.

The author goes on to speak of the success which has attended the lectures given in various places by Fräulein Wirth, who is one of the lady lecturers engaged by the German Continental Gas Company, and lent by them from time to time to other gas undertakings. The author proposes to extend this class of work. The Central Organization will also communicate to its members information of which they may stand in need for extending the employment of gas; and for this information it will rely largely on the experiences gained by other members, who will be asked to support the general cause by communicating the results of their experiences to the Organization, or to the Technical Press. The author proceeds to say that much must not be expected from his personal ability, and that the Organization must largely depend on the continued efforts of Herr Schäfer and others, who have in the past done so much to assist in bringing to the knowledge of the public the advantages and manifold uses of gas. As a result of the propaganda of the organization and its supporters, it may, the author says, be hoped that German people will be roused to apply to gas engineers to supply them with gas on such a scale that they will be able to say that Germany, which in other respects holds a premier position among civilized countries, will be justified in claiming a similar honourable position in respect of the result of the application to it of the test of the degree of civilization which is afforded by the extent of the consumption of gas.

LIGHT DISTRIBUTION IN VARIOUS DIRECTIONS

In the course of a paper on "Some Methods of Measuring Light," read by Mr. W. C. Philpott, of Toronto, at the annual meeting of the Canadian Gas Association, he made the following remarks on the subject of the distribution of light in different directions.

It is necessary to remember, when comparing lamps, that some send more light downwards than upwards, and others more upward than downwards; and that the true value of a lamp depends on its shedding its light in the direction where it is most required. For lighting factories, public buildings, and large inside areas, it is necessary to throw the light sideways and downwards. For street lighting, a lamp is desired to send the greater parts of its light sideways, and not in a centralized area under the lamp alone. When comparing the efficiencies of various lamps, it is necessary to calculate their candle power on a common basis. To bring about this comparison, the candle power of various lamps is usually expressed as the "mean spherical candle power," or "mean hemispherical candle power"—expressions which may be explained by imagining a light enclosed in a sphere or hemisphere set at a radius of 1 foot from the source of the light.

In any fair comparison of different lights, it is necessary to consider not only the light that is sent out horizontally, but the total light that is shed in all directions which is proportional to the mean spherical candle power. It must, however, be borne in mind that the light rays thrown upwards are in some cases useless; and in these cases the true efficiency of the lamp should be calculated on the mean hemispherical basis. The rays of light which would under some circumstances be useless when thrown upwards, can, with a judicious arrangement of reflectors, be made to fall downwards or sideways, and become a valuable lighting factor. To measure the light thrown in different directions and at different angles, the flicker disc-box is most suitable.

The inequality of the distribution of light from different lamps will be better understood by referring to the following figures:—

Upright Welsbach Burner without Shade.

Direction of Rays.	Candle Power.
Straight up	20
67½° above horizontal	32
45° " "	50
22½° " "	75
Horizontal.	63
22½° below horizontal	40
45° " "	22
67½° " "	15
Straight down	0

Mean spherical candle power, 47·75

Upright Welsbach Burner with Reflector.

Direction of Rays.	Candle Power.
Horizontal.	58
22½° below horizontal	75
45° " "	65
67½° " "	27
90° " "	0

Mean hemispherical candle power, 60·29

Inverted Burner with Clear Globe and Reflector.

Direction of Rays.	Candle Power.
Horizontal.	40
15° below horizontal	43
30° " "	43
45° " "	48
60° " "	40
75° " "	42

Mean hemispherical candle power, 43·046

Humphrey Lamp with Four Burners, Clear Globe with Reflector.

Direction of Rays.	Candle Power.
Horizontal.	410
15° below horizontal	330
30° " "	350
45° " "	355
60° " "	188
75° " "	185
90° " "	150
Mean hemispherical candle power, 320.28	

The foregoing tests were made with gas having a net calorific value of about 600 B.Th.U. at a pressure of 2.5 inches head of water.

By comparing the first two tables, the effect of using reflectors will be noticed. The light rays from all lamps are, in the majority of cases, thrown in an upward direction, where, in the greater number of cases, it is less needful. The upward light can be intercepted and reflected in the direction where most required. The type of reflectors and globes used has all to do with good effective lighting; and a few hours spent in choosing suitable materials for the particular kind of lighting to be done would amply repay anyone having to do with inside or outside illumination. Surrounding circumstances must also be given due consideration. The problems of absorption and emission of surfaces on which the light falls must be reckoned with; and each particular case should be considered by itself.

REGULATING THE AIR SUPPLY TO GENERATORS.

Bromham's Patent.

It is a matter of common experience that, in ordinary working, when the grate of the generator has recently been cleaned, the primary air enters the furnace in larger quantity than when the grate is obstructed. This extra inflow of primary air passing into the layer of coke forms an excess of carbonic oxide, which, combined with the secondary air, causes imperfect combustion at the outlet of the furnace, and consequently loss of fuel. When the generator is at work, the coke in process of consumption produces ash and clinker, which gradually clog the grate; and if this continues the passages for the primary air will become so reduced in size that the supply of air will be inadequate, with the result that the quantity of carbonic oxide will gradually diminish. The secondary air will then pass into the chimney gases, and cooling of the furnace will follow. This, however, can be obviated by

properly regulating the admission of primary air to the furnace; and M. Bromham, one of the Engineers at the Brussels Municipal Gas-Works, has designed and patented an appliance by which he says this object may be effectually accomplished. As mentioned in the account of these works given in the "JOURNAL" last week, M. Bromham's regulator is in use in connection with a large installation of inclined conical retorts; and he explained its working to the members of the Société Technique on the occasion of their recent visit. It is shown in the accompanying illustrations—fig. 1 being a longitudinal section of a furnace fitted with it (taken on the line CD of fig. 2), while fig. 2 is partly an elevation and partly a section on the line AB of fig. 1.

Referring to fig. 2, it will be noticed that a strong clock A, hung in the basement of the retort-house, actuates a light transmission-rod B running from one end of the bench to the other.

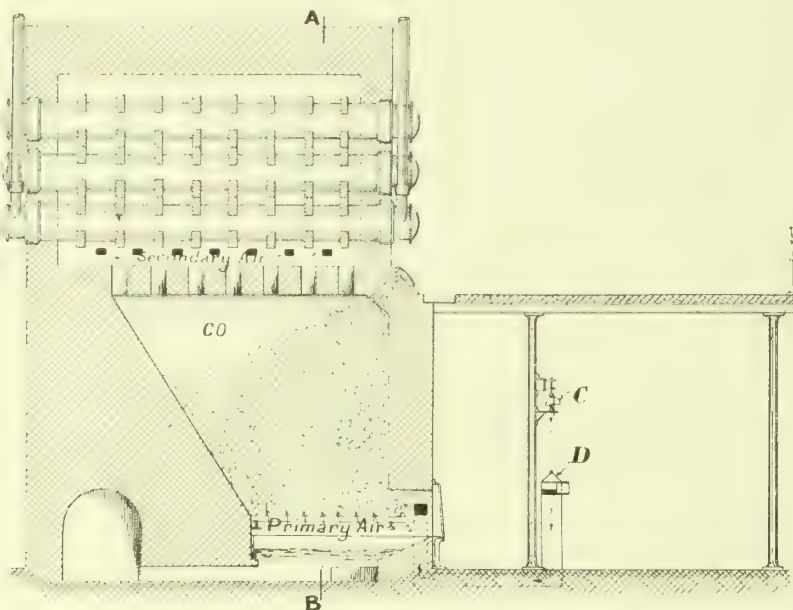


Fig. 1.

Bromham's Regulator of the Primary Air Supply to Generators.

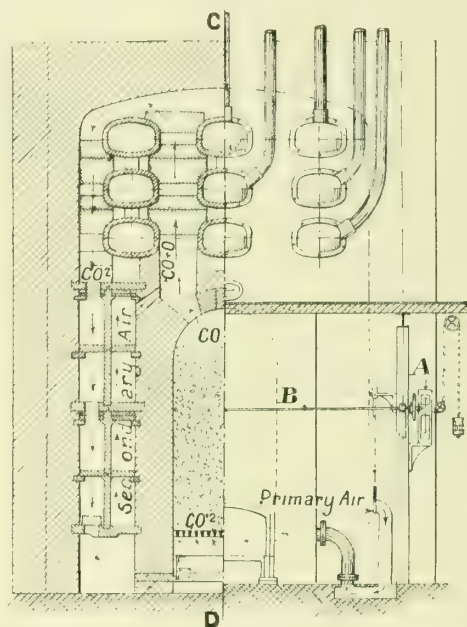


Fig. 2.

To this rod is attached a cam C (fig. 1), which makes one revolution in the time elapsing between two clinkerings. This cam causes the slide of the primary air valve D to rise. When the grate is cleared, the opening of the slide is at its minimum; and consequent upon the rotation of the rod B, the cam entrains gradually the valve D, which opens slowly and regularly. The form of the cam is such that when the time for the clinking of a furnace arrives, the valve, having reached the extent of its travel, closes automatically, and starts working again without requiring any attention. As soon as the valve is closed, the stoker can commence clearing the hearth. When he has finished, he closes the doors, and the regulation is perfect during a fresh cycle. The speed at which the rod B revolves may be regulated as desired by simply shifting an index pinion. No regulator will then close except at the hour for which it has been set.

The gradual opening of the inlet for primary air corresponds with the rate of obstruction of the grate by ash and clinker. The result is that the volume of primary air admitted to the furnace is always constant; the effect being to produce a regular quantity of carbonic oxide in the generator, and ensure unvarying composition of the escaping gases. Some analyses of these gases from one of the settings at the Brussels Gas-Works testify to the efficiency of M. Bromham's regulator. The gases were taken at the point where the letters CO₂ occur on the left-hand side of fig. 2. With the ordinary arrangement, the quantity of carbonic oxide dropped from 2.6 per cent. to zero in a period of 8½ hours from the time of clinking. After this the furnace began to cool, the presence of oxygen manifested itself, and gradually increased

in quantity till it reached 2.6 per cent. at the end of 14 hours, when clinking again became necessary. When, however, the regulator was employed, there was no loss of fuel and no cooling of the furnace; the carbonic oxide and oxygen varying only from zero to 0.2 per cent.—to be regarded as perfect regulation.

The advantages claimed for the appliance are that by its use economy of fuel is effected, there is a regular temperature during the entire period between two clinkerings, no excessive heating takes place after these operations, and consequently there is less wear and tear of the refractory material, and greater regularity in the production of gas. The cost of upkeep is practically nil, as the installation needs only a little oil once a week; and a special workman is not required to look after it.

In the "JOURNAL" for the 28th ult., it was recorded that, in view of his approaching marriage, Mr. Harley Andrew Stephenson, son of the late Mr. Andrew Stephenson, had been the recipient of a present from the London officials of the British Gaslight Company. His friends will be pleased to learn that his wedding with Miss Stella Hetherington took place on the 9th inst.

We are sorry to learn that Doris Bullivant, the daughter of the Secretary of the Derby Gas Company, has died in Derby Infirmary from injuries sustained at some athletic sports at Derby last Saturday. During a motor-cycle race, one of the machines got out of control and dashed into the crowd. The girl, who was eleven years of age, was knocked down, rendered unconscious, and never recovered.

FURTHER STUDIES IN COAL CARBONIZATION.

WHEN noticing a fortnight since the Forty-Sixth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (which was signed by Mr. R. Forbes Carpenter, with an expression of regret that continued ill-health precluded his doing more than generally supervise its preparation, the work in connection with which was carried out by his Assistant, Mr. S. E. Linder, B.Sc.), some allusion was made to the further studies in coal carbonization which had been carried out during the year under review. The statement with regard to this work constitutes an important and considerable part of the report; and in view of its particular interest to readers of the "JOURNAL," we now reproduce it in full.

Interaction of Methane and Ammonia in Presence of Carbon.

INTRODUCTORY.

At the conclusion of the experimental work described in the forty-fifth report, 1908, it was seen that continuance of the work on the lines laid down in that research would be impossible, accompanied, as each experiment had to be, by gas analysis of a laborious character. During the present year, however, it was felt that some effort should be made to continue the research, when opportunity offered, on a less ambitious scale, with a view, if possible, of clearing up some of the many problems left unsolved at the conclusion of the work in 1908—more especially those relating to the yield of hydrocyanic acid at different temperatures and varying rates of flow. It seemed desirable to confine attention entirely to the reactions taking place in presence of wood charcoal and graphitic carbon, and to exclude porcelain altogether from consideration, as the results obtained in 1908 clearly proved that, at temperatures exceeding 800° C., porcelain has a strong oxidizing effect on hydrocarbons, ammonia, and hydrocyanic acid.

On endeavouring to repeat some of the results obtained in 1908 with wood charcoal, it was found that the charcoal could not always be relied upon to yield the same results under the same conditions of temperature, rate of flow, and volume and composition of reacting mixture—in fact, that the efficiency of the contact material itself was subject to variation. The cause of this variation is obscure; but there is reason to connect it with the fact that hydrocarbons and hydrocyanic acid are more or less unstable in contact with carbon at high temperatures. Under such conditions, carbon of possibly graphitic character is deposited on the surface and within the pores of the contact material, and profoundly modifies its character. It was further found that, after continued treatment with coal gas (freed from illuminants) and ammonia, the wood charcoal became uniformly coated throughout its substance, and that the catalytic power attained a value sufficiently constant to justify the use of the material for the purpose of determining the comparative effect of varying temperature and other factors under controlled conditions.

The wood charcoal was prepared for use in the comparative experiments by continuing the treatment with ammonia and coal gas,* under the same conditions, until approximately constant results were obtained. The temperature or rate of flow was then altered, and a series of results obtained. Conditions were finally restored, and the original experiment repeated. Agreement between the first and last experiments was considered to be proof that the contact material remained unchanged throughout the series. Thus, at 915° C., the following results were obtained:—

	Per 100 parts of NH ₃ entering,			
	Undecomposed.	AsHCy.	Decomposed.	
Eighth experiment on Wood Charcoal A. .	86.3	..	6.0	.. 7.7
Thirty-first experiment on Wood Charcoal A	86.9	..	5.7	.. 7.4

Twenty-two experiments at various temperatures and rates of flow intervened between these two, including ten experiments with hydrogen as diluent.

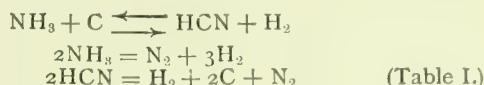
Fifty-six experiments in all were made with "Wood Charcoal A," including blank experiments with diluent coal gas and hydrogen alone. In the series: Experiments I. to XIV. were made with ammonia and diluent coal gas. Experiments XV. to XXIV. were made with ammonia and diluent hydrogen. Experiments XXV. to XLI. were made with ammonia and diluent coal gas. Experiments XLII. to XLVI. were made with hydrocyanic acid and coal gas. Experiments XLVII. and XLVIII. were made with ammonia and coal gas. Experiments XLIX. and L. were made with ammonia and hydrogen. Experiments LI. and LII. were made with ammonia and coal gas. Experiments LIII. and LIV. (air treatment to restore activity). Experiments LV. and LVI. were made with ammonia and coal gas. Ten experiments were made with "Wood Charcoal B," taken from the same sample as "A." In this series: Experiments I. to III., V., and VII. were made with ammonia and diluent coal gas. Ex-

periments IV. and VI. were made with ammonia and diluent hydrogen. Experiments VIII. and IX. were made with ammonia and coal gas plus ethylene. Experiment X. was made with ammonia and coal gas.

In Tables I. to IV. below, the results are numbered consecutively (Nos. 1 to 31), and without reference to the order in which the experiments were made. In many cases, figures are averaged, and presented as one result. Before proceeding to discuss the results in detail, it will be convenient to summarize here the more important conclusions arrived at.

1.—That the efficiency of wood charcoal in effecting the conversion of ammonia into hydrocyanic acid decreases with use. Such decrease is attributed to the deposition on the surface of the charcoal of graphitic or other form of carbon derived from hydrocarbons or hydrocyanic acid as a result of thermal decomposition.

2.—That the hydrocyanic acid so obtained is the product of a reversible reaction controlled by temperature and accompanied by secondary reactions yielding carbon, nitrogen, and hydrogen, by thermal decomposition of NH₃ and HCy. Thus—



3.—That in presence of wood charcoal coated with graphitic carbon, hydrocyanic acid possesses a high degree of stability up to a temperature of 1000° C. At 1100° C., thermal decomposition begins to be rapid. (Fig. 3.)

4.—That the presence of hydrocarbons, methane and especially ethylene, is favourable, but not essential, to a high yield of hydrocyanic acid; ammonia acting directly on carbon to form hydrocyanic acid in presence of hydrogen alone as diluent. (Tables III. and VI.)

As the present work was approaching completion, attention was directed to the researches of Dr. G. A. Voerkelius on the "Formation of Hydrocyanic Acid from Ammonia and Wood Charcoal," published in the "Chemiker Zeitung," 1909, 33, 1025-1026, 1078-1081, 1090-1092. Dr. Voerkelius, by independent research, and employing other apparatus and procedure, has arrived at conclusions very similar to those stated above; and the two researches afford mutual support and confirmation.

APPARATUS AND PROCEDURE.

The procedure was substantially that adopted in 1908 and detailed in the forty-fifth report. Briefly stated, two controlled streams of diluent gas and ammonia (or hydrocyanic acid) were delivered to a mixing flask, and thence to a furnace tube of silica, packed with fragments of contact material and heated to the desired temperature by means of a ten-burner Méker furnace. The exit gases were passed successively through one or more Drechsel's bottles containing standard sulphuric acid to absorb ammonia, and through caustic soda to absorb hydrocyanic acid, before entering the water-aspirator in which they were stored and measured. A layer of oil was placed on the surface of the water in the aspirator to minimize absorption of the gases. The apparatus formerly employed was modified in certain important details, with a view to secure greater regularity in the flow of the reacting mixture through the system. This was effected by placing the bolt-head flask (in which the purified coal gas was stored) in connection with a cistern adjustable at any desired height, and provided with a constant flow of water. By this means, the pressure of gas in the bolt-head could be maintained throughout an experiment within extremely narrow limits, and the attention of the operator released for other and more important duties. The diluent coal gas, hydrogen, or enriched coal gas, as the case might be, was dried before entering the flask in which admixture took place with ammonia (delivered from the mercury cylinder) by passage through a scrubber containing pumice moistened with strong sulphuric acid; a mercury seal being interposed between the scrubber and mixing flask to obviate risk of absorption of ammonia by the acid, should the gaseous current receive a check.

Pyrometer readings were taken at intervals of a few minutes throughout the experiment, and the results averaged. The temperature range in general did not exceed 10° C. in any one experiment.

A trial run was made in every experiment to determine the weights of ammonia and hydrocyanic acid obtained when the diluent gas alone was passed through the heated tube. This was conveniently effected by providing the exit end of the tube with a bye-pass arrangement delivering both to the air and to a secondary system of absorbing bottles containing standard acid and caustic soda. During the period of heating-up, the exit gases were drawn into a small aspirator. As soon as constant temperature conditions were attained, they were diverted through the secondary train of absorbers; the volume of diluent gas used being then recorded. At the conclusion of the blank experiment, the bye-pass connection was closed, and communication was opened with the primary train of Drechsel's bottles. The production of traces of hydrocyanic acid and ammonia was noticed in nearly all the blank experiments. It is attributed, in part, to the direct interaction of nitrogen and hydrogen in the reacting mixture. The amounts of such hydrocyanic acid and ammonia obtained, and

* "Coal gas" throughout these remarks denotes the purified product deprived of its illuminants in the manner described in the forty-fifth report for 1908. See "JOURNAL," Vol. CVII., pp. 569, 570.

the relative proportions of these bodies, varied both with the condition of the contact material and with the temperature; the united figure for the two products attaining a maximum with uncoated wood charcoal at 1000° C. No correction was possible for hydrocyanic acid and ammonia introduced in this way. The figures presented in the tables are, therefore, inclusive.

Diluent Gas.—As before, the coal gas employed as diluent was drawn from the laboratory service-pipe, and was freed from illuminants, carbon dioxide, and other impurities in the manner described in the 1908 report. It was only found possible to analyze the coal gas in two experiments (see Table III., Nos. 18, 20). Any variation in methane content would, of course, be a disturbing factor. But such variation would not be very great; and its effect was reduced by the practice of preparing a somewhat larger stock of purified gas than was required for one day's work—the balance being used on the following day, with such addition of fresh gas as might be required. Twenty-two analyses of purified coal gas in 1908 showed an average methane content of 28 per cent. (maximum 31·5; minimum, 23·7). Carbon monoxide appears to act simply as a diluent, and need not be considered.

In the experiments with ethylene, purified coal gas was enriched with ethylene generated by heating a mixture of absolute alcohol and strong sulphuric acid; the ethylene being washed with sulphuric acid and caustic soda.

Hydrogen was prepared from zinc and dilute acid. The gas was freed from arsenic and sulphuretted hydrogen by means of chromic acid and caustic soda.

Contact Material.—The wood charcoal used was taken from the stock employed for the experiments made in 1908, and was graded and prepared for use as there described. The specific gravity after use was 0·5 (approximately).

Sample A. (after 56 experiments) left, on ignition, 1·6 per cent. of ash. Fe, 0·01 per cent.

Sample B. (as charged) left, on ignition, 1·7 per cent. of ash. Fe, 0·003 per cent.

In addition, a few experiments were made on two samples of retort carbon kindly forwarded by Dr. Rudolf Lessing. These are described as—

“Hard scurf from bottom of gas-retort:” Ash, 0·5 per cent.; sp. gr., 1·8.

“Granular carbon deposited from purified coal gas:” Ash, nil.

ANALYTICAL RESULTS.

It has already been remarked that the efficiency of wood charcoal as a contact material for the conversion of ammonia into hydrocyanic acid shows great variation, according to the use to which it has been put. The cause of this variation appears to be related in some way to the deposition upon the surface of graphitic or other form of carbon derived from thermal decomposition of hydrocarbons, or possibly of hydrocyanic acid, or both. This hypothesis is supported by the fact that, after continued use with coal gas, the surface of the wood charcoal acquires a silvery appearance. Hydrocyanic acid, on the other hand, produces a bronzed appearance of the surface. The efficiency attained a maximum after limited treatment of the charcoal with ammonia and coal gas; on continued treatment, the efficiency fell to an approximately constant value; subsequent treatment with ammonia and hydrogen restored the activity. Hydrocyanic acid, on the other hand, had the opposite effect; marked loss of efficiency resulting when a mixture of hydrocyanic acid and coal gas was sent over the coated material at 1000° to 1100° C. Treatment with air at 1000° C. partially restored activity. Thus, wood charcoal “A” at 1000° C.

Experiment No.	Description	Yield of HCN Per Cent. of NH ₃ Taken.
Experiment No. IV.	Partially coated by treatment with ammonia and coal gas	31·5
„ XIII.	Completely coated by treatment with ammonia and coal gas	18·4
„ XXV.	Coat removed by treatment with ammonia and hydrogen	30·4
„ XXVIII.	Re-coated by treatment with ammonia and coal gas	16·7
„ LII.	After treatment with hydrocyanic acid and coal gas	6·9
„ LIII.	After subsequent treatment with air	11·4
„ LIV.	Further subsequent treatment with air	12·7

It is necessary to bear these facts in mind when one set of results is compared with another. Comparative figures are only of value when the condition of the contact material is accurately known. In the present research, an endeavour was made to ensure equal conditions when the effect of varying any one factor, temperature, rate of flow, &c., was under trial.

Tables and Diagrams.—For convenience of reference, the various results have been brought together in tabular form. The data presented are of the same character throughout, so it will be convenient to consider their meaning. In the headings to tables:

“Volume 230 c.c.” denotes the volume of the tube heated to constant temperature and occupied by the stated weight of contact material used.

“Rate of Flow” denotes the volume in c.c. of reacting mixture (diluent gas plus ammonia) entering the tube per minute, measured

at 0° C., 760 mm. dry, “slow” rate of flow—80 to 90 c.c. per minute (see the forty-fifth report) being the most rapid of those employed in the present series.

“Duration of Experiment” denotes the number of minutes occupied in the experiment, measured from the moment when the exit gases are sent through the primary train of Drechsel's bottles to the moment when the supply of inlet gas was shut off and the water aspirator stopped; and the expression “Coal gas entering” denotes the volume of the purified diluent gas entering the tube during such period.

“Reacting mixture” denotes the mixed diluent gas and ammonia entering the tube; and the expression “Time in tube” the estimated time taken by such mixture to pass through the heated free space in the tube. It is calculated as follows:—

$$\text{Total space, 230 c.c.; deduct volume of wood charcoal } \left(\frac{55}{5} \right) = 110 \text{ c.c.}$$

whence, free space = 120 c.c.

Let duration of experiment be t minutes.

Let total volume of reacting mixture be x c.c.

$$\text{Then, time in tube} = \frac{t \times 120 \times 60}{x} \text{ seconds.}$$

Calculated Increase Volume of Exit Gases due to Dissociation of Hydrocarbons.—This figure is arrived at by deducting from the volume of exit gases measured in the water-aspirator the volume of exit gases calculated; due allowance being made for the products of reaction in which ammonia is concerned (all volumes measured at 0° C. 760 mm.). An example will serve to illustrate the nature of the calculations involved:—

Table I., No. 9. 860° C.

Volume of coal gas entering	3742 c.c.
Add hydrogen set free in reaction (NH ₃ + C. = HCN + H ₂)	18 c.c.
Add hydrogen and nitrogen (2NH ₃ = N ₂ + 3H ₂)	186 c.c.
	204 c.c.
Total calculated	3946 c.c.
Total found	4000 c.c.

+ 54 (= 55 c.c. approx.)

These gas volumes are only very approximate. Much of the work had to be done in July and August, when air temperature was high. In addition, the furnace itself was a source of heat. The results under this heading are given with considerable reserve; but they indicate, with some approximation to truth, the extent to which the contact material is active in promoting thermal decomposition of the hydrocarbons present when coal gas is used as diluent. With hydrogen, there should be no excess volume, as hydrocarbons are absent—cf. experiment No. 19, Table III., where the calculated excess is 1 c.c.

Analysis of Gases and Methods of Calculation.—These questions were fully discussed in the report for 1908, to which attention is directed. Additional confirmation has been obtained during the present work of the reliability of the apparatus and procedure adopted last year. In one experiment at 700° C. (Series A., XLVIII.), not included in the tables presented here, 98·9 per cent. of the ammonia entering the furnace tube was obtained at the exit in the form of hydrocyanic acid (0·9 per cent.) and undecomposed ammonia (98 per cent.); leaving only 1·1 per cent. for ammonia decomposed into its elements, and otherwise unaccounted for. In another experiment at 785° C. (Series A., No. XLVII.), 98 per cent. of ammonia entering was so recovered—2·5 being as hydrocyanic acid; leaving only 2 per cent. for decomposed. These experiments immediately succeeded those recorded in Table III., which are Nos. XLII. to XLVI., in Series A. Results were equally consistent at other temperatures.

TABLE I.—INFLUENCE OF TEMPERATURE AND RATE OF FLOW.

In Table I., each of the experiments referred to as Nos. 1, 3, 4, and 8 is the average of two results; No. 2 is the average of three results; the others are single experiments. The efficiency of wood charcoal throughout the series remained practically constant.

Conditions throughout were approximately constant as regards the composition and volume of the reacting mixture. The effect of varying the rate of flow and temperature is best seen in figs. 1 and 2, in which the results given in Table I. are interpreted graphically.

From fig. 1, we learn (1) That the rate of thermal decomposition of ammonia rises rapidly with temperature from 2·8 per cent. at 860° C. to 46·6 per cent. at 1100° C. (2) That the yield of hydrocyanic acid at “slow” rate of flow increases with temperature from 3·6 per cent. at 860° C. to 22·9 per cent. at 1100° C.

From fig. 2, we learn that the yield of hydrocyanic acid is practically independent of rate of flow at temperatures not exceeding 1000° C. Thus, at 1000° C.: At 21 c.c. per minute, 17·9 per cent. HCN; at 40 c.c., 17·7 per cent. HCN; at 82 c.c., 17·7 per cent. HCN. At 1100° C., on the other hand, the yield rapidly increases with increase in rate of flow. Thus: At 21 c.c. per minute, 5·8 per cent. HCN; at 41 c.c., 15 per cent. HCN; at 87 c.c., 22·9 per cent. HCN.

INFLUENCE OF TEMPERATURE ON YIELD OF HCy AND DECOMPOSITION OF NH₃.

"Slow" Rate of Flow, 82 to 87 c.c. per minute.
Wood Charcoal A.

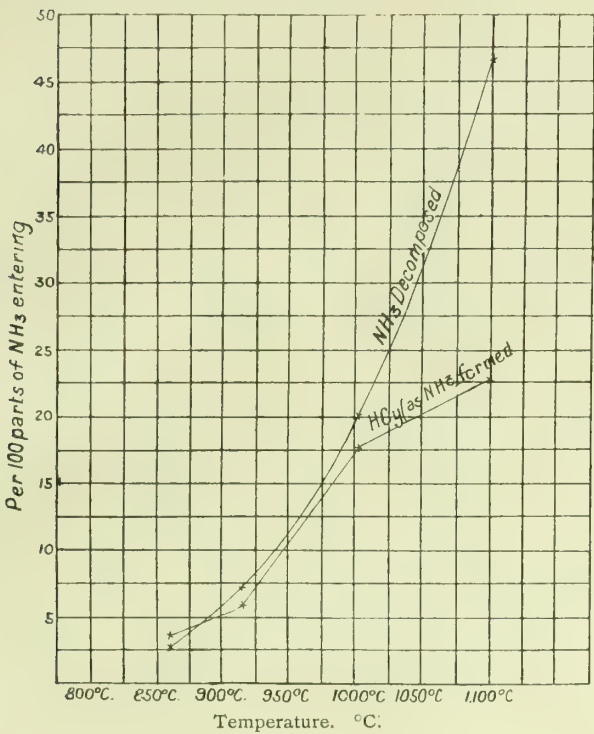


Fig. 1.

TABLE I.—Interaction of Methane and Ammonia. Influence of Temperature and Rate of Flow.

Rate of Flow.	Wood Charcoal (A). Volume, 230 c.c.; Weight, 55 grammes.			
	860° C.	915° C.	1000° C.	1100° C.
Experiment No.	1.	2.	3.	4.
"Slow" rate. .c.c. per min.	84	85	82	87
Reacting mixture:—				
NH ₃ , volume per cent. . .	10·8	10·8	10·8	11·2
Time in tube . . . secs.	85	86	87	82
Ammonia balance:—				
NH ₃ entering tube, grammes	0·351	0·348	0·345	0·355
NH ₃ products, per cent. :—				
Undecomposed . . .	93·6	86·9	62·3	30·5
As hydrocyanic acid . .	3·6	5·9	17·7	22·9
Decomposed (by diff.) . .	2·8	7·2	20·0	46·6
	100·0	100·0	100·0	100·0
Calculated increase volume of exit gases due to dissociation of hydrocarbons . . . c.c.	—40	+125	+255	+740
Experiment No.	5.	6.	7.	8.
"Slower" rate .c.c. per min.	40	45	40	41
Reacting mixture:—				
NH ₃ , volume per cent. . .	11·2	10·9	11·0	11·0
Time in tube . . . secs.	178	161	182	173
Ammonia balance:—				
NH ₃ entering tube, grammes	0·355	0·347	0·338	0·357
NH ₃ products per cent. :—				
Undecomposed . . .	84·5	77·5	52·7	24·0
As hydrocyanic acid . .	4·2	8·1	17·7	15·0
Decomposed (by diff.) . .	11·3	14·4	29·6	61·0
	100·0	100·0	100·0	100·0
Calculated increase volume of exit gases due to dissociation of hydrocarbons . . . c.c.	—15	+175	+420	+770
Experiment No.	9.	10.	11.	12.
"Slowest" rate .c.c. per min.	21	21	21	21
Reacting mixture:—				
NH ₃ , volume per cent. . .	11·2	10·6	11·3	11·1
Time in tube . . . secs.	340	337	349	343
Ammonia balance:—				
NH ₃ entering tube, grammes	0·361	0·346	0·357	0·355
NH ₃ products per cent. :—				
Undecomposed . . .	76·4	61·7	42·9	13·2
As hydrocyanic acid . .	3·9	5·8	17·9	5·8
Decomposed (by diff.) . .	19·7	29·5	39·2	81·0
	100·0	100·0	100·0	100·0
Calculated increase volume of exit gases due to dissociation of hydrocarbons . . . c.c.	+55	—	+595	+840

Consideration of these and other results leads to the conclusion that hydrocyanic acid is the product of a reversible reaction,

INFLUENCE OF RATE OF FLOW ON YIELD OF HCy.

HCy produced per 100 parts of NH₃ entering.
Wood Charcoal A.

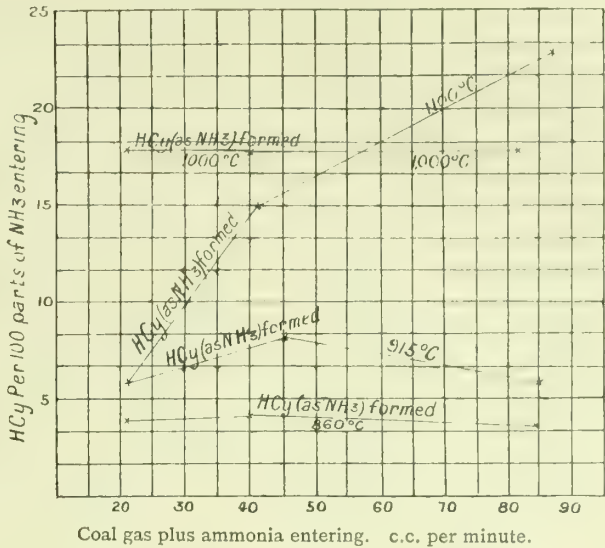
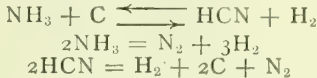


Fig. 2.

controlled mainly by temperature and accompanied by secondary reactions yielding the elements C, N₂, and H₂ by thermal decomposition of HCy and NH₃. Thus—



To test the correctness of this hypothesis, a mixture of coal gas and hydrocyanic acid was passed over the contact material used in previous experiments. The results are given in Table II.

TABLE II.—ACTION OF WOOD CHARCOAL ON HYDROCYANIC ACID.

The procedure adopted was similar to that employed in the experiments recorded in Table I. Conditions were varied as regards temperature only; rate of flow and volume and composition of reacting mixture remaining approximately the same throughout the series. The results are graphically represented in fig. 3.

INFLUENCE OF TEMPERATURE ON YIELD OF NH₃ AND DECOMPOSITION OF HCy.

"Slow" Rate of Flow, 79 to 85 c.c. per minute.
Wood Charcoal A.

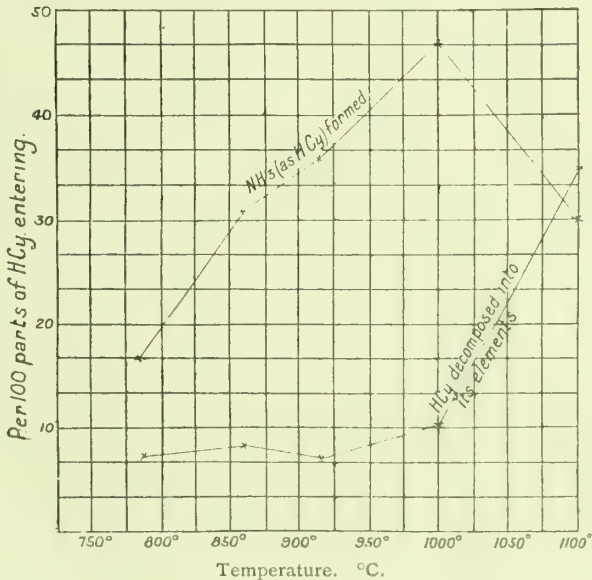


Fig. 3.

From this we learn: (1) That the amount of hydrocyanic acid per cent. converted into ammonia reaches a maximum at 1000° C.; at 1100° C. there is a marked decrease in yield. (2) That the amount of hydrocyanic acid thermally decomposed, or converted into products other than ammonia, is small below 1000° C., and large at 1100° C. Thus: At 1000° C. HCy decomposed, 10·6 per cent.; at 1100° C., 35·5 per cent.

It is interesting to note that the contact material after use in these experiments showed marked loss of activity. The surface of the charcoal, further, was found to have lost the silvery appearance that characterizes it after treatment with coal gas alone or coal gas and ammonia, and had acquired a distinct bronze lustre

TABLE II.—Action of Wood Charcoal on Hydrocyanic Acid—
“Slow” Rate of Flow.

°C. 760 m.m.	Wood Charcoal (A). Volume, 230 c.c.; Weight, 55 grammes.				
	785° C.	860° C.	915° C.	1000° C.	1100° C.
Experiment No.	13.	14.	15.	16.	17.
Rate of flow . . . c.c. per min.	79	83	85	81	85
Duration of experiment, mins.	52	50	48	51	49
Coal Gas entering . . . c.c.	4005	3995	3950	4025	4035
Hydrocyanic acid (pure, dry) . . . c.c.	126	136	131	124	140
Reacting mixture :—					
HCy, volume per cent. . .	3'0	3'2	3'2	3'0	3'3
Time in tube . . . secs.	91	87	85	89	84
Hydrocyanic acid balance :—					
HCy (as NH ₃) entering grammes	0'096	0'104	0'100	0'094	0'107
HCy, products per cent. :—					
Undecomposed . . .	76'0	60'6	57'0	42'6	34'6
As ammonia . . .	16'7	30'8	36'0	46'8	29'9
Decomposed (by diff.) .	7'3	8'6	7'0	10'6	35'5
	100'0	100'0	100'0	100'0	100'0
Calculated increase volume of exit gases due to dissociation of hydrocarbons . . . c.c.	—25	+110	+120	+220	+705

when viewed by reflected light. The loss of efficiency and altered physical character is attributed to deposition of carbon upon the surface from thermal decomposition of hydrocyanic acid.

TABLE III.—DILUENTS—COAL GAS AND HYDROGEN COMPARED.

It has been stated already that ammonia gas in absence of methane will remove the graphitic skin from the surface of coated

TABLE III.—Interaction of Methane and Ammonia.
Diluent Coal Gas and Hydrogen compared. “Slow” Rate of Flow.
Temperature, 1000° C.

°C. 760 m.m.	Wood Charcoal (B). Volume, 230 c.c.; Weight, 55 grammes.					
	Coal Gas.		Hydrogen.		Coal Gas.	
	Enter-ing.	Leav-ing.	Enter-ing.	Leav-ing.	Enter-ing.	Leav-ing.
Experiment No.	18		19		20	
Diluent gas entering . . . c.c.	3790	4480	3880	..	3750	..
Per 100 volumes :—						
CO ₂ . . .	0'2	0'1	..	..	..	0'1
O . . .	0'5	0'2	0'1	..	0'7	0'2
CO . . .	22'6	20'0	..	0'6	19'5	17'4
CH ₄ . . .	22'9	14'8	..	..	25'3	15'4
H . . .	48'7	59'0	99'5	98'1	50'2	60'6
			(by diff.)			
N . . .	5'1	5'9	0'4	1'3	4'3	6'3
	(by diff.)	(by diff.)	(calcu-lated).	(by diff.)	(by diff.)	
	100'0	100'0	100'0	100'0	100'0	100'0
Rate of flow . . . c.c. per min.	88	..	83	..	83	..
Duration of experi-ment . . . mins.	49	..	52	..	51	..
Ammonia (pure, dry), . . . c.c.	485	..	439	..	458	..
Reacting mixture :—						
NH ₃ , volume p. ct.	11'3	..	10'2	..	10'9	..
Time in tube, secs.	82	..	87	..	87	..
Ammonia balance :—						
NH ₃ , entering grammes	0'370	..	0'335	..	0'349	..
NH ₃ , products per cent. :—						
Undecomposed . . .	..	38'4	..	10'4	..	32'4
As hydrocyanic acid . . .	..	25'9	..	22'7	..	27'8
Decomposed (by diff.) . . .	..	35'7	..	66'9	..	39'8
	..	100'0	..	100'0	..	100'0
Methane balance :—						
CH ₄ entering, cal-culated as car-bon . grammes	0'490	..	Nil	..	0'507	..
CH ₄ , products per cent. :—						
Undecomposed . . .	..	72'9	..	..	..	73'6
Oxidized to CO . . .	..	(—4)	..	..	..	6'3
As hydrocyanic acid . . .	..	13'5	..	..	..	13'4
As solid carbon (by diff.) . . .	..	27'1	..	..	..	26'4
	..	14'0	..	..	..	6'7
	..	100'0	..	..	..	100'0
Calculated increase volume of exit gases due to dissociation of hydrocarbons c.c.	..	+ 200	..	+ 1	..	+ 260

wood charcoal. Comparative experiments on a wood charcoal contact with coal gas and hydrogen as diluents are of very little value unless precautions are taken to ensure that the charcoal is properly coated with graphitic carbon throughout the series. In the present research, this was ensured by arranging that an exper-iment with hydrogen as diluent was preceded and followed by similar experiments in which coal gas was used. The results are given in Table III. Conditions as regards rate of flow, volume, and composition of reacting mixture, and temperature, remained practically constant throughout the series.

It will be seen that the results with coal gas show a distinctly higher yield of hydrocyanic acid, and that less ammonia is decom-posed into its elements. The presence of gaseous carbon is un-doubtedly favourable to the formation of hydrocyanic acid. The lower figure for ammonia decomposed into its elements when coal gas is employed as diluent may be due, in part, to the dilution brought about by the decomposition of methane; the increase in volume (200 c.c., 260 c.c.) from this cause being very marked. Dilution, we know from Table IV., is favourable to conservation of ammonia.

TABLE IV.—EFFECT OF DILUTION.

Conditions were approximately constant as regards rate of flow, volume of reacting mixture, and temperature for each pair of experiments. The necessary reduction in the volume of ammonia employed was effected by diluting the ammonia in the mercury cylinder with dried coal gas; the amount of gas so used being included in the figure “Coal gas entering.”

The results indicate that dilution at “slow” rate of flow is un-favourable to yield of hydrocyanic acid, but favourable to con-servation of ammonia.

TABLE IV.—Effect of Dilution. Interaction of Methane and Ammonia. “Slow” Rate of Flow.

°C. 760 mm.	Wood Charcoal (A). Volume, 230 c.c.; Weight, 55 grammes.					
	915° C.		1000° C.		1100° C.	
	Ammonia in Re-acting Mixture. Per Cent. by Volume.		Ammonia in Re-acting Mixture. Per Cent. by Volume.		Ammonia in Re-acting Mixture. Per Cent. by Volume.	
	10'8	5'7	10'8	5'4	11'2	5'6
Experiment No.	2	21	3	22	4	23
Rate of flow . . . c.c. per min.	85	83'9	82	82'5	87	85'7
Duration of experiment mins.	50	50	51	50	50	50
Coal gas entering . . . c.c.	3,800	3,955	3,750	3,900	3,910	4,050
Ammonia (pure, dry) . . . c.c.	457	238	453	222	466	237
Reacting mixture : Time in tube . . . secs.	86	86	87	87	82	84
Ammonia balance :—						
NH ₃ entering, grammes	0'348	0'182	0'345	0'169	0'355	0'181
NH ₃ , products per cent. :—						
Undecomposed . . .	86'9	90'7	62'3	78'8	30'5	39'3
As hydrocyanic acid . . .	5'9	4'9	17'7	10'6	22'9	20'4
Decomposed (by diff.) .	7'2	4'4	20'0	10'6	46'6	40'3
	100'0	100'0	100'0	100'0	100'0	100'0
Calculated increase volume of exit gases due to disso-ciation of hydrocarbons c.c.	+ 130	+ 1	+ 255	+ 40	+ 740	+ 600

TABLE V.—CONTACT MATERIALS, WOOD CHARCOAL (COATED AND UNCOATED), HARD SCURF, AND GRANULAR CARBON, COMPARED.

Comparison is made in this table between the efficiencies of two forms of retort carbon and that of wood charcoal, coated and uncoated. Conditions as regards temperature, rate of flow, volume, and composition of reacting mixture were approximately constant throughout the series. The calculated free space in the tube, however, in the case of the “granular” carbon so much exceeded that in the case of the wood charcoal and “hard scurf,” owing to the physical condition of the granules, that it is thought better to exclude this from consideration when discussing the results.

Comparing the results obtained with the remaining three con-tact materials, we see that the scurf is an active promoter of the thermal decomposition of ammonia. The yield of hydrocyanic acid, on the other hand, is low.

TABLE VI.—INTERACTION OF ETHYLENE AND AMMONIA.

An enriched coal gas was used as diluent. Conditions throughout were approximately constant as regards rate of flow, temperature, volume, and composition of reacting mixture, and time of gas in tube. The ethylene experiments, Nos. 28 and 29, were preceded and followed by corresponding experiments with coal gas, Nos. 27 and 30, to ensure that the contact material was acting normally.

The results clearly indicate that the presence of ethylene in the reacting mixture is favourable to the production of hydrocyanic acid and to conservation of ammonia. It is probable that the survival of ammonia is materially assisted by the large dilution

TABLE V.—Interaction of Methane and Ammonia. Contact Materials, Wood Charcoal, Graphitic Scurf, and Granular Carbon, compared. "Slow" Rate of Flow. Temperature, 1000° C.

° C. 760 mm.	Wood Charcoal (A). Volume, 230 c.c.; Weight, 55 Grammes.		Hard Scurf from Coal-Gas Retort. Volume, 230 c.c.; Weight, 200 Grammes.	Granular Carbon Deposited from Purified Coal Gas. Volume, 230 c.c.; Weight, 43 Grammes.
	Uncoated with Graphitic Carbon.	Coated with Graphitic Carbon.		
Experiment No.	24	3	25	26
Rate of flow . . c.c. per min.	82	82	88	85
Duration of experiment, mins.	50	51	49	51
Coal gas entering . . . c.c.	3665	3750	3850	3825
Ammonia (pure, dry) . . c.c.	459	453	484	483
Reacting mixture :—				
NH ₃ , volume per cent. . .	11·1	10·8	11·2	11·2
Time in tube . . . secs.	88	87	82	..
Ammonia balance :—				
NH ₃ entering . . grammes	0·350	0·345	0·369	0·368
NH ₃ , products per cent. :—				
Undecomposed . . .	28·0	62·3	24·7	52·0
As hydrocyanic acid . .	30·7	17·7	8·8	10·6
Decomposed (by diff.) .	41·3	20·0	66·5	37·4
	100·0	100·0	100·0	100·0
Calculated increase volume of exit gases due to dissociation of hydrocarbons . . c.c.	..	+ 255	+ 170	+ 180

TABLE VI.—Interaction of Ethylene and Ammonia. "Slow" Rate of Flow. Temperature, 1000° C.

C. 760 mm.	Wood Charcoal (B). Volume, 230 c.c. ; Weight, 55 grammes.				Hard Scurf from Gas-Retort. Volume, 230 c.c. ; Weight, 203 grammes.	
	Coal Gas.	Per Cent. of Ethylene in Coal Gas used.		Coal Gas.	Coal Gas.	Coal Gas Contain- ing 19·4 per Cent. Ethylene.
		15·6.	26 7.			
Experiment No.	27	28	29	30	25	31
Rate of flow. c.c. per min.	82	86	81	82	88	86
Duration of experiment mins.	51	50	52	52	49	51
Gas entering (coal gas plus ethylene) c.c.	3,745	3,840	3,750	3,815	3,850	3,915
Ammonia (pure, dry). c.c.	458	472	459	469	484	493
Reacting mixture :—						
NH ₃ , volume per cent. .	10·9	10·9	10·9	10·9	11·2	11·2
Time in tube . . . secs.	87	84	89	87	82	83
Ammonia balance :—						
NH ₃ entering . grammes	0·349	0·359	0·350	0·357	0·369	0·375
NH ₃ , products per cent. :—						
Undecomposed . . .	32·4	38·4	38·0	33·6	24·7	54·6
As hydrocyanic acid .	27·8	30·9	31·7	26·6	8·8	13·1
Decomposed (by diff.) .	39·8	30·7	30·3	39·8	66·5	32·3
	100·0	100·0	100·0	100·0	100·0	100·0
Calculated increase volume of exit gases due to disso- ciation of hydrocarbons c.c.	+ 260	+ 525	+ 725	+ 300	+ 170	+ 540

brought about by thermal decomposition of the ethylene; but such dilution would be unfavourable to production of hydrocyanic acid (Table IV.).

RELATION OF HYDROCYANIC ACID TO AMMONIA IN CRUDE COAL GAS.

It is interesting to observe that the relation of hydrocyanic acid to ammonia in the laboratory experiments described above is controlled mainly by temperature. Indeed, so markedly is this the case, that a knowledge of this relationship for the graphitic contact material used in the experiments would enable one, with rough approximation, to determine the temperature of the carbon with which the reacting mixture had been in contact. Thus, calculating the amount of hydrocyanic acid (as ammonia) per 100 parts of ammonia remaining undecomposed, for each of the temperatures and rates of flow in Table I., we find:

Wood Charcoal (A). Coated with "Graphitic" Carbon.
NH₃ in Reacting Mixture, 11 Per Cent.

—	Time in Tube.	850° C.	9·5° C.	1000° C.	1100° C.
	Secs.				
"Slow" rate . .	85	3·8	6·8	28·4	75·2
"Slower" rate . .	174	5·0	10·4	33·6	62·5
"Slowest" rate . .	312	5·1	9·0	41·7	43·9

The "hard scurf," Table VI., Experiment No. 25, gave much

the same result. Thus, for 11 per cent. NH₃ at 1000° C. "Slow" rate; gas 82 secs. in tube. 35·6 per cent. HCN (as ammonia) per 100 parts of ammonia undecomposed. A similar relationship is found to exist for other dilutions of ammonia. Thus, Table IV.:

Wood Charcoal (A). Coated with "Graphitic" Carbon.
NH₃ in Reacting Mixture, 5·5 Per Cent.

—	Time in Tube.	915° C.	1000° C.	1100° C.
	Secs.			
"Slow" rate . . .	85	5·4	13·5	52·0

The conclusion here reached relates strictly to the reactions that take place under the experimental conditions observed in the laboratory; and it is not permissible to assume, without strict inquiry, that conditions even remotely similar will exist in gas-works practice and govern the relation of hydrocyanic acid to ammonia in crude coal gas. Probably the working of a vertical retort of the continuous type most nearly approaches that of the laboratory tube adopted in this research; but the similarity is by no means a close one, as conditions in respect both of contact material and temperature were uniform throughout the laboratory tube from end to end, while in a vertical retort experience shows that carbonization proceeds at different speeds at differing levels, and notably in the same horizontal section, more especially in the upper half of the retort. It is therefore quite impossible, with any degree of certainty, to ascertain the temperature conditions under which the gases are evolved, and to which they are exposed in their subsequent passage to the outlet. The conditions diverge, perhaps, to a still greater extent when we come to consider the nature of the diluent gases in the two cases. The products of distillation of coal are so numerous, and differ so widely in their chemical and physical properties, that it would be quite impossible to reproduce in the laboratory conditions existing in this respect in gas-works practice; and a number of assumptions have necessarily to be made that materially lessen the value of the conclusions drawn from laboratory experiments when the chemist attempts to apply them to large-scale operations. Moreover, the genesis both of ammonia and hydrocyanic acid in the distillation of coal remains very much a matter for speculation. It is evident that the ammonia found in the crude coal gas leaving the gas-retorts may be derived from the nitrogen of the coal in many ways—by the agency of nascent hydrogen, by the decomposition of nitrogenous bodies present in the coal or produced therefrom on distillation, and, lastly, by decomposition of hydrocyanic acid, either alone or by interaction of hydrogen ($\text{HCN} + \text{H}_2 \rightleftharpoons \text{NH}_3 + \text{C}$), or steam ($\text{HCN} + \text{H}_2\text{O} \rightleftharpoons \text{NH}_3 + \text{CO}$).

In the same way, hydrocyanic acid may be a direct product of the decomposition of nitrogenous organic bodies, or may be obtained as a product of the decomposition of ammonia in presence of carbon, gaseous or solid, in accordance with the reversible reaction given above. We cannot exclude the possibility of the direct production of hydrocyanic acid, as the lower limit for its formation from ammonia appears to lie at or slightly below 700° C.; whereas cyanogen compounds have been found in considerable amount in ammoniacal liquors obtained in the manufacture of "coalite" by the distillation of coal at temperatures stated not to exceed 800° to 850° Fahr. (427° to 454° C.)—see report for 1908.

However, whatever be the source of the ammonia and hydrocyanic acid, both these bodies are normal constituents of crude coal gas when generated by the distillation of coal at temperatures whose upper limit within the retort may be taken to be about 2000° Fahr. (1100° C.); and, when generated, it is reasonable to infer that the relative amounts of these constituents tend to attain an equilibrium determined by the nature and temperature of the material with which they are in contact, the time of contact therewith, and the degree of dilution and nature of diluent gases present.

Exact data are wanting for determining the relation of hydrocyanic acid to total ammonia in crude coal gas as it leaves the retort. Mr. James McLeod published the results of a number of determinations of the nitrogen found in the products of distillation of eighty coals in use at the Provan Gas-Works (see "Journal of the Society of Chemical Industry," 1907, Feb. 28, pp. 137-139);* but the estimation of the cyanogen present in the gas was made at the exit of the scrubbers, and no account was taken of the cyanogen present in the "virgin" and scrubber liquors as cyanide, thiocyanate, and ferrocyanide. Correcting for this, we have—

Nitrogen in the coke	Per Cent. of Total Nitrogen.
	58·3
" in the tar	3·9
" in ammoniacal liquor as ammonia	17·1
" as cyanogen (corrected)	1·5
" in gas (by difference)	19·2

No figures are given, however, for the average time of the gas in the retorts, nor for the dilution of ammonia per cent. in the crude coal gas.

Mr. McLeod considers that the amounts of cyanogen and ammonia produced are governed by the following factors: "(1) The physical condition of the coal when introduced into the retort.

* See "JOURNAL," Vol. XCVII. p. 748.

If the lumps are very small, the heat takes longer to penetrate the whole charge; and consequently the products differ. (2) The amount of extraneous moisture the coal contains. Practical experience shows an increased amount of carbonic acid, sulphuretted hydrogen, tar, and ammonia if the coal is wet. (3) The temperature of the distillation. High heats produce a marked increase in the amount of cyanogen, and also influence the amount of nitrogen retained by the coke."

As regards the conclusions reached by Mr. McLeod, the present research, of necessity, can afford no confirmation or otherwise with respect to factor (1). As regards factor (2)—the amount of extraneous moisture—attention was directed in the annual report for 1904 to the conditions under which the reaction $\text{HCN} + \text{H}_2\text{O} = \text{NH}_3 + \text{CO}$ is operative. The combined oxygen present in the coal would be also a source of aqueous vapour. The importance of temperature factor (3) has been emphasized elsewhere. In addition, the time of gas in the retort and degree of dilution of ammonia in the crude coal gas are factors that must not be overlooked in an exhaustive study of the question.

More complete data have been recently published (1909) by Dr. Harold G. Colman, in his various tests of the Glover-West vertical retort at St. Helens, and recorded in the technical journals.* The installation in question consisted of a setting containing eight vertical retorts 20 feet in length, heated by gaseous firing from a generator combined with the plant. The gas produced was condensed and purified in a plant entirely separate from that dealing with the gas from the horizontal retorts; the gas passing through a dry main to the foul main, thence through a set of vertical atmospheric condensers to the exhaust, after which it traversed successively a washer, a scrubber, and an oxide purifier, passing thence to the meter. The gas was sampled for estimation of hydrocyanic acid at the inlet to the washer. A correction is therefore needed for cyanogen condensed with the virgin liquors in the condenser. It will be sufficient for our purpose to assume that 25 per cent. of the hydrocyanic acid leaving the retort is condensed with the virgin liquor, and is retained thereby as cyanide, ferrocyanide, and thiocyanate. Calculating on this basis from Dr. Colman's results, we find—

GLOVER-WEST VERTICAL RETORT AT ST. HELENS.

Tests Taken on Different Dates, and with Various Coals in Use.

	A.	B.	C.	D.
Per cent. NH_3 in crude coal gas . . .	1'6	1'1	0'9	1'1
Per cent. HCy (as NH_3) to total NH_3 .	17'9	21'7	30'7	25'4

Dr. Colman gives no temperature data, nor is it possible from his figures to determine the time spent by the coal gas in the retort. Mr. Thomas Holgate estimated that for a horizontal retort (partially filled) the time of the gas in the retort (calculated for gas at 30 inches bar., 60° Fahr.) would be 27 minutes (= 162 seconds) at the start to 56 (336 seconds) at the end of distillation (see the report for 1908); but such limits would not be applicable to a fully-charged vertical retort continuously generating gas. In the laboratory experiments on "graphitic scurf" above referred to, the time of gas in the tube (calculated for 30 inches bar. and 60° Fahr.) would be about 77 seconds.

Further data are required before any conclusion can be safely drawn as to the connection existing between carbonization temperature and relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort. In the works, further knowledge is required of the distribution of temperature in the retort and of the relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort and before condensation has taken place. In the laboratory, the work has to be extended to include experiments on ammoniacal mixtures down to 1 per cent.; and, further, to study the effect of varying the nature and amount of ash in the graphitic contact used. It may well be found that a high percentage of ash, and especially of ash containing iron compounds, is very detrimental to the survival of ammonia and hydrocyanic acid in the reacting gases.

Mr. Carpenter concludes his report as follows: I regret that continued ill-health has precluded my doing more than generally supervise the preparation of this report, which proceeds from Mr. Linder's pen. I desire fully to recognize the great value of his services to the work of the Department. He has conducted the experimental work, the results of which are recorded here, with conspicuous ability and zeal. The whole credit for this research, if the work possesses value, is really entirely due to him.

* See "JOURNAL," Vol. CVII., p. 166; Vol. CVIII., p. 42.

Gas and Electricity Supply at Krupp's Works.—In the last report of the Essen Chamber of Commerce, some interesting particulars are given respecting the great works of Krupp, at Essen, to which 68,905 employees (6840 being officials) were attached on May 1 last. The firm have works which produced 652½ million cubic feet of gas for lighting 2004 street lamps and for use in 32,207 workshops, offices, and dwelling-houses. Beyond this, the central electric generating station produced 39,640,000 kilowatts of electric energy, compared with 25,541,000 kilowatts in the year 1908.

ILLUMINATING POWER AND CALORIFIC VALUE OF GAS IN CANADA.

Report to the Canadian Gas Association.

The subject of the illuminating power and the calorific value of the gas supplied in Canada was brought before the members of the Canadian Gas Association in a report submitted by a Committee at the third annual meeting, held in Hamilton (Ont.) last month, under the presidency of Mr. J. S. Norris, of Montreal. The Committee, consisting of two members (Messrs. Arthur Hewitt and John Keillor), was appointed at the preceding meeting, when a paper was read on "The Candle Power of Gas," which brought out the following facts and suggestions: That there had been no change for 24 years in the Dominion Government Statutes regulating the testing of gas and the candle power to be supplied. That during this period the methods of using gas had so totally changed that there was no longer any necessity for gas companies in Canada to supply to consumers the quality of gas prescribed by the Gas Inspection Act of 1886. That in other countries—notably Great Britain and Germany—the regulations governing the testing of gas had been revised to suit the new methods of using gas, and the candle power had been reduced. That in other countries more modern and efficient burners for testing the candle power of the gas had been adopted, notably the "Metropolitan" No. 2 burner, and the old standard argand burner discarded. That, in view of the fact that about 90 per cent. of the total gas made in Canada was being sold for purposes other than flat or open flame lighting, it was suggested that tests should be made in Canada of from 12 to 20 candles, for the special purpose of ascertaining the respective candle power and heating values of the gases lower than 16 candles; the idea being to obtain certain information which would guide the Association in recommending a reduction to a lower-grade candle-power gas which would still contain sufficient heat units for the all-round requirements of the consumers.

Following the lines indicated, the Committee decided to make the tests in Toronto, where coal gas and water gas are made, and a blend of the two distributed to consumers, the tests to be made as follows: (1) For candle power, using the Sugg 16-candle standard and the pentane lamp; the calorific value to be measured by the Junkers calorimeter. (2) For candle power, using the new "Metropolitan" No. 2 burner and the pentane lamp; the calorific value to be measured by the Junkers calorimeter.

It was also considered that the Association should be in possession of statistics covering the entire gas production of Canada, for the purpose of ascertaining first hand the total quantity of gas made, its candle power, and the proportions sold for heat and fuel, incandescent lighting, &c. Accordingly, a circular-letter was sent to every gas company in the Dominion making coal gas, water gas, or a mixture of the two, requesting them to supply the information the Committee desired. Returns were received from all but two companies; and they are tabulated below.

	Gas Made, Thousand Cubic Feet.	Proportions (Thousand Cubic Feet) Used for			Candle Power Supplied.
		Heat and Fuel.	Incandescent Lighting.	Open Flame Lighting.	
Barrie	12,000	6,000	5,400	600	18'0
Belleville	20,200	10,200	7,500	2,500	19'3
Berlin	35,000	26,250	6,750	2,000	16'7
Calgary	27,000	20,250	6,750	..	16'0
Cobourg	7,400	4,400	1,500	1,500	18'1
Guelph	44,000	26,400	13,200	4,400	17'5
Hamilton	101,000	53,500	38,000	9,500	16'0
Ingersoll	12,000	6,000	4,800	1,200	16'0
Kingston	40,000	20,000	20,000	..	20'0
Listowel	3,000	300	2,250	450	19'0
London	192,000	115,200	67,200	9,600	17'5
Montreal	1,459,000	875,000	510,600	75,000	17'4
Napanee	5,000	2,500	2,500	..	20'0
Nelson	7	5,000	2,100	..	18'0
Owen Sound	18,000	10,800	3,600	3,600	16'0
Oshawa	4,000	2,000	1,840	160	17'0
Ottawa	126,500	113,850	12,650	..	16'5
Peterboro'	17,000	16,150	850	..	18'0
Quebec	120,000	72,000	45,600	2,400	18'0
Stormont	4,000	1,600	2,000	400	18'0
St. Catharines	18,650	13,100	5,550	..	18'0
St. John	36,200	1,800	30,800	3,600	17'0
St. Thomas	56,200	22,500	22,500	11,200	17'3
St. Hyacinthe	5,000	4,000	800	200	18'0
Toronto	2,226,200	1,113,200	667,800	445,200	19'0
Vancouver	123,000	95,900	27,100	..	16'0
Winnipeg	245,600	184,000	49,300	12,300	17'0
Woodstock	30,000	15,000	14,400	600	16'7

According to these returns, the total quantity of gas made in Canada last year, exclusive of the companies not making returns, was 4,995,050,000 cubic feet; and it was used in the following proportions for the purposes named:—

	Cubic Feet.	Percentage of Total Make.
Heat and fuel	2,837,300,000	.. 57
Incandescent lighting	1,573,340,000	.. 32
Open-flame lighting	584,410,000	.. 11
Total	4,995,050,000	.. 100

The following are the returns of ten tests for illuminating power and calorific value of (A) coal gas, (B) water gas, and (C) a mixture of coal and water gas in the proportions of 75 per cent. of the former and 25 per cent. of the latter; the tests being made with Sugg's 16 candle standard and the Junkers calorimeter:—

(A)			(B)			(C)		
Candle Power.	Calorific Value.		Candle Power.	Calorific Value.		Candle Power.	Calorific Value.	
	Gross.	Net.		Gross.	Net.		Gross.	Net.
17'85	652'6	584'06	17'46	587'30	536'67	15'64	587'30	533'09
17'46	677'3	621'98	19'42	585'70	535'35	16'06	601'30	541'37
17'72	662'0	598'01	19'92	600'00	586'01	17'31	623'60	578'14
16'92	621'8	575'74	19'43	592'42	555'59	19'42	631'90	599'30
17'38	685'1	630'04	17'52	617'20	580'28	18'33	626'40	575'29
18'53	703'0	647'84	20'20	610'50	587'33	18'29	626'30	575'79
17'81	665'3	605'20	21'72	612'40	577'48	17'39	621'10	575'22
10'68	674'6	593'53	20'77	612'10	572'39	17'32	612'50	576'33
16'85	626'8	584'53	18'53	565'00	538'33	18'41	629'60	581'30
16'22	614'4	557'00	18'08	570'60	538'50	17'34	614'08	554'82

The following are the returns of ten similar tests, using the "Metropolitan" No. 2 argand burner:—

(A)			(B)			(C)		
Candle Power.	Calorific Value.		Candle Power.	Calorific Value.		Candle Power.	Calorific Value.	
	Gross.	Net.		Gross.	Net.		Gross.	Net.
17'79	587'3	533'09	22'48	605'1	554'34	21'06	624'0	610'19
18'38	590'8	558'68	22'83	604'1	557'15	21'15	638'9	589'70
19'58	653'7	598'32	23'53	625'0	592'36	21'92	668'4	603'13
19'15	607'5	560'70	22'91	614'4	563'82	22'59	634'7	592'91
19'30	614'3	554'69	25'10	612'4	577'48	22'60	609'9	572'67
20'48	644'0	588'12	21'94	570'6	538'50	21'59	621'3	569'91
20'74	667'6	611'65	21'70	565'0	538'33	21'63	610'5	576'29
21'40	639'8	586'52	22'09	590'8	558'68	19'85	632'2	590'51
21'11	631'7	575'60	21'37	598'3	593'65	22'09	626'4	575'29
20'54	621'0	565'34	23'68	610'5	587'33	20'54	623'6	578'14

The following are the returns of fifteen tests for illuminating power and calorific value of pure coal gas, using Sugg's 16-candle standard and the Junkers calorimeter:—

Calorific Value.			Calorific Value.		
Candle Power.	Gross.	Net.	Candle Power.	Gross.	Net.
11'76	575'25	538'26	16'71	644'0	588'12
11'87	548'20	501'69	17'27	639'8	586'52
13'83	603'90	546'76	17'81	665'3	605'20
14'32	607'50	560'70	18'03	633'1	579'38
15'56	610'40	575'57	18'28	648'0	578'92
15'83	633'30	577'59	18'68	674'6	593'53
16'06	627'30	557'62	19'00	669'0	611'30
16'17	632'10	571'57			

On the general subject of their investigations, the Committee made the following remarks.

From the first tabulated statement, it will be observed that out of the total gas made in Canada 57 per cent. is used for heat and fuel, 32 per cent. for mantle lighting, and 11 per cent. for open-flame lighting. We desire especially to draw attention to the small percentage used for open or flat flame lighting (11 per cent.), compared with the large proportion used for heat and fuel and mantle lighting combined—89 per cent. Compare these with the proportions of gas used for the same purposes in 1886, when the existing testing regulations were enacted:

	In 1886. Approximately.	In 1910. Actual.
For heat and fuel	15 p. ct.	57 p. ct.
For lighting by mantle burners	nil	32 „
For lighting by luminous or flat-flame burners	90 „	11 „

These figures show how radically changed are the conditions to-day, in the matter of using gas, compared with 1886. In that year, when the argand burner was adopted by the Government as the standard burner for testing gas, 90 per cent. at least of the total gas sold was for lighting by luminous or open-flame burners. This necessitated making gas of high candle power, so that with the standard burner a light equal to at least 16 candles could be obtained; the gas being consumed at the prescribed rate of 5 cubic feet per hour. In 1886, the Government decided that gas companies would have to maintain a 16-candle standard—a regulation intended to protect the consumers who used those luminous flame burners against the possibility of getting poor light. But, remember, that was in 1886—24 years ago. The argand and flat-flame burners were the only ones in general use then, and practically all the gas made was used by these burners. Look at the changed conditions in 1910. Only 11 per cent. of the total gas made is now used by luminous-flame burners, against 90 per cent. 24 years ago. To-day as much as 89 per cent. of the gas made is being used for the combined purposes of heat, fuel, and mantle lighting; in 1886, approximately 10 per cent.

Taking into consideration these changed conditions of using gas, it is evident that what the gas industry is called upon to supply to-day, and in the future, is not a lighting but a fuel gas. We do not push the sale of a single gas appliance nowadays that necessitates the making of high candle-power gas. The gas-range, water-heater, gas-engine, industrial furnace, gas-arc, gas-fan, &c., can all be well served with a lower-grade gas than that prescribed by the Act of 1886.

Turn, now, to the other tabulated statements. These tests were made for the purpose of obtaining some reliable information, based on Canadian practice, to lay before the Deputy-Minister and Chief Electrical and Gas Inspector, should the Association decide to recommend a reduction of the candle power or the substitution of a calorific standard in its stead. There is no doubt in the minds of your Committee that the calorific standard will eventu-

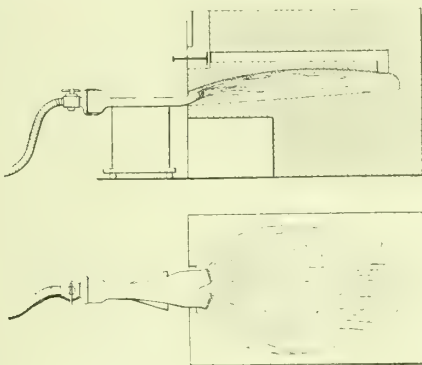
ally supersede the candle standard in Canada; but how far the Government are prepared to go in the matter at this time, we have no means of knowing. At any rate, it is safe to assume that, when it is made known to the authorities, in the opinion of the Canadian Gas Association, a change in the Statutes is necessary, in view of the radically changed conditions of using gas, either a reduction of the candle standard will be granted, or that standard will give place entirely to the calorific standard.

Two important facts are to be deduced from the tabulated results of the tests referred to: (1) That coal gas of about 13-candle power as tested by the Sugg 16-candle standard, containing about 540 B.Th.U. net, is sufficiently high in heat units for all practical requirements and the "Metropolitan" No. 2 burner. (2) The difference in the efficiency of the old Sugg 16-candle standard burner and the new "Metropolitan" No. 2 burner, when testing gases lower than 16 candles, is very marked. But this is to be expected, because whereas the Sugg standard burner is made to test 16-candle gas only, the "Metropolitan" burner, with its adjustments, can be adapted to test correctly any gases higher or lower than 16 candles.

HEATING BAKERS' OVENS BY GAS.

The members of the Société Technique du Gaz en France who attended the recent congress in Paris, and afterwards accepted the invitation of the Council of the Belgian Association of Gas Managers to visit Brussels, had their attention directed in both cities to the subject of the use of gas for heating bakers' ovens. At the Paris meeting, it was introduced by M. Méker, who read a short paper describing the burner he has devised for the purpose; and in Brussels, M. Bromham, one of the Engineers at the Municipal Gas-Works, gave an explanation of the two ovens designed and constructed at these works, and in operation in the pavilion of the Belgian Association at the Exhibition.

Dealing first with the arrangement of M. Méker, whose name is well known in this country in connection with his heating burner, it may be said that it is the outcome of experiments, extending over two years, carried out under the auspices of M. Rouland, the Managing-Director of the Paris Gas Company, who generously gave facilities for making them. The problem M. Méker set himself to solve was the utilization of gas as a fuel in place of wood or coal in existing ovens, without necessitating any structural alterations. The first appliance tried consisted of about seventy of M. Méker's No. 3 burners, each consuming some 10½ cubic feet of gas per hour, or a total of 740 cubic feet. In consequence of the difficulties attending the lighting of such an appliance, M. Méker produced another, of the type of his multi-flame apparatus, in which the gas and air were supplied by separate injectors, and in which the gaseous mixture produced about 35 round flames 1½ inches in diameter. These results were more satisfactory; and, after two modifications, M. Méker fixed upon the appliance described and illustrated in his paper. It consists of a burner mounted upon movable framework, so that it can be brought up to the mouth of the oven. The supply of gas is furnished by a flexible metallic tube about 1½ inches diameter, which will stand all the wear it is likely to be subject to.



Ordinary bakers' ovens are generally about 12 feet from front to back and 8 feet wide; the superficial area of the floor being, on an average, 80 to 90 square feet, and the height from the floor to the vault 12 inches, and sometimes more. Though ovens constructed to utilize solid fuel necessarily do not allow of gas being used to the greatest advantage, the results obtained by M. Méker are, he thinks, sufficiently interesting to justify managers in recommending the use of this fuel for the baking of bread in existing ovens. The accompanying illustrations show, in section and plan, an oven with the gas apparatus in position. The length of the heating period depends upon the effect to be produced and the pressure of gas. For heating the first batch, gas has to be burnt from two to three times as long as for the succeeding batches, as there is comparatively little heat in the oven at the start. But from the point of view of the duration of work, there is great advantage in heating by gas. On the first batch

alone there is a gain of at least an hour, and a quarter-of-an-hour on each succeeding one.

M. Méker was unable to give exact results with respect to the consumption of gas in relation to the quantity of flour or dough baked; but he gave some figures subject to a variation of 25 per cent. and upwards, according to circumstances. To bake in one night bread corresponding to a weight of about 11 cwt. of flour, in seven batches of various kinds—one-third being fancy bread—required 2100 cubic feet of gas. These figures refer to an average oven forming part of a fairly large bakery. In the trials carried out by the Paris Gas Company, the men worked quite normally with the appliance—some for two and others for five months—with the greatest satisfaction. M. Méker thought that it would be interesting to call gas managers' attention to the fact that it is possible to put into the hands of quite inexperienced people, as he had done, appliances consuming from 700 to 1000 cubic feet of gas per hour. The trials were carried out without the slightest accident. Reverting to the question of cost, he said that in Paris it appeared to be, on an average, 1s. 4d. per batch in the case of ordinary ovens heated by wood; and he considered that where gas is sold at about 3s. 8d. per 1000 cubic feet it could compete economically with solid fuel.

M. Méker summed up the matter as follows: It is possible to heat existing ovens by gas, without difficulty or fear of accident, by means of a safe and strong appliance; the quality of the bread is better than that baked with solid fuel; and the workmen are favourable to the use of gas, which facilitates and shortens their labour. The question of cost has to be considered in connection with each particular case and the local circumstances.

One of the speakers on M. Méker's paper was M. Bromham, who, as already mentioned, described, in the pavilion of the Belgian Association of Gas Engineers at the Brussels Exhibition, the two ovens on view there, with which demonstrations are given. The object in view when designing these ovens was, first of all, to obviate the necessity for a baker locating the oven in a cellar, which not only heats the house, but causes a great deal of dust when coke or wood is used as the fuel, both of which, of course, have to be stored, which takes up room. One of the principal advantages of the Brussels oven is that it can be placed anywhere. It is made in two compartments; and the gas is not burnt within, but is led round them in small pipes, so that the oven is hot when the batch is introduced. Consequently, if the oven is not hot enough to finish off the bread, more gas can be used to bring up the temperature to the required point. This arrangement has also the advantage of enabling a baker to bake small fancy bread or pastry while the oven is being heated for the heavier batch. The oven requires the consumption of 250 or 300 cubic feet of gas to heat it up again after a baking. The two compartments will hold about 300 lbs. of bread; and the gas required to bake 2 lbs. is $3\frac{1}{2}$ cubic feet. The temperature required for baking bread is 460° to 500° Fahr.; and the time occupied is 50 to 55 minutes. Consequently, the oven can be filled every hour.

It appears from the foregoing particulars that the gas-heated bakers' oven should commend itself as an economical and cleanly appliance, especially in localities where the price of gas is lower than it is on the Continent, and where wood is dear.

DANGERS OF MIXED GAS AND ELECTRICITY APPLIANCES.

In the course of the review of the proceedings at the recent Congress of the Société Technique du Gaz en France, given in the "JOURNAL," for June 25, it was mentioned that the Committee had investigated the precautions to be taken in the employment of mixed gas and electricity appliances, and had prepared a report on the subject. It was read at the meeting by M. Bouvier; and the following is an abstract translation of it.

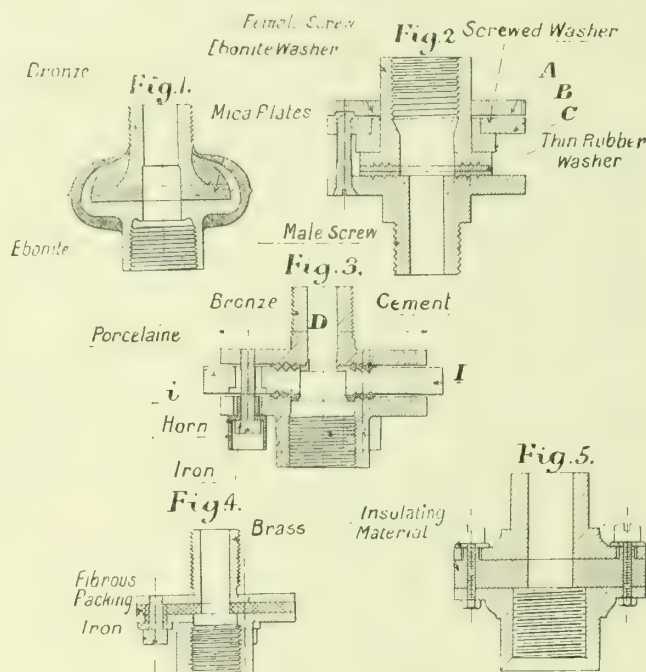
Electricians, and even those connected with gas lighting, having at times displayed distrust in fittings which allow of either system of lighting being used, a Committee of the Society instituted an inquiry into the particular sources of danger in the adoption of such appliances in domestic lighting, and also into the precautions which should be taken with a view to minimize the risks attending their employment. As is well known, any electric-light fitting, whether of the hanging or the wall-bracket pattern, can be insulated. Unless this be done, any contact between one of the electric connections and the body of the fitting will result in short-circuiting; and, as a result, there will be danger of fire. In the case of fittings serving for use on both systems of lighting, the need of proper insulation is more insistent, since the danger of fire is obviously greater under conditions where the passage of current may lead to leakage from a gas-main.

Nevertheless there is much to be said for the duplex fittings from the point of view of corporations supplying both gas and electric current, as well as of those producing the former only. Obviously, competition with electric light will be less acute if those employing electric illumination can at the same time retain fittings for use also with gas. This feature of the duplex fittings will appeal to companies supplying gas only; while those who supply both will succeed more readily in selling electric light to customers who have been using gas, if the latter can easily transform the fittings they already have. An electrical company, too, should see it to their interest to encourage double fittings, not only for the

commercial reasons just stated, but also because customers who have the two systems at command will complain less bitterly of a breakdown in the supply of one.

The precautions which may be taken in installing fittings for the double purpose referred to may therefore be assumed to be of importance to all classes. These precautions, according to the information collected by the Committee, are as follows: (1) The sockets employed for the lamps should invariably be those having the bottoms insulated. (2) Each fitting should be safeguarded from short-circuiting by means of a cut-out provided with a fuse so adjusted that the circuit is broken by the passage of a current one-and-a-half times that normally employed. (3) The fitting should be connected to the gas-pipe by means of an insulating union joint. The two first precautions do not call for comment. As regards the third, some further remarks are necessary.

A number of patterns of insulating unions are available; and they vary considerably in point of efficiency. In order to give satisfaction, an insulating union should have a resistance between its two armatures of at least 500,000 ohms; and this resistance should not be liable to reduction through use, or by accidents such as the deposition of dust, the fall of a metallic article, &c. Also, it should make a tight joint; and, having generally to support the weight of the fitting, it should offer ample resistance.



The insulating unions most commonly employed may be classified into three divisions. The first type (fig. 1) possesses in the highest degree the qualities of an ideal union. The end of both the male and female screws is firmly embedded in the insulating material—a construction which ensures a perfect joint. By making the two parts of the necessary thickness, any required strength may be attained; while it is very difficult to bring the parts accidentally into contact with a foreign body.

The type of union shown in fig. 2 is equally satisfactory; but in this case the perfection of the joint depends only on the threads, which have always a tendency to unscrew if subjected to constant vibration. Moreover—and this is the chief defect of the pattern—the metal washer B is always in contact with the lower junction through the threads; and therefore the insulation is liable to suffer through dust falling on the washer B, or on the upper part of the ebonite washer C; while the fall of a metal body on the washer B will entirely destroy the insulation. This type of union is greatly improved by covering the washer B with an insulating disc A, shown in cross hatching.

From this standpoint, the third type (fig. 3), which is somewhat similar to the preceding, affords a greater degree of safety; but if the heads of the screws do not properly fit the holes of the lower part of the union, the part I is liable to be cut, and there is thus danger of the fitting falling. Unions of the last type are the most common; but the simplifications or modifications made in them should usually be rejected. For example, the diameter D of the unions and of the ebonite disc I are frequently reduced in order to give the model the form shown in fig. 4. Here it will be seen that the chances of leakage are increased, and this, the greater the amount of thrust to which the union may be subjected. Moreover, the heads of the screws being no longer protected, accidental connection can easily be made between one of them and the external element of the union.

In other cases (see fig. 5), the screw-head is placed on the upper part of the union, where the presence of dust or a metal body reduces or entirely destroys the insulation it should give.

As a last recommendation, it may be mentioned that, for any fittings employed for both gas and electric light, the flexible cable carrying the two wires should be of the flat pattern, and of a description thoroughly well insulated (600 megohm series). It should, of course, be arranged so that it is not subjected to deterioration by the heat of the gas.

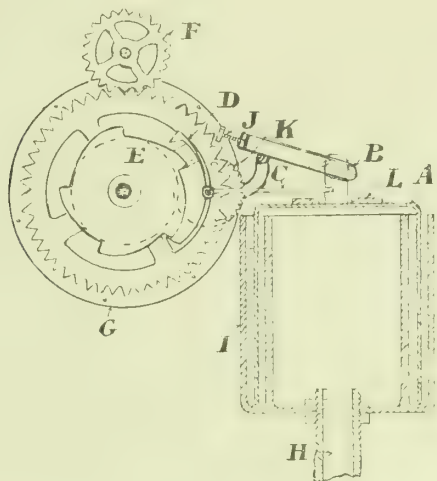
REGISTER OF PATENTS.

Automatically Turning On and Off Gas-Burners.

BLAKE, E. W., of South Croydon, Surrey.

No. 13,350; June 8, 1909.

This invention consists of an improved construction of the "Robson" automatic lighter, patent No. 20,109 of 1907; and the object of the invention is to provide apparatus which is to a certain extent self-regulating, so that the turning off of the gas at extinguishing time may be performed at a lower pressure than is required for turning on the gas at lighting time. Another object is to prevent the unintentional variations of pressure in the main from operating the apparatus during lighting periods.



Blake's Modification of the Robson Automatic Lighter.

A is a gas-tight bell; B an adjustable tube carrying the movable weight of mercury or other liquid; C a rigid lever fixed to the exterior of the bell A at one end and to the pawl D at the other; E is a ratchet wheel; F is a wheel directly connected to the plug of the gas cock or valve; G is a casing containing the operating spring; H is the gas inlet pipe; I is the outer casing carrying the liquid seal into which the lower end or rim of the bell A dips; J is an adjusting plug and screw for lengthening or shortening the tube B; K is a wheel with one or more stops or pegs for returning the liquid weight to the bell when the apparatus is in operation.

The apparatus acts as follows: The diaphragm or bell is always open to the existing gas pressure in the main, and has no valve of any description whatever between it and the main. It is weighted by the movable weight B, and may also, if desired, have one or more fixed weights L; and can be adjusted to operate at any desired pressure. When the pressure in the main is intentionally increased and reaches a predetermined point at which the apparatus has been set to operate, the pressure causes the bell A to rise, and in rising to take up with it the weight-carrying tube B, and, raising the loaded end of the tube above the centre or spindle on which it rocks, causes the mercury to flow by gravity to the other or opposite end of the tube, putting the tube into a more vertical position and quite clear of the bell. This provides a positive action for relieving the bell of the whole or a portion of its weight or weights during the lighting operation. The bell A, now being relieved of a portion of its weight (or, if so desired, the whole of its weights), the abnormal pressure rapidly causes the bell to complete the remainder of its upward movement or stroke, taking up with it the lever or bar C, which rocks the pawl D, releasing the lower end from the ratchet E, and at the same time allowing the spring G to come into action and operate, by means of the wheel F, a gas cock or valve, admitting gas to the main burner and shutting off gas to the pilot light, when one is used in conjunction with the main burner. The action of the spring motor is checked by the upper end of the pawl D engaging with the next tooth on the ratchet E, which occurs directly gas has been admitted to the main burner.

The bell A remains up until a certain decrease of pressure occurs in the supply pipe or main, when the weight of the bell overcomes the pressure and returns to its former position. The bell, in descending, takes down with it the lever C, releasing the upper end of the pawl D from the ratchet E, and allowing the spring to again come into operation until the lower end of the pawl engages with the next tooth on the ratchet. This operation has partly turned the plug of the gas cock or valve, and put it into the position for extinguishing when the next operation takes place.

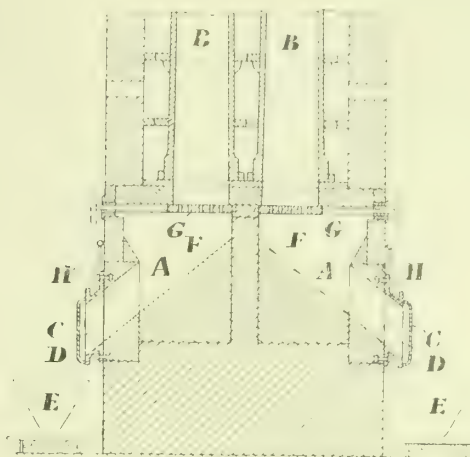
The pressure in the main is now slightly raised again; but not necessarily to the same high point as for the lighting operation. This small increase causes the bell A to again rise, taking up with it the lever C, releasing the lower end of the pawl D from the ratchet E, which again allows the spring to come into action, turning the wheel F, which operates the gas cock or valve extinguishing the main burner and putting on a supply of gas to the pilot light. The gas pressure in the main is at once brought back to the normal pressure again, so as to allow the bell A to fall, and, in falling, it carries down the lever C. Releasing the upper end of the pawl D from the ratchet E, the spring again comes into operation, bringing the stop or stops on the wheel K directly into contact with the lower end of the tube B, lifting or raising this end above the centre or spindle on which the tube rocks, causing the mercury in the tube to flow or fall to the other end, and thus causing weight to be again placed on the bell A.

Vertical Gas-Retorts.

EWING, W., of Glasgow.

No. 14,508; June 21, 1909.

This invention has for its object to provide an improved construction of vertical retorts whereby "the heat from the discharged incandescent coke is utilized to assist the carbonizing action, and in which, by the use of steam, the coke is gradually cooled, its quality is improved, and water gas is produced; while an increased amount of ammonia is obtained." A hermetically sealed chamber for the reception of the discharged coke is provided at the lower end of one or more of the retorts; and a perforated movable plate or valve is arranged between each hermetically sealed chamber and the lower end of one or more of the retorts.



Ewing's Vertical Retorts.

In the vertical section shown of a gas-retort setting, the closed chamber A, for the reception of the discharged incandescent coke (provided at the lower end of one or more retorts B), is fitted with a hermetically sealed discharge door C adapted to close an opening D for the passage of the coke to gravity buckets E or the like. Each chamber has a sloping wall F, down which the coke passes to the opening D. The lower end of each retort is adapted to be cut off partially from the chamber A by a perforated movable plate or valve G; so that carbonization may take place either continuously or intermittently—the plate being operated by suitable devices. Steam is introduced by a branch pipe H into the chamber A, and is arranged to pass upwards through the discharged coke retained temporarily in the chamber and through the coal in the retort when the plate G is open or closed—"thus gradually cooling the coke, making water gas, and increasing the amount of ammonia obtained."

The patentee intimates that he makes no claim to anything described in patents No. 23,650 of 1905, No. 7113 of 1895, No. 15,552 of 1891, No. 7952 of 1898, and No. 7953 of 1898.

Coin-Freed Mechanism.

HIBBERD, C. E., of Victoria Street, S.W.

No. 14,758; June 23, 1909. No. 16,141; July 10, 1909.

This invention relates to coin-freed mechanism, and, although applicable to machines adapted to receive only one size of coin, is more especially useful in a machine adapted to receive different valued coins, and provide an amount of a commodity corresponding to the value of the coin inserted. The mechanism, which may be applied to gas, electricity, or other meters, or to any coin-freed mechanism, consists of a pair of vertical leaves or plates pivoted together and adapted (when closed) to permit the insertion of the coin between them and, by suitable projections on the insides of the leaves, to arrest the coin in a predetermined position therein. When adapted for taking any of a series of different valued coins, each different kind is arrested in a different predetermined position within the coin-holder. The leaves are adapted to be rotated by the operating handle until one of them is stopped by the engagement of the coin with a stop; the movement of this leaf being communicated to the commodity-controlling means. A further movement of the handle moves the other leaf forward and ejects the coin. The patentee describes and illustrates the arrangement of apparatus applied to an electricity meter.

Gas Lighting Apparatus for Use in Connection with Life-Saving Apparatus.

WILLIAMS, T. E., of Egremont, Cheshire; BERGER, E., of Paddington, W.; and BURROUGHS, J. G., of Southend-on-Sea.

No. 15,191; June 29, 1909.

This invention relates to gas lighting apparatus for use in connection with life-saving apparatus, and for other like purposes wherein a light is required to be given only when the life-saving or other apparatus is automatically released and operated by a sliding weight or other means. Such lighting apparatus is particularly applicable for use in connection with a life-saving buoy as described in patent No. 21,840 of 1907. This life buoy is fitted with a hinged flagstaff, which is normally folded down and held so that it lies snugly against the closed buoy, but is released and raised by a spring or equivalent means when the latter is brought into use and opened. Instead, however, of fitting the upper free end of

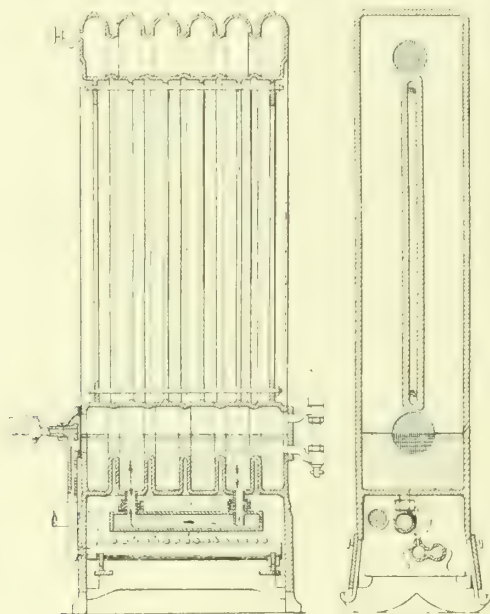
the flagstaff with an electric glow lamp, it is fitted, according to the present invention, with a burner to which two gases, such as phosphoretted hydrogen and acetylene, are supplied, one of which will ignite the other. The supply pipes for the two gases extend down the interior of the flagstaff. Each is connected with a valve plug forming part of the hinge of the flagstaff, and in which the orifices are so arranged that the valves are opened only when the flagstaff is released and raised. The valves are connected by flexible or other pipes with reservoirs containing the gases or materials for generating same; and, consequently, the supply of gas to the burner can only take place when the buoy is in actual use, and will be cut off when the apparatus is closed for storing.

Radiators Heated Directly by Gas.

MARTIN, A., of Revin, France.

No. 28,370; Dec. 4, 1909.

This invention relates to gas-radiators in which the boiler is provided with a thermo-syphon "serving to accelerate the evaporation of the water by increasing its circulation and likewise the heating surface," and it essentially consists in arranging the thermo-syphon in the chamber of the burner above, and laterally of, the rows of gas-jets in such a manner as not to impede the heating of the boiler.



Martin's Gas-Heated Radiator.

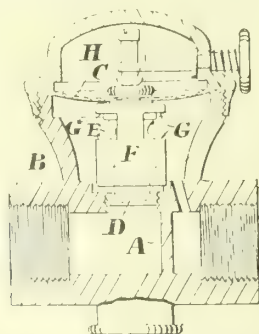
This radiator (as shown) consists, like others of the same type, of elements communicating one with the other at their upper part and forming at their base a boiler, the bottom of which is heated by a row of gas-jets, which the gas reaches after having passed through a valve which automatically regulates its consumption. Beneath the boiler there is arranged a horizontal tube connected with the boiler by two vertical tubes. The assemblage constituted by these three tubes forms the thermo-syphon serving to increase the circulation of the water. It is arranged in the burner chamber in such a manner that it does not prevent the flame of the gas-jets from heating the bottom of the boiler; and it causes a circulation of the water in the direction indicated by the arrows.

Automatic Gas-Regulators.

WILLIAMS, G. A., of Stoke Newington, N.

No. 2017; Jan. 26, 1910.

This invention relates to automatic gas-regulators for use upon domestic or other supplies where the demand, and consequently the pressure, is subject to considerable variation. It refers to devices of the class in which a valve is employed operated by means of a diaphragm exposed upon one side to the pressure of the atmosphere and upon the other to the gas pressure.



Williams's Automatic Gas-Regulator.

In the arrangement shown, the casing of the regulator is provided on one side with an inlet to be connected to the supply, and also with an outlet to the stove. The admission and escape are separated by a partition A; and a chamber B is provided, the axis of which is arranged

at a right angle to the axis of the admission and escape. A perforated screw cap for the upper end of the chamber secures the diaphragm C. At the bottom of the chamber is an aperture leading into the admission port, and secured in the aperture by a screw-thread is a tubular body D, closed at its upper end and perforated at E. F indicates a second tubular body, perforated at G, fitting upon, and arranged to slide freely over, the body D. It is closed at its upper end, where provision is made for its attachment to the diaphragm.

The gas, on entering, passes up the centre of the body D, through the apertures, and thence into the chamber B, and finally to the outlet. So long as the pressure does not exceed a certain predetermined amount, it is not sufficient to overcome the weight of the diaphragm and parts connected thereto, and a full passage-way is afforded to the gas. Should, however, the pressure increase, it will act upon the diaphragm sufficiently to raise it, and with it the body F, which thereupon begins to close the apertures E in the body D, "by this means ensuring a regular supply at a constant pressure to the stove."

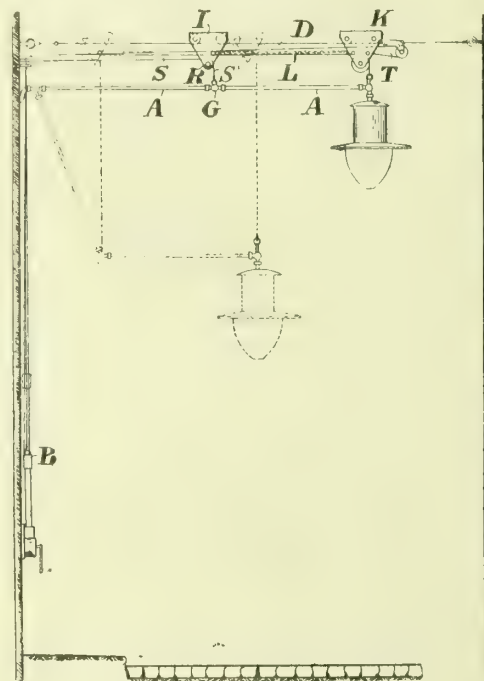
In order, however, to adapt regulators to varying maximum pressures, the resistance of the diaphragm may be increased by means of a weight in the form of a circular body H, having a head at each end, and which is freely supported in an aperture formed in the end of a spindle having a milled head at its outer end in the cap. When the regulator is working under a normal pressure, the spindle is turned until the body of the weight is at right angles to the axis of the spindle. When, however, there is a demand for additional pressure, the spindle is turned so that the lower end of the weight rests upon the head of the extension on the part F, and its weight is added to that of the parts required to be lifted before the supply can be reduced.

Suspending Gas-Lamps at Cross Streets.

DEUTSCHE GASGLÜHLICHT ACTIENGESellschaft, of Berlin.

No. 1166; Jan. 17, 1910. Date claimed under International Convention, Sept. 2, 1909.

This apparatus, for suspending lamps on supports that cross streets, is of the kind wherein the middle joints of the supply pipes are secured to a rope usually passing over a pulley or roller fixed to a house front in order to prevent sagging; the object being a construction in which the strain at the middle joints is directed upwards vertically (or nearly so) by employing, in addition to the running block which carries the lamp, an auxiliary running block, to which is secured the pulley or roller for the rope carrying the pipe joint.



A Gas-Lamp Lowering Plant.

In the form of construction shown, D is the tension rope, which, as usual, extends across the street from one row of houses to the other, and on which the block K travels. On the tension rope an auxiliary block I is provided, which is connected with the main block by a chain or the like. The auxiliary block carries the pulley or roller R, over which runs the rope S connected with the joint G. If, now, by way of example, the lamp which has been lowered is raised from the position shown in dotted lines by moving the main block K towards the right by the rope T, then the auxiliary block I, connected with the main block by the chain L, will move in the same direction, whereby the joint G, through the rope S, will be pulled upwards. In this operation, the pull on the joint always takes place upwards and in a nearly vertical direction, and the strain on the joint and in the rope is much less than if the direction of the pull is sideways, at an acute angle. The downward pull on the rope coming from the weight of the pipe-joint G and the pipe-limbs A, may be balanced by a counterweight B.

The operation in lowering the lamp is illustrated by the position of the parts shown in dotted lines.

A Reduction at Burton-on-Trent.—The Burton-on-Trent Town Council have agreed to a reduction in the price of gas of 2d. per 1000 cubic feet; making the maximum charge within the borough for ordinary lighting 2s. 4d., and the minimum 2s. 2d.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Battle of the Burners.

SIR,—Not since the memorable battle of the gauges in the railway world has Parliament had a more protracted and exhaustive industrial struggle in hand than the just-concluded "Battle of the Burners."

After the patient—nay, long-suffering—attention given by an exceptionally intelligent and conscientious Committee, over such a protracted inquiry as ten days furnished, the promoters have emerged with the three Bills practically unaltered.

The conspicuous feature of the inquiry in the Commons was the very clear-sighted, searching, and probing investigation by the Chairman of every ramification of the various allegations in opposition, and his thorough grasp of the essential merits of the varied cases involved in the contentions, occasionally rather wide of the promoters. Standing out very markedly was the masterly array of the facts and main issues shown in the convincing speeches of Mr. Honoratus Lloyd. Next to these forces towards victory, must be noted the lucid logical power of Mr. Carpenter's thrice—nay four—old tale, making clear the technicalities surrounding the evolution of his burner, the consequential "advantages" to the manufacturer, and, above all, his insistence, logically advanced and maintained against the fiercest cross-examination from many sides, that such advantages had always in the past, and would ever in the future inure to the benefit of the consumer. For clear demonstration, frank discussion, and earnest conviction, this evidence, even at the wearisome end, and after the most provoking tergiversation in opposition, was unrivalled, though Professor Vivian B. Lewes, and some others, were successful in defending the "faith that was in them."

A regrettable feature of the opposition was the base nature of the suggestions as to how the consumer was to be exploited, and the plunder disposed of by the "wicked directors" and the companies; and when the Chairman blandly inquired what had happened where corporations had changed to the new burner, the witnesses walked into the trap with a most diverting simplicity, failing to see how their admissions undermined the foundations of their attack.

The fight was a bitter one. But the cases for the Bills were well formulated; and here the agent, Mr. Cooper, deserves full recognition. It will prove an expensive fight; and it is to be hoped that those whose circumstances brought on the fiercest and most prolonged attack will bear this in mind when the "bill" comes to be paid.

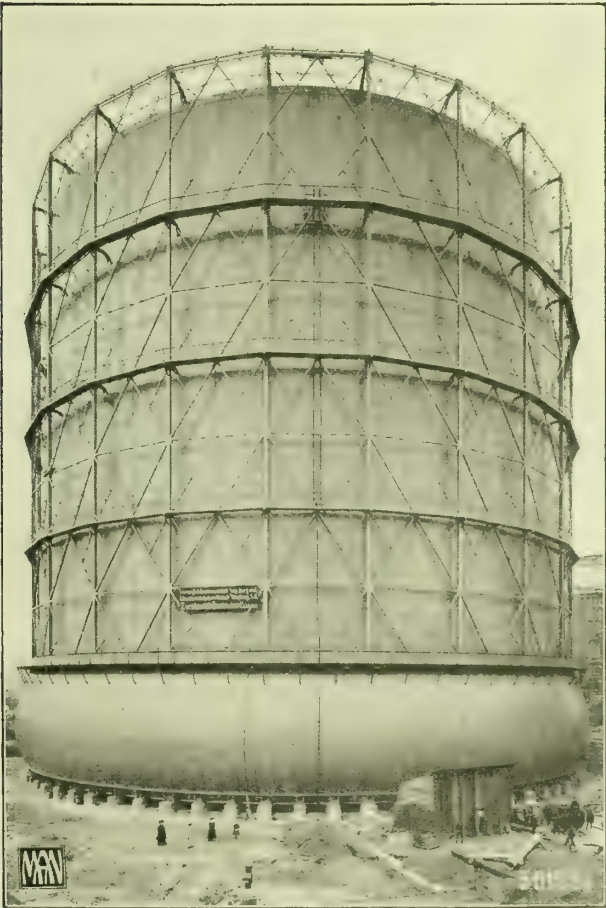
Palace Chambers, Westminster, S.W., July 18, 1910. HY. E. JONES.

Gasholder Tanks with Bulging Sides.

[TRANSLATION.]

SIR,—In reply to the observations of Mr. Cripps in the last number of the "JOURNAL," permit me to say—

- 1.—In the example given, the strain following the tangent, at the upper part of the curve, is 62,100 kilos. It is distributed, per metre of length, into a vertical strain of 54,500 kilos,



- which the vertical posts resist, and a horizontal strain of 30,000 kilos., which the horizontal girder resists.
- 2.—The vertical posts are 2.83 metres (9ft. 3 1/4 in.) apart.
- 3.—The circumferential tension is $\frac{30,000 \text{ k.} \times 65 \text{ m.}}{2} = 75,000$ kilos., which the horizontal girder has to put in equilibrium. This girder is calculated to work at 10 kilos.

In order to make the curve of the tank more easily seen, we have exaggerated it. In reality, in the construction of the gasholder at Simmering, the tank wall is less curved. The tangent, at the upper point, approaches more nearly the vertical, and the horizontal strain is less than 30,000 kilos., in order not to have too strong a horizontal girder. At Simmering, the girder is of wrought iron, 1.520 metres wide and 18 mm. thick, and four angle-irons 100 x 200 x 14 mm. These dimensions are sufficient for working at 10 kilos., as this girder corresponds to a horizontal strain less than that of 30,000 kilos. indicated on our drawing.

Lyon-Vaise, July 15, 1910. E. BONNET.

In connection with the subject under discussion, it will be of interest to reproduce, from M. Bonnet's paper, read before the Société Technique, which gave rise to it, the accompanying illustration of a holder constructed as described, which we were unable to give in conjunction with the translation [see ante, p. 37].

Handling Hot Coke by Electric Telfer.

SIR,—I notice in the paper which Mr. Shoubridge recently read, on "Stoking Machinery and Coke-Handling Plant," that reference is made to the electric telfer; and Mr. Shoubridge is evidently under an impression that the telfer is not efficient when dealing with full charges as delivered by the present-day discharging machine. I beg to suggest, however, that this can hardly be the case, as the telfer would seem specially suitable for dealing with coke under the above conditions.

The writer has had considerable experience of telferage work, especially as applied to gas-works, and has no knowledge of a case where the telfer has not been capable of handling the coke as fast as the machine can discharge the retorts; although, of course, this to a large extent depends on the actual run that the telfer has to perform to discharge its coke, and the experience of the telfer driver in the handling of his machine.

The telfer can be designed to take practically any load; it is only a question of a sufficiently large motor. Therefore, the actual number of retorts discharged into the skip is, to some extent, optional. The average load handled, in the writer's experience, is about 21 cwt. of actual coke—say, equal to the coke discharged from three retorts; the coke-skip being made of such a size that it will extend over (say) any three retorts at one level. These three retorts are then discharged into the skip by the machine; and, from the writer's experience, the discharging machine will take at least three minutes to discharge the three retorts.

The telfer (having previously placed another skip in position in front of the next three retorts) travels over the full skips; the hoist ropes are attached; and the load is hoisted, and conveyed out of the retort-house, where the skip is lowered into a tank of water to quench the coke. It is immediately hoisted again, and the machine travels to the coke hoppers or heap, and discharges the coke. The telfer then returns with the empty skip; lowers it down on the floor in front of the next retorts to be drawn; the hoist ropes are attached to the loaded skip; and the same cycle of operations is performed.

The average running speed of the mono-rail telfer is about 450 feet per minute; and the hoisting speed 60 feet per minute. Therefore, say the height of hoist inside the house was 30 feet, and the length of run-out to the heap 400 feet and back 400 feet, the time-cycle for the telfer properly handled would be as follows:—

To hook on hoist ropes, say	5 seconds
„ hoist 30 feet, say	30 „
„ travel 400 feet, say	55 „
„ tip into hopper or on heap, say	5 „
„ travel back light, say	52 „
„ lower empty skip by gravity, say	10 „
Total for complete run 157 seconds	

If the skip is lowered into a tank for quenching, this would take (say) 20 seconds; the tank being at such a height that the minimum distance only has to be hoisted and lowered.

Thus with a long run of 400 feet each way, one telfer should be capable of handling three retorts of coke in three minutes; and if the discharger is actually worked to handle one retort a minute, it is hardly likely to get ahead of the telfer.

With regard to there being a large number of skips required in the house, as mentioned in Mr. Shoubridge's paper, as will be seen from the above, there is no need for more than two skips to be used per telfer, and even then there is practically only one on the floor at the same time.

I notice Mr. Shoubridge refers to a telfer plant in operation at the Linacre South Gas-Works, Liverpool, and is not quite sure if it is worked in conjunction with a large number of retorts worked by stoking machinery. This plant is, however, of such a design that it could practically handle any number of retorts discharged by any number of machines, for the following reason. The actual telfer-track runs right through the house, out at the end, along over the coke store and hoppers parallel to the house, and continues on round into the house at the other end—being a complete circular track. Actually, therefore, any number of electric telfers could travel round this track, one after the other.

There are actually, I believe, 174 retorts in the Linacre house; and they are all discharged by machinery. I am of opinion that if only one discharger is used, one telfer is able to keep pace with the machine, though the run is rather a long one and the hoist considerable. There

are, however, actually two telfers installed on the track; but I believe the two are not used except in cases of great pressure.

From the illustration shown of the house at Lower Sydenham, the actual maximum run from the house to the coke-store would only appear to be (say) 500 feet, and the height required to hoist inside would apparently be only about 12 feet. I am, therefore, of opinion that, even if the discharging machine worked at the rate of one retort a minute in this house, one telfer would handle the coke as quickly as the machine discharged it. The actual average length of run is only 300 feet.

Telferage is not applicable to all retort-houses, as the conditions vary so; but, under ordinary conditions, a telfer is certainly able to deal with the coke discharged by machinery as fast as the discharger would be likely to work.

With regard to the power required, one telfer handling one-ton loads, hoisting and travelling as stated, will require an average of about 6 H.P., as, although, of course, the maximum horse power used when hoisting is likely to be (say) 12 H.P., the power used when travelling back light is very small. So that the power question for any length of run certainly seems much less in the case of a telfer. And with regard to the question of upkeep and repairs, this is bound to be very low, as the whole of the working parts—i.e., the telfer—is up out of all contact with the coke; the coke skips only being subject to this influence.

PERCY G. BROOKS,
Manager, Handling and Transport Department,
Robert Dempster and Sons, Limited.

Elland, July 11, 1910.

How Gas Consumers are Robbed—Instructive Illustrations.

SIR,—An article headed as above, by W. I. Parker, in "John Bull" of July 9, 1910, starts with quotations from a paper I read before the Yorkshire Junior Gas Association on March 19, 1910, and leads up to the conclusion that, "as matters now stand, meters cannot be described other than as legalized robbery."

While agreeing that there is room for improvement in the Sales of Gas Act, 1859, I showed that, in the majority of cases, the conditions told in favour of the gas consumers.

I gave a series of tests of meters, illustrating that it would be beneficial even to the sellers of gas to advocate an amendment of the Act, and that it was but a common-sense proposal to make the testing conditions as approximate as possible to actual working conditions. From this series, the results of the tests of three meters (tested under conditions most favourable to them) have been quoted to give colour to the article.

Mr. Parker does not mention that my paper also contained the following: "Mr. James Stratford, Gas Meter Inspector for the City of London, in the course of his report for the year ending Dec. 31, 1908, says: 'Of the meters tested for disputed registration, 3083 were found to be correct, while 3527 were wrong; 1304 being fast, and 2223 slow;' " and, while he quotes from the latest report of the same authority, it appears more convenient to say nothing about the meters which were:

	Fast.	Slow.
Over 20 per cent.	4	311
Over 10 per cent. and under 20 per cent.	42	554

This, and the concluding part of the report, would have spoilt the "legalized robbery" idea.

For his own purpose, Mr. Parker finds it better to point out the few extreme cases found in the last report of Mr. S. Dyson, the City of Manchester Inspector of Gas-Meters; and then to quote numbers showing the proportion of tested meters that were inaccurate, ignoring the fact that, in the great majority of cases, these are meters picked out, because from their age, exposure, &c., incorrect working is suspected, and finally, by suppression of the facts, to leave the general newspaper reader to infer that all incorrect meters are fast—i.e., going against the consumers' interest.

Mr. Parker evidently has not had much experience of the conditions under which gas-meters work, and has had only one end in view; otherwise he would not have used a portion of my paper to illustrate an article with the above title.

Again, it must be patent to all that, if there were many meters like those he mentions, such items as "leakage" or "unaccounted-for" gas would be unknown to gas concerns.

PETER McNAB.

Lowmoor, Bradford, July 18, 1910.

The article in "John Bull" contains the following passages:

In all probability, there is no form of weight or measure whose accuracy is open to so much question as that of gas-meters. Yet despite this, it is one that is subjected to the least control. In fact, it is such that it practically amounts to nothing more nor less than legalized robbery, as I will endeavour to prove. Gas-meters are tested for accuracy according to the tests prescribed by the Sale of Gas Act, 1859; such tests being carried out at a pressure of 5-10ths, or $\frac{1}{2}$ inch. When it is remembered that gas is now supplied and consumed at a pressure of from 4 to 6 inches, it will be readily seen that the test imposed is one that is altogether at variance with modern conditions. As an example of how the registration of a meter may be affected by difference of pressure, I will quote the result of tests made at a meeting of the Yorkshire Junior Gas Engineers. Three three-light meters were tested and registered as follows

	1st Meter. Per Cent.	2nd Meter. Per Cent.	3rd Meter. Per Cent.
At 5-10ths pressure registered	2.4 fast	1.42 fast	correct
" 25-10ths "	3.6 "	2.6 "	1 fast
" 45-10ths "	4.1 "	2.25 "	2 "

Thus showing that, with an increased pressure, they registered against the consumer. Another point in connection with such tests is that, when once a meter has been passed as correct, it is deemed to be so for all time. If the report of the Chief Inspector of Meters for Manchester is noted, it will be found that meters have a great tendency to become inaccurate after they have been in use a few years; for he reports that of the 1449 meters tested for the Corporation, the majority of which belonged to the consumers, 1093 were found to be inaccurate, the meters in question having been in use over ten years. The Chief Inspector of Meters for Manchester points out in his report an anomaly that should be rectified—viz., that the indices of meters were not required to be tested, and that the test authorized simply related

to the measurement part of the meter and not the recording. Of the indices tested by him, 56 were condemned; the five most serious errors being as follows:

5-light meter registered	100 per cent. fast
3 " " " " " " " "	50 " slow
5 " " " " " " " "	25 " fast
10 " " " " " " " "	150 " "
50 " " " " " " " "	150 " "

The first three were meters repaired by makers, while the others were owned by gas consumers. The meters when submitted to the legal test registered correctly according to the test. But, as a matter of fact, they were recording as shown by his figures, thus showing that a meter that has been passed as being accurate may all the while be showing 100 per cent. more, due to a defective index. The Chief Inspector of Meters for the City of London lately made inquiries, and reported that of the 7541 disputed meters tested by him, 5373 were found incorrect. . . . What is more, a form of measure is in use that is subject to no test at all—viz., the prepayment meter attachment; and as such affects the poorer classes more than any other, it is absolutely necessary, if their interests are to be safeguarded, that a change should be made. But as matters now stand, meters cannot be described other than as legalized robbery.

LEGAL INTELLIGENCE.

PROPERTY OWNERS AND WATER CONSUMERS LIABILITY.

At the Wandsworth County Court last Tuesday, His Honour Judge Harington delivered a considered judgment in an action tried before him a month ago. The plaintiff, Mrs. Ivy Bond, an upholsteress, residing in South Wimbledon, claimed from the Wandsworth Borough Council and the Metropolitan Water Board £100 damages for personal injuries sustained by her through the alleged negligence of the defendants in leaving a hole in the pavement in Blackshaw Road, Tooting, in consequence of which she fell and was somewhat severely hurt. It appeared that the lady was passing along the road on the 13th of January last when her foot caught in a hole in the pavement which had been cut by the Council to receive a stopcock and box which had been furnished by the Board for the purpose of giving a supply of water to an adjoining house. The evidence showed that in 1907, the Board, at the request of the owners of the adjoining houses, fitted a service-pipe and apparatus for supplying water to the property. Shortly after this, the Borough Council intimated to the Board that they were about to make up the road, which at that time had not been taken over by the local authority as a highway to be repaired at the expense of the inhabitants at large. The Board were directed to have the water-fittings brought to the necessary level before the pavement was placed in position; and this having been done, workmen on behalf of the Council adjusted the stopcock and box in position.

At the trial, the learned Judge held that there was no liability upon the Council to maintain the stopcock and box in a state of repair; and consequently he dismissed the action against them. Mr. Ross-Brown, for the Water Board, then submitted that his clients were also exempt from liability to repair; and he cited various Statutes and authorities, but particularly the Metropolitan Water Board (Charges) Act, 1907, under which the consumer for whose benefit, and at whose expense, the pipe and service were laid was entitled to open up the pavement for the purpose of repairing a defect. Mr. Justice Phillimore, in the recent action of *Stacey v. Gaslight and Coke Company, Metropolitan Water Board, and West-End Tailoring Company* ["JOURNAL," Jan. 18 last, p. 185], had held that section 8 of the Act was retrospective, and applied to old pipes as well as to new.

His HONOUR, in an elaborate judgment, reviewed the authorities and Statutes, and held that the contention of the Water Board was valid. The Board were, in his opinion, relieved from liability by Parliament, who had shifted the responsibility on to the shoulders of unsuspecting private owners who requested the Board to furnish their property with a supply of water. This burden was placed on the ratepayers by a Private Act of Parliament, of which the public were not cognizant; and it should be made as widely known as possible. However, in view of the authorities, he was bound to hold that the Board were entitled to succeed; and he therefore gave judgment in their favour also.

A question arose as to costs; and those of both defendants were ordered to be paid by the plaintiff.

National Air Gas Company, Limited.

On Monday last week, Mr. Justice Parker was asked *ex parte* to appoint a Receiver of the undertaking of the above-named Company. Counsel on behalf of Mr. Crewdson, the plaintiff, said his client was holder of certain debentures issued by the Company in 1909, which became due on the 1st of January last, but had not been paid; and the interest due in July was also in arrear. The urgency for the application arose from the fact that creditors had obtained judgment, and one had seized the chattels of the Company; in addition to which the landlord had put in a distress. His Lordship appointed a Receiver over the following Friday. On that day, Mr. Romer, K.C., informed his Lordship that it had been arranged that the motion should stand over for a week, and that the Receiver should be continued and also be appointed Manager. As there were several important contracts to be completed, it would be necessary that the Receiver should be authorized to borrow, to pay wages. The Company not objecting, his Lordship gave leave to borrow a sum not exceeding £200.

At the meeting of the Tiverton Town Council on Monday last week, the Lighting Committee recommended that the Gas Manager (Mr. Clark Jeffery) be paid £75 as remuneration for extra services in superintending various alterations at the gas-works. It was pointed out that £13,000 had been laid out in connection with the gas undertaking during Mr. Jeffery's management, and all had proved remunerative. He had also saved the town a good deal of money by drawing up specifications, &c. The recommendation was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills read a second time and committed : Fylde Water Board Bill, Water Provisional Order Bill.

Bills reported, with amendments : Gas Orders Confirmation Bills (Nos. 1 and 3), Mountain Ash Water Bill, Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Shirebrook and District Gas Bill, Slough Water Bill, South Hants Water Bill.

Bills read the third time and passed : Gas Orders Confirmation Bills (Nos. 1 and 3), Glasgow Gas Consolidation Bill, Mallow Urban District Gas Bill, South Hants Water Bill, Water Orders Confirmation Bill.

The Water Provisional Order Bill, against which a petition has been presented by the Kingswood Water Company, has been referred to a Select Committee, consisting of Lord Clinton (Chairman), Lord Langford, Lord Colchester, Lord Shute, and Lord Blythe; to meet to-day.

A Bill to confirm a Provisional Order relating to Clydebank and District Water has been presented, read the first time, deemed to have been read a second time, pursuant to the Private Legislation (Scotland) Act, 1899, and reported.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills brought from the Lords, read the first time, and referred to the Examiners : Gas Orders Confirmation Bills (Nos. 1 and 3), Water Orders Confirmation Bill.

Bills reported : Havant Gas Bill [Lords], Middleton Corporation Bill.

Bills read the third time and passed : Great Grimsby Gas Bill [Lords], Montrose Water, &c., Order Confirmation Bill, South Lincolnshire Water Bill [Lords].

MR. ISAAC CARR'S TEST-BURNER DIAGRAM.

At the sitting of the Committee on the Standard Burner Bills last Wednesday, the publication in the "JOURNAL" of the comparative test diagram prepared by Mr. Isaac Carr received prominence by an objection raised by the Hon. J. D. Fitzgerald to the inclusion in the diagram of the figures connected by dotted line, showing, as a foot-note stated, "the observations by Mr. Carr, at the offices of the London County Council, 40, Craven Street, Strand, on the 7th inst." The special case of Liverpool was proceeding; and the Hon. J. D. Fitzgerald was examining Mr. Carr. Learned Counsel, producing a copy of the "JOURNAL" opened at the page on which the diagram appeared, asked witness if he was responsible for it; and Mr. Carr readily replied in the affirmative. The following discussion ensued :

Mr. FITZGERALD : I would like the Committee to see that. It is something which appears in the "GAS JOURNAL."

Mr. TALBOT : If something is to be handed in, the opponents are entitled to see it.

Mr. FITZGERALD : If you will allow me, I will make the point; and then you can see it.

The CHAIRMAN : You will allow Mr. Talbot to see it.

Mr. FITZGERALD : Here is the diagram.

Mr. TALBOT : That is what I want to see. [The paper was handed to learned Counsel.]

Witness : It is a copy of the diagram on the wall.

The CHAIRMAN : We are familiar with that.

Mr. FITZGERALD (to witness) : It is a print of that diagram there?

Witness : Yes, with some addition.

Supplied by you to the "GAS JOURNAL"?—Yes.

You added to it something which is said to have happened on July 7?—Yes.

What is that?—My own observations.

Do you mean when you were present with the members of the Committee?—Yes.

Mr. FITZGERALD : The members of the Committee will know if any tests were taken on that day. You will see this gentleman has put an addition to the diagram and suggested something was done when you visited the London County Council station, and that the dotted line which is added represents something done on that occasion.

The CHAIRMAN : As I said before, we do not look upon that as a test, and did not ask for a test to be made. It was admitted all round that a test was not made.

Mr. FITZGERALD : This is published in the paper as something that occurred in your presence at the testing-station.

Witness : This is my observation. I observed the gas. The No. 1 burner was screwed on to the photometer. The flow was adjusted to 5 feet. The operator for the London County Council read out the illuminating power as 10.4.

The CHAIRMAN : He did.

Witness : And then after the burner was taken off, the No. 2 burner was screwed on. The first observation when the burner was cold was read out by the County Council observer as 13.9, after the current had been regulated. I pointed out then it was necessary before an observation could be taken with this burner that the burner must be allowed to burn a time to get heated, in order for the regenerative effect in the base of the burner to take place. While the Committee were de-

parting from the room, the illuminating power was increasing all the time; and I directed the attention of one of the members of the Committee to it just as he was going out of the room, and said : "The observation now has risen to 15." I know I asked the tester the quality of gas that was being distributed in that district by the Gas Company that day, and he said it was about 15 candles. So that there was the difference from the observation that I made at the station of 4.6 candles between the two burners.

Mr. FITZGERALD : You know, Sir, what happened at the station.

The CHAIRMAN : Yes.

Re-examined by Mr. TALBOT : I understand you have put upon that diagram what you yourself saw on the occasion when the Honourable Members of the Committee saw the test?

Witness : That is so. I had not seen it before.

The CHAIRMAN : It is common to both sides that there is a difference. I distinctly said at that time : "We cannot take this as proof of what the difference is." We did not go there for that purpose; and I do not think it was made under conditions which altogether can be accepted as proof.

Mr. TALBOT : I quite understand that, Sir. All I want to know is this. I understand my learned friend put this diagram in, in this dramatic manner, suggesting some misconduct on the part of Mr. Carr. I only want to know if you are satisfied with what he has said and done.

The CHAIRMAN : Yes.

Mr. FITZGERALD : Mr. Carr ought not to have suggested that any test took place when the Members of the Committee were present, because I am informed that nothing of the sort took place.

Witness : May I explain? I had not seen the paper before. If they have copied a marginal note I put on the diagram and handed to the "GAS JOURNAL," they will know I did not put it as a test. I said these were my observations made on that day. So they were not proper tests; and I have never set them forth as proper tests. They were my observations just as I could pick them up, during the explanation of the apparatus, in the way I have explained.

The CHAIRMAN : We did not understand Mr. Carr as pretending at the time that it was an actual testing figure.

Witness : I stated in the marginal note to the diagram what actually took place.

Mr. TALBOT : May I respectfully call your attention to what you, Sir, said before the Committee went there, because that was the origin of the misunderstanding? No doubt it was not what you intended; but you will see how we unfortunately misunderstood what you said. We understood the Committee wished to see a test taken in their presence.

The CHAIRMAN : Did I say that?

Mr. TALBOT : You will find that if you look at page 202 of the minutes; and you will see how we misunderstood. I do not in the least complain, but only wish to explain it.

The CHAIRMAN : Perhaps I did say I wanted to see how a test was operated—that is, the *modus operandi* of a test, not resulting figures.

Mr. TALBOT : Please understand I do not in the least complain of what you have done—it would not become me to do so if I thought there was ground for it. But there is no ground for it.

The CHAIRMAN : I quite understand.

Mr. TALBOT : May I read it? These are the words you are reported to have used, Sir : "I spoke yesterday about the Committee going to see a testing of the gas with one expert on each side; and I believe it has been arranged to-day." I quite understand what was in your mind. You merely wanted to see how a test was taken. We, unfortunately, thought you meant you wished to see the burners compared in your presence. You see how the misunderstanding arose.

The CHAIRMAN : Yes; I do. Perhaps I am responsible for it. I ought to have negated it.

HAVANT GAS BILL.

The Bill promoted by the Havant Gas Company for the purpose of conferring statutory powers on them came up for further consideration by the Unopposed Bills Committee of the House of Commons on Thursday last—having been put back for a fortnight to enable some alteration to be made in its financial provisions.

Mr. BAKER (Parliamentary Agent) explained that the consideration of the Bill had been adjourned by reason of the Company issuing fresh capital during the progress of the measure through the House. The necessary alterations had now been made in the Bill. The Company had issued £1500 of 7 per cent. capital, and obtained a premium on it of £766. This capital had been dealt with, and the clause in the Bill altered and made to apply not only to the moneys raised under the Act, but also under the Provisional Order of 1879; and they were only to be applied for capital purposes. With regard to the standard price, this had already been fixed by Parliament at 5s. by the Provisional Order of 1879; and the Company for years past had been entitled to pay a dividend of 13 per cent., because they were only charging 4s., instead of the standard price of 5s. But they had not exercised this privilege, and had only paid 10 per cent. They were quite prepared now to reduce the standard price from 5s. to 4s.; and the Bill had been altered in this form.

Mr. MOON (Speaker's Counsel) : We are not cutting down the dividend by cutting down the price, because they have never paid more than the standard dividend.

Mr. BAKER agreed.

Formal evidence proving the preamble was then given; and the Bill passed and was ordered for third reading.

Middlesbrough Corporation Bill.—This Bill, which proposes to confer further powers upon the Middlesbrough Corporation with respect to the supply of gas and electricity, and for other purposes, came yesterday (Monday) before Lord Balfour of Burleigh, acting in the capacity of Lord Chairman of Committees. The Bill was ordered to await report pending certain minor amendments.

THE LIVERPOOL GAS COMPANY AND THE BURNER BILL.

The Proceedings on the Separate Case.

Friday, July 8.

In this case, the opposition came from the Liverpool Corporation and the Waterloo with Seaforth, Litherland, Great Crosby, and Allerton Urban District Councils, who were represented by Mr. RAM, K.C., Mr. TALBOT, K.C., and Mr. COURTHOPE MUNROE; the Bootle Corporation, represented by Mr. RAM, Mr. TALBOT, and Mr. MUNROE; and the Mersey Docks and Harbour Board, for whom Mr. BALFOUR BROWNE, K.C., and Mr. G. J. TALBOT, K.C., appeared.

Opening Speech by Mr. Honoratus Lloyd.

Mr. HONORATUS LLOYD, in opening, said he thought the case was covered by every observation he had already made; but there were certain additional observations he wished to make upon the special features of the case. In 1848, the Liverpool Gas Company were under obligation to supply 16-candle gas. In those days, there was an idea that a high illuminating power was of greater value; and so it was. But gas was not then used for motive power to the extent it was now, nor for incandescent lighting. But in 1865, the power was raised to 20 candles; and from that time to the present moment the Company had been under obligation to supply 20-candle gas. This had been measured by the flat-flame burner. In this case, the proposal was the same—to substitute the No. 2 burner which was being asked for by the other companies in the No. 1 Bill. It so happened that when they got up to high candle power gas, there was considerably less difference between the one and the other burner than there was with the lower candle power. The saving was therefore not as great in the manufacture, although it was considerable. It was said by the opponents that the change ought not to be allowed; and if the change was allowed, that some *quid pro quo* should be given. They were all agreed that the change ought to be made in the other cases; and the question was whether it should be made in Liverpool. In 1895, there was a certain amount of incandescent lighting in Liverpool; but it had not come to the enormous preponderating point that it had now. In 1895, the Lighting Committee of the Liverpool Corporation passed a resolution, which they sent to the Company. The resolution was as follows:

That, having regard to the development in the methods of manufacturing gas and the improvements in gas-burners which have been made since the Gas Company's Act of 1865 was passed when the illuminating power of the gas was fixed at 20 candles, and the experience gained since that date, the Directors of the Company be requested to consider whether the standard candle power of the gas could be reduced in the interests of the consumer; and if so, whether it would be in the interests of the Company that parliamentary sanction should be obtained to lower the candle power so as to enable the Company to supply gas at a lower price than at present, and that the Directors be asked to confer with the Committee on the subject.

So that the Corporation foresaw this position before they did. He mentioned this because his other opponents, the Mersey Docks Board, cried out when it was suggested that the candle power would come down with the change of test-burner. They said it was monstrous that there should be this alteration. So enamoured were they of a lower grade gas and a cheaper gas, that last year their Engineer actually threatened the Company that if they could not see their way to reduce the price of the gas they were contemplating providing gas for themselves. So that fifteen years ago they had the Liverpool Corporation desiring a reduction in candle power, and the Mersey Docks Board saying that they proposed themselves to adopt a lower grade gas. Yet they were both now crying out when the Company were seeking to establish the accurate burner which had the effect to a slight extent of reducing the candle power and enabling them both to get cheap gas. Liverpool were a maximum-price Company, paying their maximum dividend, and their reserve fund was full. Therefore the only outlet for the profit that was made was by a reduction of the price of gas. Under their Act, it was provided that all surplus profits should go in reduction of the price.

Under these circumstances, what were the differentiating items between Liverpool and the other case? Liverpool had expressed its desire for a lower candle power gas and obtaining cheaper gas, both of which they would get under the Bill. The proposed burner (No. 2) was not suitable for testing the Liverpool so-called 20-candle power gas at the rate of 5 cubic feet per hour, because the flame tailed-up beyond the chimney, and they were not able to deal with it satisfactorily. But when it tailed-up over the chimney, they were to reduce the flame by getting the greatest amount of light. Therefore, in the Bill, there was a provision specially for Liverpool—that where the gas tailed above the chimney, it should be dealt with in this way.

With regard to the Mersey Docks and Harbour Board, in the other House there were witnesses called who told a most terrible story of what was going to happen to the gas-engines; and Mr. Carr told the Committee that if the gas-engine to-day was being worked up to its maximum power, with a reduction of the calorific value, the engines would have to be scrapped. But, of course, if an engine was being used to-day right up to its maximum power, inasmuch as the calorific value of the present gas varied considerably from day to day, it followed that the engine would be in a very awkward position, because it was incapable of dealing with any margin on account of the variation. As a matter of fact, it was not so. Another witness in the other House, Mr. Newbigging, said that if such gas were supplied to the Mersey Docks the result would be that their engines might have to be scrapped. The opposition, however, called Professor Burstall to support them; and he said, "That is nonsense what Mr. Carr and Mr. Newbigging have been telling you. As a matter of fact, we prefer a lower grade gas for gas-engines; and by means of an adjustment of valves, or, if the pipes happen to be too small, enlarging the pipes, the gas-engines will be all right." The promoters would now call before the Committee a gentleman who had expert knowledge of these matters; and he substantially agreed with what Professor Burstall said on that occasion. The differences that existed in Liverpool were, if anything, in favour of the promoters. They could measure the gas perfectly accurately with the new burner; and they would be able to provide a cheaper gas,

which was what had been asked for. The candle power would incidentally be reduced; and in so doing, all the saving must automatically go to the consumer, inasmuch as they were a maximum-price Company paying their maximum dividend.

Mr. Charles Carpenter's Evidence.

The first witness called in support of the promoters' case was

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company. He said Liverpool was the only one of the 43 companies in the Bill that supplied 20-candle power gas. His burner was capable of accurately measuring the gas; but in the process of gas supply it was not possible, when the test was made with a flat-flame burner, to keep quite accurately at the 20-candle line. It was very often 21 and 22 candles. In the case of the extra richness of the gas under these circumstances, it would require that the consumption of the gas in the burner should be somewhat reduced. His burner was not designed for the purpose of 20-candle gas. It was designed particularly to carry out the recommendations of Lord Rosse's Committees; but they had tested it up to 20-candle gas, and it was found to give accurate results. There was the provision in clause 5 that if the gas was so rich that it could not be burnt with a full air supply and at the prescribed rate of consumption without tailing above the chimney, the rate of consumption should be reduced until the flame burnt properly within the chimney. This met the case if the gas were so rich as to cause the flame to tail. This proviso was extracted from the "Notification" of the Gas Referees current in the present year, which described the process exactly—the consumption was to be reduced to bring it within the limits of the burner. With his burner, the true illuminating power of the gas would be accurately recorded. Taking the Liverpool gas as it was at present supplied, the difference shown would be from 1½ to 2 candles; but if gas was supplied enriched with benzol instead of with carburetted water gas, there would be practically no difference—he was sorry to use the word "practically"—between the indication given by the present flat-flame burner and the No. 2 "Metropolitan" argand. In South London, they had something like 2000 gas-engines at work. The largest set of these belonged to the London County Council, and were used for pumping the storm water from the streets into the River Thames. There was a large installation at the Surrey Commercial Docks; and gas-engines were used for a great number of other purposes. During the last seven or eight years, they had reduced the illuminating power of their gas from 16 to 14 candles, and had adopted the standard burner; but they had received no complaint at all from gas-engine users.

In reply to Mr. BALFOUR BROWNE, witness agreed that he was not connected with the Liverpool Gas Company; but he said he had had exceptional facilities for following the working of the Company. In the Liverpool Act, it was provided that: "All gas supplied by the Company shall be of the best and purest quality, and shall, in respect of its illuminating power, at a distance as near as may be 1000 yards from the works, be such as to produce from a batwing or fishtail burner consuming 5 cubic feet of gas per hour a light equal in intensity to the light produced by 20 sperm candles of six to the pound, each burning 120 grains in an hour." He agreed that this bargain between the consumer and the Company had been confirmed on two separate occasions. The bargain was made in the year 1865, and was confirmed in 1882 and 1886. He thought it was right that the Company should be allowed to change it.

Mr. BALFOUR BROWNE: Supposing the Mersey Docks and Harbour Board had come and said: "Notwithstanding this bargain, Parliament ought to put a clause upon the Company making them deliver 25-candle gas as tested in that way," would you not have said it was unfair?

Witness: Yes; but may I put it in another way? Supposing such a bargain did exist by which the Company had to supply gas of 20-candle power measured in this appliance. Supposing the Company come before Parliament and say: "We can supply the same thing with greater advantage to the consumer if you will allow us to measure it in an instrument which is more accurate."

We have nothing to do with accurate instruments?—It is perfectly possible to supply the parliamentary requirements of Liverpool with a gas which is carburetted with benzol. If gas is carburetted with benzol, it will give a return in the flat-flame burner comparable with what the No. 2 argand will give; but it will give a return which is more capable of reproduction in the argand burner than in the flat-flame. In other words, of identical gas you have a much more accurate method of measuring it in the case of the No. 2 argand than in this old imperfect appliance.

I am not on the question of accuracy of test. That is not what Parliament said. Parliament said you are to give these 20 candles tested by the flat-flame burner?—Certainly; in those days.

CHAIRMAN: Accurate or not accurate.

Mr. BALFOUR BROWNE: Accurate or not accurate. Supposing the flat-flame burner absolutely destroys half the value of the gas, then you have to make gas of double the quality that you would otherwise have tested with that burner?

Witness: Yes; only that is not the case in Liverpool, because, with the new burner, it may be that under certain circumstances exactly the same value as, and under other circumstances gas of a little lower illuminating power than, is made with the flat-flame test-burner would be shown.

If it is exactly the same, what is the use of the Bill?—Because it is not always exactly the same. If you carburet with benzol, it is the same.

London is in an entirely different position to Liverpool, because we have not got the No. 1 burner. We have got the fishtail or batwing burner, and you propose to substitute something for this?—Yes; it is different in name, but not in fact.

Replying to further questions, witness agreed, generally speaking, with what he said in the other House when he admitted that by the new burner they could give to the consumer gas of less high quality and candle power than he was getting before, and that would give him in some cases something less in the way of light and heat than he had before. If the consumer were to have the same amount of light and heat he had before, he would have to burn more gas to get it.

Mr. BALFOUR BROWNE remarked that the disadvantage of having taken this case separately was that the promoters were not going to

call Mr. Corbet Woodall. He could not now cross-examine him. He then proceeded to quote extracts from the evidence given by Mr. Woodall in the other House: "(Q) Suppose you were testing a gas which showed on the London No. 1 burner 20-candle power, like Liverpool, by testing it through the 'Metropolitan' No. 2 you would expect to find some difference?—(A) I think I would rather not answer a question about that. I know nothing about the testing of those gases with these burners. But certainly the No. 1 argand burner would be quite unsuitable for testing 20-candle gas." "(Q) Would you regard the flat-flame standard No. 7 (that is, the test at Liverpool) as being an unsuitable burner to test 20-candle gas?—(A) No; I should think probably it would be a good one." "(Q) I put it to you that if you test 20-candle power gas (result shown, 14.7), shown on the flat-flame, it would show on the 'Metropolitan' No. 2 20-candle power—that is, 6-candle power difference?—(A) It may be so; but I do not know it, and I should be very much surprised if such a result took place." "(Q) Would you grant that there is a difference in all cases in the results—in the case of high-grade gas a small difference, and in the case of low-grade gas a big difference?—(A) Yes."

Witness thought he could accept every word of that evidence.

Mr. BALFOUR BROWNE: Do you know that the argand No. 2 was put upon London by the Referees because they thought they were bound to do it by the Act of Parliament?

Witness: Of course, they were bound to do it. They were fulfilling the duties for which they were appointed by Parliament.

The object of the clause in the Liverpool Act is not to ascertain the illuminating power, but to test the illuminating power of gas by the flat-flame burner?—Yes.

Now you want to put upon me something else and say: "It is not accurate; I want to have an accurate test." Then you must pay for that?—If you will eliminate from consideration the fact that by far the largest proportion of the gas used for illuminating purposes is used in an incandescent burner—if you will eliminate incandescent burners because they are for the present a disturbing factor, and assume that the whole of the gas would be used apart from an incandescent burner, the burner which the public would use would be an argand burner, as they did all over London before incandescent burners were invented. There is nothing whatever to prevent the Liverpool people going on testing with a flat-flame burner for information purposes, exactly in the same way as is done in London. The Liverpool Company were exceptionally situated with regard to the obtaining of richer coal than was available for London, and that is one of the reasons why the quality of Liverpool gas, and therefore the use of the flat-flame burner for testing it, was maintained for so many years.

And can easily be maintained now?—If the use of cannel were not an antiquated, extravagant, and obsolete manner of making gas.

Replying to further questions by Mr. BALFOUR BROWNE, witness said it was quite true that the price of cannel was not so high as it was in 1886; but it was still an unsuitable coal for the manufacture of gas. His Company had reduced the illuminating power from 16 to 14 candles, and they gave the public 2d. per 1000 cubic feet. Sir George Livesey said that was twice as much as they ought to have given; but it was a sacrifice the pioneer in anything had to make. In the case of Liverpool, the adoption of the No. 2 burner might reduce the illuminating power of the gas; but there were a great many arguments why the Liverpool Company should not give the consumers what his Company had given. In the first place, London ought not to have had it. They did not have it for the use of the burner; they had it because Parliament altered the bargain in reducing the candle power from 16 to 14 candles. So far as he had been able to ascertain, there was no connection between illuminating power and calorific value.

Mr. BALFOUR BROWNE: Do you mean to say that a 20-candle gas tested in this way in Liverpool is not a better calorific agent than a gas of the same illuminating power tested by the No. 2 burner?

Witness: Not necessarily. You may have a gas which shows 20 candles in the No. 2 burner, and a gas which shows 20 candles in the flat-flame burner; and it might be that their calorific value was the same.

By this method of testing, will there be a reduction of probably 15 per cent. in the calorific value?—No; I should not say anything like that quantity under the worst circumstances. I think 5 or 6 per cent. would be the very outside in the extreme cases, and in some instances there would be a gain.

With this reduction of calorific value, you would be substituting for cannel coal gas, coal gas mixed with carburetted water gas?—You might do so.

With a mixture of these two, what percentage of carburetted water gas would you give under circumstances of giving this less calorific value?—There is no direct relationship between the two.

Calorific value is of some use to people who consume gas for heating, cooking, or motive power?—Yes.

And yet you propose in the worst conditions (we say it is far more) to reduce this by 5 or 6 per cent. without altering the price of your gas?—That is 5 or 6 per cent. in the laboratory test. If you used these two qualities for cooking your dinner or boiling your kettle, you would not be able to tell the difference the one from the other.

I am perfectly certain if you reduced it by 5 or 6 per cent. it would not cook so quickly?—There is really not that difference, because supposing the calorific value is 500 B.Th.U., for the sake of argument, only a fourth or a fifth of the calorific value is used; so that you bring down your 5 or 6 per cent. to a very small figure.

If in the laboratory you find 6 per cent., in the house you say the 6 per cent. does not count?—In the house you do not utilize it at all. You have not the scientific instruments for using the whole of the heating quality of the gas. In the laboratory, the scientific instruments absorb the whole of it.

Cross-examined by Mr. Talbot: Do you say the No. 2 argand is suitable for testing gas of 20-candle power?

Witness: With the proviso that in case the flame tails above the chimney, you reduce the consumption and correct it in the manner provided by the Gas Referees.

Supposing you burn the Liverpool gas, which now shows 20 candles in the flat-flame burner, what would it show in the No. 2?—It might be 20, or 21½, or 22 candles.

But there is no difficulty in applying the parliamentary test which has

been applied ever since the year 1865 in Liverpool?—The difficulty has been that you could take half-a-dozen burners of this kind and get a difference of probably 4 candles in the results they give. You might have a gas showing anything from 18 to 22 candles.

And you propose a burner that would enhance the gas by 2 candles?—Under some circumstances; but in other circumstances, it would give the result the flat-flame burner would give.

Witness agreed that nearly three years ago he wrote to the Superintendent of Street Lighting at Liverpool: "In reply to your letter, I beg to say the No. 2 'Metropolitan' argand was not designed to burn such a quality of gas as is supplied to the Liverpool Corporation. Such qualities are rare, and becoming rarer; and for that the air supply is too restricted. I could have designed such a burner; but my object in the present production was to make such a one as would give uniformity of testing to the London gas supply and, *inter alia*, many others without departing too much from the previous existing patterns."

Mr. TALBOT: Your burner was not designed to test such a supply as Liverpool?

Witness: Yes; it was not designed to burn the quality of gas such as is supplied by the Liverpool Company—that is, between 20 and 21 candles.

Taking a gas that shows 20 candles in the argand No. 2, what would that show in the flat-flame Liverpool burner?—It might show 20—the same thing. I suppose it might show probably 3½ candles more.

Re-examined by Mr. FITZGERALD, witness said the Liverpool Company used to have to bring thousands of tons of cannel from Australia in order to comply with their antiquated requirements. This could not be in the interests of the consumer. It only resulted in keeping up the price. The competition which gas companies had to meet nowadays was more effective than all the Acts of Parliament to keep them in order. But in the present condition of the manufacture of gas, the No. 2 argand was the more accurate burner for testing 20-candle gas. If they were to take four flat-flame burners, the results obtained with 20-candle gas might vary to the extent of 4 candles; but if they were to take four dozen No. 2 argands, and put them all on a float or a pipe, and light them all up at once, they would get exactly the same results from each. The gas supplied by various companies was sometimes tested by friendly and sometimes by unfriendly authorities; and it was important to eliminate the disturbing factor of inaccuracy as much as possible.

Mr. Edward Allen's Evidence.

The next witness to be heard was

Mr. Edward Allen, the Engineer to the Liverpool Gas Company. He said Liverpool was a maximum-price Company; and for some time they had been paying maximum dividends. Any additional profits made must necessarily go towards a reduction of the price of gas. He described the present test-burner as indefinite and not accurate for the testing of the gas. He had purchased a dozen of the burners, and found, as the result of tests, that there was a variation of fully 4 candles. It might be that on some days they were fulfilling their statutory requirements, and others they were not. In 1865, the batswing burner was in use at his works. But in 1871, this was changed for the steatite batswing; and it showed the gas to be 2 candles better than the previous burner. He had been experimenting with the No. 2 burner for about four years, and found the results given by it were somewhat higher than those given by the flat-flame burner, which they were now using. The difference varied from 1 to 2½ candles. He then made experiments extending from February, 1908, to April last; and they showed that the average increase obtained by using the standard burner—the new burner—was 1.94 candles. Gas showing 20 candles in the batswing showed nearly 22 candles in the standard burner. With gas made from coal and cannel, the illuminating power in the batswing was 17.99 candles; and in the standard burner it was 20.46 candles. Since the Bill had been before the other House, experiments had been conducted with gas made from coal and cannel and mixed with carburetted water gas. Probably 100 tons of material was used, and the gas was made in the ordinary way. The No. 7 batswing showed with that gas 18.54 candles, and the standard burner 19.79 candles. With coal containing no cannel and a mixture of carburetted water gas, the batswing showed 17.37 candles, and the standard burner 18.95 candles. The experiments made on gas of lower candle power were altogether misleading. He had made many tests during the past 2½ years dealing with nearly 2000 tons of coal. They were samples sent from 25 collieries; and he conducted tests in order to show what could be done with a lower quality of gas. In the No. 7 batswing, the illuminating power was 16.13 candles; in the No. 1 argand, 14.3 candles; and in the standard burner, 17.82 candles. The reduction of 2 candles which had been mentioned would affect only the flat-flame consumers; and that class was fast disappearing, and should, wherever possible, be replaced by the incandescent burner which gave a sevenfold light. In conjunction with gas of a high candle power, a man changing from a flat-flame burner to an incandescent burner used much less gas for the same amount of light. By the proposed change, the calorific value of the gas would not be appreciably affected. At the present time, gas was only judged by its illuminating value. With regard to calorific value, the maximum was 7 above, and the minimum 2½ below, the average. They had exceptional gas of high quality; and it tested most nearly at 665 B.Th.U., and a little above that. For the purposes of this Bill, experiments were made at one of their works with various lots of gas made to suit the conditions if the new burner were adopted; and they found the averages of the illuminating power and calorific value were: Illuminating power, batswing burner, 17.94, the standard burner, 19.90; calorific value, 660.85 B.Th.U. gross, 597.55 B.Th.U. net. As a result of 124 tests, they found figures of 665.90 gross and 605.61 net—giving a difference of 5.05 B.Th.U. gross and 8.06 B.Th.U. net; the percentage of deficiency being 0.75, ¾ per cent. gross and 1½ per cent. net. The user of a gas-engine would only experience a difference of 1½ per cent. From his experience in connection with a number of gas undertakings, there had been no increased sale consequent upon the adoption of the No. 2 burner. In Liverpool, the adoption of the burner would be a distinct advantage to the consumers. He did not wish to say that there would be as great an efficiency in a gas-engine per foot of gas were the new burner to be introduced in place of the old one,

or, in other words, where there would be a reduction of the calorific value,* there would not be the same efficiency per cubic foot of gas used if the calorific value were reduced. He was of opinion that the gas-engines would be as efficient and as capable of doing the work required from them as before. They would be as capable of doing the duty they were doing to-day with the present gas. With gas of a less calorific value, it would mean more gas. As regarded the efficiency of the gas per cubic foot, it would be less; but as regarded the power of the engine, leaving out the word "efficiency," the new gas would be more suitable and more satisfactory. They would have to admit more gas to get the same result. In comparing high-quality gas with low-quality gas, a higher-quality gas in an unsuitable burner would give less efficiency than a low-quality gas in a suitable burner. With a lower-grade gas, the incandescent mantle was of greater durability. They failed to get perfect combustion of the gas in the incandescent burner; and there was carbon deposited on the mantle. Where a manufacturer had prepared a burner specially suitable for 14 or 16 candle gas, they could not get the same duty from that as from a burner specially prepared for 20-candle gas. In this sense the Liverpool consumers were handicapped. High-pressure gas lighting was coming rapidly to the front; and by its means, very great efficiency was effected. The duty had risen as high as 60 candles per cubic foot of gas used. In this system, rich gas was unnecessary, because, when placed under pressure, the heavy hydrocarbons were liquified and lost. With the 20-candle standard, they had to enrich the coal gas they made to the extent of about 6 candles; and by the adoption of the proposed burner, there would be a saving in the process. Cannel was becoming scarce, and they were driven to enrich with carburetted water gas or benzol. They considered that 3d. per candle was the cost of enrichment by cannel, 3d. by carburetted water gas, and 3d. with benzol. But benzol had increased in price; and enrichment by this means was unsuitable, because it did not carry. The consumers were therefore not getting what they paid for. There was no testing-station at Liverpool; the tests being taken at various places by arrangement. The Mersey Docks and Harbour Board were important customers of the Company; the average sum paid by them for gas during the last three years being £17,375. This amount did not include the sum paid by the tenants of the Dock Estate, which would probably be about £11,000. Only 9 per cent. of the burners used by them were flat-flame. Last year, the Engineer of the Dock Board approached him with regard to the amount paid by them for gas, and said that, unless a reduction could be made, he would have to recommend his Board to provide a producer gas plant and dispense with the town gas. As to their gas-engines, the Company had had no complaint of the gas supplied; and his opinion was that the new burner would be to their advantage.

Tuesday, July 12.

In cross-examination by Mr. TALBOT, witness agreed that the object of the Bill was to enable the Company to supply gas of a lower illuminating power than they were at present bound to give. The proposal to change the burner was not merely the machinery to that end, because they well knew that the batswing burner did not do even justice to the various gases that they made. One object they had in view was to be able to compare their gas with that supplied by other towns.

Mr. TALBOT: Supposing you had to keep up the same illuminating power of the gas manufactured, would you think it worth while to get the powers sought in the Bill?

Witness: I am not so sure. The matter has not been considered.

Supposing the Committee thought that while allowing you to change the burner you yet had to supply gas of the same illuminating power as hitherto, would you consider it worth while to have the Bill?—If the matter were put in that way to my Directors, they might possibly not think it worth their while.

Supposing the Committee considered that the illuminating power of the gas should not be diminished, would you still think the change in the burner a valuable one?—I would like to consider that.

Replying to further questions, witness agreed that he was formerly a strong advocate of the higher power gas; but he did not make up his mind with regard to the matter till 18 months ago. He was converted at a meeting at Manchester where he found himself in the minority, and where Mr. Newbigging brought forward facts to show that the reduction of illuminating power would not affect the light. The consumers, of course, had a special interest in this matter; but he agreed that when he made his experiments he did not invite the co-operation of the Corporation or the Docks and Harbour Board. There was no gas so closely tested as in Liverpool; and they were able to keep up to their statutory requirements. It did not follow that because a particular burner or a particular quality of gas was good for one place that it would be good for another. In one town it might be desirable to use a cheap coal, while in another the coal might be much more costly. There were many circumstances to be taken into account.

Mr. TALBOT then put to witness a number of quotations from the "JOURNAL OF GAS LIGHTING" of February, 1907, which represented his opinions at the time; and he agreed that 20-candle gas at 2s. 6d. per 1000 cubic feet was cheaper than 16-candle gas at 2s. 4d. With regard to a number of tests he then made with a Welsbach burner, and in connection with which he stated that the effect on the mantle when the gases were changed was very pronounced, he now said the whole of these experiments were vitiated by the fact that he attempted to make the best possible use of one burner only. Subsequently he attempted to use other burners, and got other results. By altering the burners, it was possible to get an infinite variety of results; but he had learnt something since then. His opinion now was that the value of the gas in the incandescent burner depended upon its calorific value. He agreed that when he made the experiments in 1907 he said that the inevitable conclusion to be drawn was that a reduction in the illuminating power would be detrimental to the interests of the consumer when the gas was used for lighting, whether in a flat-flame or an incandescent burner.

Mr. TALBOT: With the flat-flame burner, a reduction in the illuminating power would be detrimental to the interests of consumers?

Witness: I am not prepared to say what would happen if I used other gas.

Replying further to Mr. TALBOT, witness agreed that in 1907 his opinion was that with regard to a reduction in light in the flat-flame and incandescent burners, the calorific and illuminating power bore very close relation to each other.

The CHAIRMAN: What you are trying to prove, Mr. Talbot, is that the gas which would be supplied if the Bill passed would be of lower quality than that which is supplied now?

Mr. TALBOT: That is admitted. But the other side say: "It will be of a lower quality; but it is to the advantage of the consumer that it should be." What I am putting to witness is that in 1906 he said it would be detrimental to the consumer to get a worse light.

The CHAIRMAN: The broad fact is admitted that there would be a difference in the gas.

Mr. TALBOT: If the Committee think it is proved that there will be a difference in the gas, and that difference not only gives the consumer a worse light but costs more money, I will not say another word.

The CHAIRMAN: The whole issue is really a simple one, and that is as to what was the intention of Parliament with regard to the meaning of the words used in the former Acts to carry out the intention.

Mr. TALBOT: But there is a difference with regard to Liverpool. Take, for example, the Hastings case. There is no dispute that the requirements of Hastings are perfectly explicit—it must be 15-candle gas in the No. 1 burner. When the promoters put their case, they said: "It is quite true that is a definite prescription which can be applied; but the No. 1 argand was adopted because the Referees in London had selected that burner under an Act which required them to prescribe a burner which did most justice to the gas." They say the Referees prescribed this No. 1 burner as complying with this requirement, and that was put in the provincial Acts. But that has nothing whatever to do with Liverpool. We have never had a No. 1 burner. Our burner has been prescribed ever since 1863—five years before the City of London Act was passed. There is a perfectly clear and specific requirement in Liverpool—the gas is to be such as in a batswing burner gives a light equivalent to 20 candles. This is the bargain in Liverpool as between the Company and the gas consumers. It was fixed before the City of London Gas Act, and has nothing to do with the No. 1 burner, or the Referees, or anything. It is admitted that the effect of this Bill, by changing the burner, is to enable the Company to distribute a lower illuminating power of gas. All I want to get from Mr. Allen on these experiments, and with that burner, is that the change must be detrimental to the consumer, both in respect of light, heat, and money.

The CHAIRMAN: It seems to me the principle is the same in the Hastings case as in the Liverpool case.

Mr. TALBOT: There is no colour in Liverpool for suggesting that the Liverpool test-burner was adopted on the principle of what is called doing justice to the gas.

The CHAIRMAN: The candle power was fixed in both; and the candle light was well understood in both. We are told by a very eminent scientific authority that there is no such thing as a scientific candle; but there is such a thing, and a well-understood thing, as a candle. The fact is common to both cases, Liverpool and Hastings—that Parliament prescribed a light equal in density to so many prescribed candles. You are going to differentiate between them by saying in Liverpool they began with a different kind of burner, and therefore perhaps it is more damaging in that case. Professor Frankland himself said: "There is no such thing as a scientific candle."

Mr. TALBOT said that the question was not of candles, but whether with a standard of gas testing with a photometer they were able to say: "There is gas of 15 or 20 candle power." His case was that this entirely depended, first of all, upon the burner in which the gas was burnt, and, secondly, upon the rate at which it was burnt.

The CHAIRMAN: Your position is that it is the burner which is the cardinal point?

Mr. TALBOT: Yes. He said there were two cardinal factors; one was the light of the candles, and the other was the burner in which they had to burn the gas, and according to which the gas showed a different light. There was no dispute about that. On the other side, it was admitted that, by changing the burner, the illuminating power of the gas they were bound to supply would be changed also. The question was as to whether the change was disadvantageous to the consumer in light and in heat and in money, and the witness admitted it was so if the consumer were to burn the gas in the flat-flame burner or the particular Welsbach burner which had been mentioned.

Witness said he was willing to admit that the change would involve a difference of 2 candles; but he would not admit the difference would be 4 candles. The expression in their Act was indefinite—"batswing or fishtail."

The CHAIRMAN: Did you, in order to supply a 20-candle power light through whatever burner you used, have to force through it gas which, tested in the No. 2 burner, would have shown more?

Witness: Yes.

Mr. TALBOT: Yes, of course, Sir, that is our case.

Witness said that through the first burner they had to pass very much more gas.

Mr. TALBOT: They are going to supply a gas which will be much lower than 20 candles illuminating power.

The CHAIRMAN: But in the No. 2 burner, as I understand it, that really represents so many candles light; whereas under the previous burners it would not represent what was the real candle light prescribed.

Mr. TALBOT: I cannot make it clearer. To my mind, that is giving the go-bye to our whole case.

The CHAIRMAN: I think it is very convincing.

Mr. TALBOT: Our whole case is that there is no such thing as 20-candle gas; and what Parliament has told the Liverpool Company to do is to supply gas which, in a certain burner, gives a light of 20 candles. If you alter the burner, it will enable them to give a gas which, in the existing statutory burner, would only show 17 or 16 candles, and thereby you reduce the illuminating power of the gas by at least 3½ candles.

The CHAIRMAN: But they do not produce the prescribed amount of light.

Mr. TALBOT said they could hardly conceive that Parliament would be evaded by so transparent a process as this. If the promoters had

come to Parliament for a reduction in the prescribed illuminating power, there would have been some allowance made as compensation; but because they were achieving the same result in a different way, they were to give nothing.

Witness said his experience was that in some cases the alteration would be to the advantage of the flat-flame burner.

Mr. HARVEY: May I take it that, under certain conditions, this lower candle power gas, burnt in an incandescent burner, would be worse for the consumer?

Witness: It might be; it depends upon the calorific value of the gas. In some cases there is a lower illuminating power and a higher calorific value.

Mr. BALFOUR BROWNE then proceeded to cross-examine witness on behalf of the Mersey Docks and Harbour Board. He said, with regard to the tests he had made, that the results obtained from the No. 7 batwing and the standard burner varied. In one test, the batwing gave 13.16 candles, the No. 1 burner 14.93, and the standard burner 17.82. This was with low-grade gas. He agreed that by the adoption of the No. 2 burner they would be able to work more economically; and he saw no reason at all why the saving should not go to the consumer. When the South Metropolitan Company reduced their illuminating power by 2 candles, there was an allowance of 2d. That Company worked under the sliding-scale. In the case of Liverpool, every penny that was saved must go to the consumer. Asked whether the saving might not be applied in the increasing of the salaries of their servants, witness said that the Directors would not be affected in the slightest in that respect. The salaries of their servants would not be increased unless there were good reasons for doing it. The Company's accounts were very closely audited.

Mr. BALFOUR BROWNE: And you have been making expensive experiments to the extent of using 2000 tons of coal. Might not those experiments deprive the consumers of any reduction?

Witness: That is so.

On the other hand, if you reduce your price in the Act equal to the reduction of illuminating power, it would be fair, would it not?—There is no necessity whatever for it.

It is a prudent thing to spend money out of revenue that might be spent out of capital?—We do not do it.

But you might if you got a large sum in hand?—It would be impossible, because the Recorder's Auditor carefully examines our accounts, and we are prevented from doing anything of that sort.

Would the new test deprive us of any of the calorific value that we get to-day?—I am of opinion that it would not, or very slightly.

By a lower calorific value of gas, I have to use more to get the same result?—That would be so; but it would not apply to Liverpool.

With regard to the gas engines of the Dock Board, witness said they would not have to abandon their engines altogether in consequence of the proposed change of burner. The Company's proposal was not to injure their consumers, but to benefit them.

In re-examination by Mr. PADDON, witness said that the Mersey Docks and Harbour Board had asked the Company for a reduction in the price of gas, and had intimated that if they did not get a reduction they might have to provide power gas for themselves. The calorific value of producer gas was 150 B.Th.U., and that supplied by the Company was 660 B.Th.U. The normal change in the average calorific value from day to day was 9½ per cent. over the year. They had strong electrical opposition in Liverpool; and the Company's object was to sell their gas as cheaply as they could, so as to compete with electricity. On the other side of the Dock estate, they were receiving a supply from two other gas companies of 14-candle power. In the experiments which had been referred to, he used a Welsbach burner, which was required to handle gases of 16 and 20 candle power. Apart from illuminating power, the uniformity that was aimed at in the Bill was a very important consideration. The change the Company proposed to make had been made in the case of other companies where the candle power varied from 14, 15, and 16 candles; and he had heard of no inconvenience or disadvantage resulting from it.

The CHAIRMAN: Have you made any calculation as to what the amount of the saving would be as a result of adopting the No. 2 burner?

Witness: It would be 1d. The difference would be 2 candles at ¾d. per candle per 1000 cubic feet. The saving would all of it go to the consumer.

Captain Sankey's Evidence.

Evidence was then given with regard to the effect of the reduction upon gas-engines by

Captain Sankey, who said the power obtained from gas-engines depended upon two main qualities—the calorific value, and the amount of air mixed with the gas in order to produce an explosive mixture. He believed that calorific power had no definite relation to luminosity. With Mond gas the calorific power was 140 B.Th.U., and with town gas 660 maximum and 500 minimum. There was practically no difference in the value of the proposed and the existing gas for gas-engine purposes. If there was a difference at all, it would be in favour of the gas the Company were proposing to supply. If the change of burner meant a reduction in candle power from 20 to 18, his opinion was that it would make no practical difference to its use in gas-engines. As a rule, if the calorific value went down, so also the amount of air would go down, and *vice versa*. Therefore he would not expect to find any difference in the two gases. The percentage of difference was very small. In the normal working, the difference amounted to 5 per cent., which was due to various losses, and might be *plus* or *minus*; but such a variation would not necessitate the scrapping of a gas-engine. The change in burner would have a tendency to cheapen gas, which would be all in the interests of gas-engine users generally, without sacrificing any efficiency. He could not see that the interests of the Harbour Board would be affected in any way. With regard to gas-engines, an explosion could not be produced unless there was a mixture of some air; five or six times the amount of air had to be introduced. The air that was necessary depended upon the quality of the gas. As a general rule, there was a relation between calorific value and luminosity; but there were exceptions. The higher the luminosity, the more the calorific power. It was usual to have the pipes of the gas-engine suitable to the particular engine; but as to whether it was a question of having

the tubes the smaller the better, he did not think it made very much difference. He would certainly differentiate between the pipes used for Liverpool gas and producer gas, because in the case of Liverpool about 16 or 17 cubic feet of gas per hour would be required; whereas with producer gas from 80 to 100 feet would be necessary.

Mr. BALFOUR BROWNE: We are going to try and convince the Committee that the calorific value of the gas would be reduced by 15 per cent. Supposing that is so, do you mean to tell the Committee that the power of the engine is not reduced?

Witness: I say it would not be reduced.

In reply to further questions, he said that, although there would be a lower calorific value, there would be no loss of power. It was not conceivable to him that the pipes of a gas-engine would be affected by the change of the burner.

Mr. Samuel Glover's Evidence.

Mr. Samuel Glover, the Gas Engineer to the St. Helens Corporation, said he had made comparative experiments with different grades of gas. With the No. 7 batwing he had obtained 14.31 candles, and with the standard burner 18.92 candles, and showing 554.13 B.Th.U. He had also experimented in order to obtain a gas of 20 candles in the standard burner; and he found that, in the No. 7 batwing, gas showed 18.34 candles and a calorific value of 580.45 B.Th.U. He had also experimented to get a gas of 19-candle power in the standard burner; and this was found in the No. 7 burner to differ by only 1.62 candles. In that case, the calorific value was 587.01. With regard to Liverpool, his opinion was that, with the new burner, the consumers would get a gas that would be more useful for all purposes. He did not think it would affect the use of gas-engines. The flat-flame burner was not applicable to low-quality gas. It was in this way that such extraordinarily sensational results were obtained. It had been suggested to him that the different results were obtained by the manipulation of a mixture of gases; but all gas was a mixture of gases, and differences in composition must occur. The No. 2 burner would accurately measure these differences, and enable them to bring about scientific comparisons.

Professor Vivian B. Lewes's Evidence.

Professor Vivian B. Lewes then gave evidence. Replying to Mr. PADDON, who asked if he thought that the change between the No. 7 flat-flame burner and the No. 2 burner, as confined to the case of Liverpool, would make any ascertainable difference to the users of gas-engines, witness said that unless the fact were widely advertised not a single consumer would be aware of it. He saw no reason to differentiate between Liverpool and the other cases.

In answer to Mr. BALFOUR BROWNE, witness said the No. 2 burner was suitable for testing any gas. In the case of Liverpool, the loss to the consumer would be 1½ candles. He had not made experiments with the Liverpool gas; but there was no reason why it should not follow the general rule. Some experiments were absolutely useless in a case of this kind. It was work that was done year in and year out. "You will get with the No. 2 burner," he said, "results which are far better, and of far more importance, than with any other burner." With gases between 18 and 20 candle power, better results would be shown; and with 20-candle gas the difference would be from 1½ to 2 candles. The new burner would give results which could be relied upon. It would give from 1½ to 2 candles better results than the batwing burner.

In reply to Mr. RAM, witness said he gave evidence on the Dublin Gas Bill, where the proposal was to reduce the illuminating power from 16 to 14, and substitute the No. 2 argand for the flat-flame burner. The standard price was reduced from 4s. 1d. to 3s. 10d.; and there was a reduction of candle power. A good many witnesses had already said that the flat-flame burner was absolutely improper for testing gas of 16 or 17 candle power. They were making a half-way house with the bunsen burner; and by taking the flat-flame they were depreciating the light which was given. The Dublin Company had the flat-flame burner; and the result was that they had to give 18-candle gas to develop 16 candles in the flat-flame burner. They asked to be freed from this; and there was a reduction in the illuminating power. In that case he believed there was some *quid pro quo*.

Mr. RAM: There was a reduction of 3d. But apart from that, if the Company get an advantage the consumers ought to have something given to them relatively?

Witness: Yes; they must do so.

Do you think they ought to?—I think they ought, because Parliament has made it essential that they should. I am referring to the sliding-scale and maximum-price companies.

Apart from that, is it right, and has the practice of Parliament been, to make allowance?—I do not remember an allowance being made for the change of burner except in the Brighton and Hove Bill.

Re-examined by Mr. PADDON, witness said that when the Liverpool Company were given their present burner, it was found that the quality of the gas was raised by 2 candles, showing exactly the same principle that was brought forward now. The burner used should be the one that would give the best results. It was certainly not the intention of Parliament to give the maximum amount of light in London and not the maximum amount of light in the Provinces. The enormous differences which had been shown were absolutely of no importance. He could make a gas which would show a difference of some 6 candles by making it in a way which would never be employed practically. But with the Liverpool gas, as the Liverpool Company made it, they would get a difference of about 1½ candles. But with a good, honestly-made gas, these differences could not exist; and the No. 2 burner would show the illuminating power accurately, notwithstanding its composition. The burner could not show any illuminating power unless it was there.

This closed the case for the promoters; and it was agreed that Mr. Ram should proceed with the case for the Liverpool Corporation. Mr. Balfour Browne was, however, permitted to interpose a witness on behalf of the Mersey Docks and Harbour Board.

Mr. A. G. Lyster's Evidence.

Mr. A. G. Lyster, Engineer to the Mersey Docks and Harbour Board, said it would be detrimental to their interests if the Bill were allowed

to proceed in its present form. They used a considerable quantity of gas; the total amount on an average per year being 185 million cubic feet for lighting and heating, and nearly 42 millions for power purposes. Their lighting account amounted to £23,189, and for power £5226. The Company would be able to give gas of an inferior quality; and in respect of this they, as consumers, were to get nothing. The burner proposed was merely for testing purposes, and would show 20 candles; but if the gas were burnt in flat-flame burners, it would not show nearly this illuminating power. They would have to spend more money and pay a greater amount for the gas, and they would have to alter their burners and method of lighting. Their total candle power would be reduced by 15 per cent. In order to get the same efficiency, they would have to burn a larger amount of gas; and they would be put to very considerable expense. Capital outlay would be required in connection with their gas-engines, of £5600. It would be practically impossible to use a greater amount of gas of lower calorific power in their existing engines. The proposed gas would not enable their engines to perform their duty if they were now working at their maximum. Four of their gas-engines had cost £17,000. He had analyzed the total cost of consumption, and estimated that for all purposes it would cost them £5200 a year more. The test that ought to be applied should be what the gas would show when burnt in flat-flame burners. The Harbour Board wanted to pay for what they were supplied with, and not for what the Gas Company tested. It was necessary that they should have flat-flame burners, because in a great number of places it was not possible to use the incandescent light. Dust was created in connection with the traffic of the shipyard; and this settled on the mantles, with the result that they were destroyed. The benefit that might accrue to consumers would not compensate them for the loss they would sustain.

Wednesday, July 13.

The Case for the Opposition.

When the Committee met this morning

Mr. HONORATUS LLOYD drew attention to the point which had been raised by Mr. Ram, with regard to the withdrawal of the opposition in the cases of Ipswich and Ilford. When the matter was first referred to, he was not in a position to state what the facts were; but now they had been ascertained, and he thought the Committee ought to know what they were. Both the Ilford and Ipswich Companies found that they were in a position to reduce the actual selling price of the gas by 1d. per 1000 cubic feet at a certain time; and the Local Authorities had therefore decided not to oppose the Bill.

Professor Frankland's Evidence.

Evidence was then given by

Professor Frankland. In reply to Mr. Talbot, he said the substitution of a lower-grade gas for a higher-grade gas must be detrimental to the consumer, whether he used it for lighting or heating. He would get a worse article as the result of the proposed change; and it would cost him more. There was no meaning attaching to the phrase "so many candle power;" it all depended upon the burner in which the gas was burnt, and the rate at which it was consumed. If an Act of Parliament contained an obligation upon a company to supply gas of 20-candle power and nothing more, it would have no meaning at all. They must prescribe the candle power, the burner, and the rate of flow.

The CHAIRMAN: But the light from 20 candles would not alter?

Witness: Twenty candles is a specified amount; but I could get that light by one gas or another according to the method employed.

Mr. TALBOT: The whole criterion of the obligation on the Company to supply gas is the burner and the rate of flow?

Witness: Yes.

In Liverpool, if you were to substitute for their burner another one, you would alter the whole thing, and alter the gas which the Company are bound to supply?—Yes; absolutely.

Continuing, witness said that each constituent of the gas produced its effect in the flat-flame burner, and each constituent of the gas produced its effect in the No. 2 burner. But in the latter, there were factors which enhanced the amount of light. In the flat-flame burner there was no regenerator principle, and the conditions were altogether different. It was not that the flat-flame burner allowed something to pass without registering it, but that the No. 2 burner enhanced the illuminating value of the gas.

The CHAIRMAN: On the other side, they say that more gas is passed through the No. 1 burner than the No. 1 registers.

Mr. HONORATUS LLOYD: Mr. Newbigging said in his evidence that the No. 1 burner registered so much gas; but there was something which passed on to the consumer which the burner failed to show.

Witness said that the same gas passed through the No. 1 and the No. 2 burners would produce more light in the latter, because it was consumed under different conditions. It produced the regenerator principle, which led to a better result.

The CHAIRMAN: What Mr. Carpenter said was that more gas, and gas which cost them something more to make, has to go through the imperfect register in order to get it to register 14 candles.

Mr. TALBOT: We agree to this extent: They must pay more in order to get a higher illuminating power. The No. 2 burner enhances the value of the gas.

The CHAIRMAN: But the light remains a constant factor. They say that, in order to get the instrument to give 14 candles, they have to pass gas through which is really 15 or 16 candle power.

Mr. TALBOT: Professor Frankland is explaining that there is no such thing. When once you get this fact, that the same gas with a different burner shows 10, 12, 13, 14, 15, 16, 20, and 22 candle power, how can you say there is such a thing as 12-candle power or 18-candle power? (To witness:) And there is no finality in the No. 2 burner? There are others out of which you can get more candle power still?

Witness: Yes.

The CHAIRMAN: You deny what the other side allege as a fact, that very much more gas has to be passed through the instrument in order to get a return of 14 candles?

Witness said that in order to get 20 candles out of the flat-flame burner they had to supply more expensive gas than if they got 20 candles by means of the No. 2 burner.

The CHAIRMAN: You admit that by the No. 2 burner they would still

be able to comply with the parliamentary demand of 20 candles without going to the expense?

Witness: They would be setting the parliamentary standard at naught, because the Liverpool standard is that the gas there must be burnt in their particular burner.

Replying to Mr. TALBOT, witness said he considered the flat-flame burner was the proper test for Liverpool gas. Mr. Corbet Woodall had said the same thing. The Liverpool Act said they should supply gas of 20 candles in a particular burner at a particular rate. If Parliament had meant that the gas should show the same light in the No. 2 burner, the nominal illuminating power would have been greater. The effect of this Bill would be that the gas supplied would be, or might be, changed to the disadvantage of the consumer. He attached importance to the test-burner being one that the consumer could understand and reproduce in his own house.

With regard to the relation of illuminating power to calorific value, witness pointed out that when he gave evidence before the other House he said that the diminution of illuminating power by one candle was attended by a diminution in the calorific value of 3.1 per cent. He had since examined the reports of the London County Council, and in the case of the South Metropolitan Company, he had set out the averages for each week at each of their stations. In each case there was a diminution in the heating power when the illuminating power went down; and the average for the loss of one candle worked out at 2.9 calories.

Mr. HARVEY: Would it be possible for a company, if they were going to drop their candle power by two candles, to maintain the calorific value of the gas?—That would depend on the manufacturing of their gas before.

In reply to the CHAIRMAN, witness said that a diminished candle power gave a diminished calorific power. He had made experiments with low-quality gas at the works of the Liverpool Corporation, and with a gas of 14.7 candles in the No. 7 batwing, he obtained 19.1 candles in the "Metropolitan" No. 2 burner. There was a difference of 5 candles.

The CHAIRMAN: Then, in order to show a 20-candle registered luminosity, they have to supply 24 to 25 candles?

Witness: I have also examined the Liverpool gas as now supplied. In the No. 7 batwing burner it gave an illuminating power of 21.1 candles; in the No. 2 "Metropolitan" argand the same gas gave 22.8—a difference of 1.7 candles. This is a much richer gas; and the "Metropolitan" argand in that case does not show the greatly enhanced value as in dealing with lower-grade gas.

Mr. TALBOT: A gas which would show 20 candles in the No. 2 burner would show about 15 candles in the flat-flame?

Witness: It would be about that.

Continuing, witness said that all gas purveyors had to allow a certain margin. They always supplied gas a little richer than the parliamentary requirements. The Liverpool gas had a calorific power of 667 B.Th.U.; and the difference between what they would supply under the Bill and the gas they were now supplying, was that the flat-flame consumer would have a loss of 25 per cent. The loss in heating and motive power would be 15 per cent. The loss in calorific power would be 3 per cent. per candle. With regard to incandescent burners, there would be a loss of 8 per cent. in light. The flat-flame consumer would lose 7.5d. per 1000 cubic feet, the incandescent consumer 2.5d., and the user of gas for heating and motive power 4.5d.

In cross-examination by Mr. HONORATUS LLOYD, witness admitted that, when he put in the results with regard to the South Metropolitan Company, he was aware that theirs was a straight coal gas, and of a totally different composition to the Liverpool gas. The Liverpool gas was coal gas with a certain amount of carburetted water gas. He admitted that the difference of composition made all the difference in the relation of calorific value to illuminating power. Practically, only one-third of the amount of calorific value in the gas was capable of use in gas-engines.

Mr. HONORATUS LLOYD: I am trying to find out the loss. If the loss is 3.1 per cent. for one candle, and as a fact only one-third of it is capable of use, the result is the loss of one-third of the 3.1, is it not?

Witness: It would be one-third of whatever calorific power you put in; but the other two-thirds have got to be there.

I asked you on the 6th of July (a week ago) whether you had any fault to find with the proposed burner, and you said "No." Is that still true?—Yes.

And if the consumer in Liverpool gets the benefit, can you see any objection whatever to our proposal?—In some cases he cannot get the benefit.

Mr. HONORATUS LLOYD then read extracts from witness's previous evidence, and asked him whether he agreed: "I do not believe that any very serious injury would be done by lowering the candle power of the gas in Liverpool, provided it is lowered on proper terms. The lowering of the candle power would enable the Gas Company to effect a very considerable saving in the process of manufacture. The consumer would have to use more gas to obtain the results he is obtaining to-day; and I say if the consumer in the case of Liverpool were to have a reduction in the price of gas, I see no reason why the No. 2 burner should not be substituted for the No. 7 batwing?"

Witness: Yes; if you give an equivalent in money. But you cannot.

Do you know that the result of this is that whatever saving there is must go to the consumer?—But there will not be as much saving as he loses.

Your point is that, financially, he loses more than he can save?—He loses more than he can afford to give.

The CHAIRMAN: We want to deal fairly between the maker and the consumer; and we agree that the light should be equal to the light of 15 candles. Which burner would you recommend Parliament to prescribe? We will fix the price and the light, and the point at which the test is to be made?

Witness: If you wish the consumer to have 15-candle gas, and he produces that light himself, I should prescribe the flat-flame burner.

Mr. FITZGERALD pointed out that the question was answered in the Model Clause, where the test to be applied was the "Metropolitan" argand No. 2.

The CHAIRMAN: We want to insist on the consumer being supplied

with 15-candle gas at a certain price, and measured at a certain place. Under these terms, what would you advise us to use if our desire is to show most accurately what the real value of the light is?

Witness: If it is 15 candles in the flat-flame burner, its equivalent in the No. 2 burner is 20 candles; so that your desire to give 15-candle gas in Liverpool would be met in that way.

Mr. FITZGERALD: Have you ever seen that put into an Act?

Witness: No.

The CHAIRMAN: You will keep in your mind the question of price and light which we have reserved to ourselves. I ask you as a scientific expert which is the burner to test the gas accurately?

Witness: If the consumer is to receive 15 candles, then it must measure 15 candles in the flat-flame burner.

Mr. HARVEY: The No. 2 burner is said to be preferable because it operates more accurately over a wider range, and that it is advantageous on the ground that uniformity all over the country would be advisable. On these grounds, would you recommend the No. 2 burner?

Witness: Yes; but not with 15-candle power.

Mr. TALBOT: It would be quite possible to apply the No. 2 burner all over the country; but in cases where there is an existing parliamentary obligation to supply gas of so many candle power, you would require to make a corresponding adjustment in candle power?

Witness: If you wish to give 15-candle gas which the consumer will be able actually to produce, then I say he must have the 15 candles in the flat-flame burner, or, with the equivalent in the No. 2 burner, it would be 20 candles.

And in Liverpool if you wanted to secure gas which would show 20-candle power with the new burner, you would have to raise the nominal illuminating power to secure the same gas?—Yes, certainly. The nominal illuminating power would have to be varied according to the variation in the burner.

Mr. Isaac Carr's Evidence.

Evidence was next given by

Mr. Isaac Carr, who said that a small portion of Liverpool was supplied with gas by the Corporation. He referred to an application by the Corporation to the Board of Trade with regard to illuminating power, and said that an Order was granted providing for 20-candle power. That was granted after long discussion, because the Board of Trade proposed that the candle power should be 14. If they were to measure their 20-candle gas by the No. 2 burner, it would give a result of 15 candles; and they would be paying 2s. 6d. for what was worth 1s. 10½d. He had made experiments with regard to calorific power, and found that there would be a loss of 3 per cent. per candle—15 per cent. altogether. In that case, they would be paying 2s. 6d. instead of 2s. 1½d. He had also made experiments to see what the 15-candle gas could be produced for; and he found that it would be 4½d. less. He calculated that the saving to the Company would be 3½d. per 1000 cubic feet; and taking last year's gas consumption in Liverpool and multiplying by 3½d., there would be a saving of £68,000 per annum. Only in the case of the incandescent burner would that represent the loss to the consumer.

Mr. FITZGERALD: If the saving to the Company is £68,000, it would go back to the consumer, would it not?

Witness: It should do so.

Your point is that if the whole saving is given to the consumer, nevertheless he would be worse off?—I say it would compensate the incandescent burner consumer, but not the flat-flame consumer.

This question was raised in the Southport case, where they asked for the standard burner. You pointed out to the Board of Trade Inspector that it would make a very large difference in the illuminating power of the gas; but the Board still granted the standard burner?—The Board of Trade Inspector did not understand the matter at all.

The Board of Trade do not understand it; and you have already said that Parliament did not understand it. We are reduced to this—that there is only one person who does understand it?—Oh, no!

Replying to further questions, he said he was the adviser of the Liverpool Corporation. In raising their illuminating power to 20 candles they used cannel and benzol. He agreed that he had said on another occasion that if the consumers were met by a reduction in the price of gas, he saw no reason why the No. 2 "Metropolitan" burner should not be substituted for the No. 7 batwing.

Mr. FITZGERALD: At the Corporation gas-works they produce gas enriched with cannel and benzol of an illuminating power of 20 candles, as tested at their testing-place; but the calorific value is immensely lower than that of the gas supplied by the Liverpool Gas Company?

Witness: I say that the gas is precisely of the same quality.

Do you mean to say that gas enriched with benzol and gas enriched with carburetted water gas produce the same calorific value?—The calorific value varies with the method of enrichment.

Witness went on to say that he had carried out a series of tests at the Liverpool Corporation gas-works with 20-candle gas used with the No. 2 burner and enriched with cannel and benzol, and he obtained the result of 680 B.Th.U.; with 21.1-candle gas, he got 708. The 20-candle gas was that supplied to the consumer; and, by arrangement, a lower quality of gas was supplied to enable tests as to the cost of production to be made. It was then found that the effect upon the incandescent mantle consumers throughout the district was most noticeable. He had heard Mr. Carpenter's evidence with regard to the change in burner as applied to the South Metropolitan Company, and that there had been no complaints from the users of gas-engines; but he would say if that was the case the engines were not working at maximum power. With the No. 2 burner, the flat-flame consumer would have to burn 25 per cent. more gas in order to get the same amount of light that he was getting now with the No. 7 flat-flame burner. The loss would amount to 7½d. per 1000 feet; and the same applied to the user of gas for motive power. He put down the saving to the Company at 3½d., and the loss to the motive-power consumer at 4½d. The loss to the flat-flame burner consumer would be 7½d., and to the incandescent burner consumer it would be just under 3d. This loss must be borne by the consumer.

[Mr. Carr was then questioned as to the publication of his diagram in the "JOURNAL" last week, p. 129; and the discussion that ensued is reported in this issue, p. 203.]

Mr. J. G. Newbigging then gave corroborative evidence. He agreed with the results placed before the Committee by Professor Frankland.

Further Evidence in Opposition.

The Assistant Medical Officer for Liverpool said he made investigations with regard to the number of flat-flame and incandescent burners in use in the poorer houses in Liverpool. Out of 8000 houses, there was no gas at all in 2669. In 5383 houses, there were 21,770 gas-burners; and they were found in houses of which the rental was from 5s. 6d. to 8s. 6d. per week. There were 10,692 flat-flame burners, 891 fishtail, and 10,181 incandescent.

Replying to Mr. HONORATUS LLOYD, witness said it was very likely that incandescent lighting was increasing; but he did not think the flat-flame burners would be displaced in the poorer houses. He thought that in the better class houses the proportion of incandescent lighting might be very much larger.

Mr. HONORATUS LLOYD then again referred to the question which had been raised with regard to the opposition of Ilford.

A Question of Price Reduction at Ilford.

Mr. Wm. Ashmole, the Chairman of the Ilford Gas Company, said his Company were in the No. 1 Bill. The Company had been contemplating a reduction in the selling price of gas and found they were in a position to do so. The District Council had asked them whether, in the event of their not opposing, the Company would give them a reduction, and whether the Company would also agree that, in the event of the Council proposing or supporting a Bill in Parliament for the free-wiring of the electric light (they owned the electric lighting undertaking), the Company would not oppose them. He, as Chairman, gave them to understand that the Company could not agree to either of these propositions. Subsequently, the Clerk to the Council suggested that the Company might make a reduction of 1d. per 1000 cubic feet. The Company had discussed the question last year; but they decided that they could make no reduction, for three reasons. They had the question of the assessment by the Poor Law authorities, who wished to increase their assessment very considerably; but that had been arranged, and the assessment had been considerably reduced. The income-tax authorities decided that no depreciation should be allowed to gas or water companies; and this would have affected them very seriously. But the income-tax people had come to the conclusion that the circular they then sent out was irregular. The other point was that up to the present they had been rebuilding their works; but they had now concluded this. The Company, on these considerations, decided that they could reduce the price at the end of the year; and when the suggestion of 1d. came from the Council, they agreed to give it. They did not give the reduction because they were likely to secure the standard burner Bill.

Mr. HONORATUS LLOYD: That which you had always intended to give them you said: "By all means take"?

Witness: Yes.

In answer to further questions, witness said that part of the Ilford Urban Council's district was supplied by the Barking Gas Company. They had the new burner, and they had had to pay nothing for it.

Mr. TALBOT, in cross-examination, read an agreement which had been arrived at between the Ilford Gas Company and the Ilford Urban District Council, as the terms for the withdrawal of the Council's opposition. The agreement was dated July 5, 1910, and was as follows:

The Ilford Gas Company agree, providing they accept the Bill as passed by the House of Commons Committee, and that no reduction in the standard price is made by the Bill, to grant the consumers in the district of Ilford a reduction of 1d. per 1000 cubic feet from the current price of gas for one year certain from and after the reading of meters for the Christmas quarter, 1910. (2) In the event of the Bill being accepted by the Company containing a provision for a reduction in the selling price of gas of 1d., or exceeding 1d., the consumers to have the benefit of such reduction contained in the Bill in lieu of the before-mentioned 1d. reduction.

Witness said they could afford to give 1d. reduction without interfering with their dividend, and, quite apart from this consent, they would have given the 1d. reduction. They thought, however, that if the arrangement were made known, it would tend to prejudice the other companies.

Mr. TALBOT remarked that they had another special case to mention—that of Cambridge, in one of the other Bills; but he asked the Committee to defer their decision upon the No. 1 Bill until they had heard Bills Nos. 2 and 3.

The Case of the Liverpool Corporation.

Mr. TALBOT, addressing the Committee on behalf of the Liverpool Corporation, pointed out that, if the standard burner were allowed, the Liverpool Company would be able to supply gas of lower illuminating power than they were bound to supply to-day, and still pass the parliamentary test. There was no doubt that there would be a substantial reduction; and it would enable the Company to effect great economies in the cost of production. If the consumer desired to get either the same light or the same heat, whether he used the fishtail or the flat-flame burner, he would have to burn more gas and pay more for it. When they came to balance these considerations, it would be found that the economy to the Company was considerably greater than the decreased cost to the consumer. And Mr. Allen, by his tests of 1906, agreed with the findings of Lord Rayleigh's Committee and with the Corporation witnesses—that the loss to the consumer was greater than the advantage. He (Mr. Talbot) looked upon this as a matter of great simplicity. It was admitted that this was a Bill for reducing the illuminating power, and it was the practice of Parliament that, when there was a reduction of illuminating power, a corresponding concession should be imposed upon the Company. He failed to see how this principle could be departed from simply because the Companies in the Bill were effecting a reduction in their illuminating power by a change in the burner. What the Liverpool Corporation asked was that the Committee should not make this change at all. The Corporation did not say there were not considerations on each side; but, taking the matter as a whole, the existing test-burner involved the supply of an unusually high quality of gas, and the consumers for both lighting and heating were accustomed to that supply. All their arrangements had

been made relying on its continuance. There was no colour for saying the Liverpool burner for testing the Liverpool gas was prescribed in consequence of any prescription of the Referees, or had anything to do with the City of London Act of 1868. Their burner was adopted in 1865, since the London Gas Act was passed; and it had been twice confirmed since that time.

THE CHAIRMAN: All you say is that there being a reduction in the actual supply of gas, there ought to be a reduction in price?

MR. TALBOT: No, Sir, I ask you not to change Liverpool at all. A reduction of price would be better than nothing. I do not ask for any increase in the illuminating power, in fact; but supposing you think fit to put in the No. 2 burner, I would have no objection to that providing there is a corresponding increase. But I do not wish any change. Again referring to the paper which Mr. Allen read before the Institution of Gas Engineers in 1906, Counsel called attention to the author's opinions, which were that the inevitable conclusion to be drawn from the experiments he had then made was that a reduction in the illuminating power would be detrimental to the interests of the consumer when gas was used for lighting, whether in the flat-flame or the incandescent burner. He asked the Committee to say that no case had been made out so far as regarded Liverpool, and that it should be struck out of the schedule of No. 1 Bill.

The Case of the Mersey Docks and Harbour Board—Professor Burstall's Evidence.

MR. BALFOUR BROWNE then proceeded with the case of the Mersey Docks and Harbour Board, evidence being first given by

Professor Burstall, who said he had tested the Liverpool gas and had examined the gas-engines of the Harbour Board. The heating value of the gas had no effect on either the maximum output of the engine or on the economy, provided the engine was arranged to suit the particular gas. They could obtain the full power or the highest efficiency from a gas whose heating value was as low as blast-furnace gas, with producer gas. He put in a table showing the results of tests which he had made. One gas showed 188 B.Th.U., and another 162 B.Th.U. The result was that the horse power of the engines dropped from 199 to 188. If the drop in calorific power was 10 or 15 per cent., it would necessitate altering the whole of the pipes and passages of the gas-engines, which would be a very expensive matter. He was constantly being called in to examine gas-engines; and he found that very often the trouble arose with respect to the calorific value of the gas supplied. In large towns, such as Liverpool and Manchester, the following advertisement was becoming quite stereotyped: "20 H.P. gas-engine for sale; installing larger engine." Not one gas-engine user in a hundred knew what calorific power was. In the case of the Harbour Board, the pumping out of a dry dock was a serious matter, and it was essential that within limits they should receive a gas of constant calorific power. The limit should be 2 per cent. on each side of the mean. The Harbour Board, with a drop in the calorific value of 9½ per cent., would not be able to get out of the engines the power that was obtained at present.

MR. HUTCHINSON: Do you know that since these gas-engines have been put in, the calorific value of the Liverpool gas has dropped no less than 60 units; and yet the engines are working to-day satisfactorily?

Witness: I know nothing about that.

Which is the better kind of gas for working gas-engines, a higher or a lower thermal capacity gas?—I do not care so long as it is cheaper.

Witness further said that, as the proposal stood, the gas would be dearer. He was in favour of very cheap gas. As the gas was at present supplied in Liverpool, their engines were suited for the gas, and nothing should be done to alter the bargain that existed between the consumer and the Company. If the consumers were content with the present conditions, they should be allowed to remain as they were.

Mr. R. D. Holt's Evidence.

MR. R. D. HOLT, M.P., a member of the Harbour Board, said the expenditure on the estate was £30,686,000. The undertaking was carried on as a public trust, not with a view to profit, but in the interests of trade. If the trade was to be successfully carried on as against competing ports, they must reduce their expenses to the lowest possible limits. The result of the change in the test-burner would be an increased consumption of gas, which would burden the estate to the extent of another £3000 a year, apart from any capital expenditure which might be necessary. The charge of 2s. 6d. per 1000 cubic feet for power was a very high price. The Gas Company had not asked them to enter into negotiations for an alteration; and it was unreasonable that the alteration should be forced upon them.

In reply to **MR. HUTCHINSON**, witness said that their income was £1,500,000. Nobody would gain by the proposed alteration. The Company said they would charge a reduced price as a result of the proposed change; but it did not follow that because of this the Harbour Board would be compensated for the loss they would suffer.

MR. HUTCHINSON put a calculation to the witness, on the basis of **MR. Carr's** figure, that the saving would be 3·8d. per 1000 cubic feet. The price of 1000 cubic feet of gas was 2s. 6d. It was said that they would have to burn 1150 cubic feet in place of 1000 feet; and 1150 feet at 2s. 2½d. was just the same sum as 2s. 6d. per 1000 feet.

In reply to **MR. BALFOUR BROWNE**, witness said there was nothing in the Bill to guarantee the calculation.

MR. BALFOUR BROWNE, addressing the Committee on behalf of the Mersey Docks and Harbour Board, said the case was unique, and was quite separate from that with which the Committee had already dealt. In opening the case for the other Bill, **MR. Honoratus Lloyd** said: "I admit there is a distinction between Liverpool and the other places because of the high-grade gas supplied there." He asked the Committee, whatever they did with regard to the other companies, to leave Liverpool out of the Bill. The circumstances in Liverpool were an absolute bargain between the Company and the consumers; and it was confirmed by Parliament in 1865. A great deal of argument had arisen upon what was done after that year in London; and he admitted that the position of London was entirely different. In London, there was an indication that the burner to be used was one that would do the most justice to the gas. There was no such provision in the case of Liverpool; the bargain was that they should supply gas as measured by a

particular burner. It was admitted that by the No. 2 burner the Company would be able to supply them with gas of a lower power, and yet the consumers were to be called upon to pay the same amount for it. The Mersey Docks and Harbour Board, if this were done, would have to alter all their engines and all their burners. He asked the Committee to say there was no reason shown why the change should be made, and there was not a case where the change should be allowed without some *quid pro quo* to the consumer.

Thursday, July 14.

Mr. Honoratus Lloyd's Reply.

This morning was set apart for **MR. HONORATUS LLOYD's** reply. In a very forcible speech, he said that, with regard to the opposition of the Liverpool Corporation and that of the Mersey Docks and Harbour Board, what they said was at the bottom of the whole matter was the bargain between the consumer and the undertakers at the instance of Parliament. The rock upon which his case stood was that the intention of Parliament was to prescribe an illuminating power equal in intensity to that given by *x* candles accurately measured. He called attention to the evidence given by **MR. Lyster**, who put the matter very plainly in reply to the Chairman: "(Q) The Legislature having prescribed 20-candle gas, and prescribed the mode of testing it, would you imagine that the test was to be an accurate test of real 20-candle power gas, or something different, or something more? (A) I imagine the Legislature said: 'We must have a test—we must say what the quality of the gas is to be;' and they instituted a test which they thought would indicate the quality of the gas." On the other side, they said the burner was the cardinal point. But in order to arrive at what Parliament meant, one had to get clearly in one's mind two things. Parliament had dealt with what was known as the quality of the gas, and, secondly, with the mode of testing; and in dealing with the quality they had prescribed so many candles. When dealing with the mode of testing, they had prescribed this, that, or the other burner from time to time—always intending that it should be an accurate method of testing. His learned friends contended that a light equivalent in intensity to *x* candles, when prescribing a particular burner, had no meaning; and **Professor Frankland** was very strong on this point.

MR. TALBOT: No; our whole case is that there is no such thing as 20-candle gas.

MR. HONORATUS LLOYD proceeded to show how Parliament had dealt with the quality of gas and the method of testing. In the Gas-Works Clauses Act of 1871, it was provided that the quality of the gas was to be such as produced at the testing-place a light equal in intensity to that given by so many sperm candles of six to the pound; and the burner was to be as prescribed in the Special Act, or according to such rules as should be substituted therefor by any Special Act. So that, taking the quality of the gas as a fixed figure, the testing might be changed from time to time. And in the various Acts of the companies in the No. 1 Bill there was the same sort of thing. The method of testing was by the burner that was the most accurate, supposed or known, at the time. This was recognized by Parliament when fixing the basis of the financial undertaking and the quality of gas—that the prescribed apparatus might be changed in one form or another, either by the Gas Referees, by the Board of Trade, or by coming to Parliament. In the City of London Gas Act, 1868, the quality of gas was fixed when the burner was unknown. The gas was to be of an illuminating power of 14 candles; but there was no mention of a burner. Yet, on the evidence of **Professor Frankland**, his learned friends kept on saying that gas of so many candle power, without a prescribed burner mentioned and specified, was an unknown quantity. It was also provided that "The Gas Referees shall prescribe the burner; and it shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." What was the good, after this, of saying that Parliament meant nothing, and could mean nothing, by speaking of an absolute gas of 14 or 16 candle power unless they prescribed the burner, and that they meant an artificial 14 or 16 candle power with a particular burner, when Parliament distinctly said that the gas was to be measured by such burner as the Referees should from time to time prescribe? It was also said on the other side that the conditions of Liverpool and London were so different; but he was not tying himself to London, although one might suppose that London would be a good sample to take. If they were to look at the London and Provincial Gas Acts and Orders, the same thing would be found running through them—not intending an artificial figure as measured by a particular burner, but intending an absolute figure measured by an accurate burner. When the question arose with regard to sulphur restrictions and the purity of the gas, the provision in the last Liverpool Act of 1882 was that the apparatus and mode of testing should be the same as now prescribed by the Metropolitan Gas Referees. So in that case, when Liverpool was dealing with Liverpool gas, they thought "How excellent is the practice of London."

MR. FRERE (Parliamentary Agent). They kept the same burner.

MR. HONORATUS LLOYD pointed out that the Liverpool Act of 1865 provided as to the method of testing the candle power and the test-meter; and they provided for the number of candles, for the quality of the gas, for the burner (the batwing or fish-tail at 5 cubic feet an hour, giving a light equal in intensity to 20 sperm candles), and for the time and the place of testing. By the Act of 1882, they incorporated the Gas-Works Clauses Act; and notwithstanding such incorporation, sections 13 and 14 of the Act of 1865 were to remain in full force and effect. In short, the effect was that the burner was left out. Therefore Liverpool was in precisely the same position as the others—namely, they were liable to have their prescribed burner changed by Special Act. Their present burner was by no means a perfect one. They began with an iron batwing, and now they had a steatite batwing; and the evidence was that if four of these burners were put in a row there might be a difference of four candles between them. It was not as inaccurate for a high-candle gas as the No. 1 burner; but, nevertheless, it was unreliable. The evidence before the Committee stood uncontradicted—that the existing burner in Liverpool was not reliable, was not a constant burner, and was one that should not be kept if a better one could be introduced.

Then, with regard to the loss which the opponents said would accrue by the adoption of the No. 2 burner, the evidence of Professor Burstall and Mr. Lyster was all based upon the evidence of Mr. Newbigging and Mr. Carr. Mr. Lyster said he had not gone into the figures; and his evidence was based on the assumption that the loss of light and power would be that which Mr. Newbigging and Mr. Carr said it was. Professor Burstall spoke of the effect on gas-engines if the loss in power were 15 per cent.; but he did not say a word as to whether this was the amount of loss. He also accepted the figures of Mr. Carr and Mr. Newbigging.

The CHAIRMAN at this point asked Mr. Lloyd to deal with the rather forcible argument of Mr. Talbot and Mr. Balfour Browne, which was that, although the calorific power was not prescribed in any of the Liverpool Acts, it so happened that, in giving the illuminating power through a defective burner, the consumers for power had had the benefit. They said that if the No. 2 burner were substituted, a certain thing which they had had, rightly or wrongly, would be taken away; and, worse than this, they said that, in doing so, another gas would be given them which they might make up by using an additional quantity. But a different quality would be given which they could not make up at all, which might lead to very serious results with regard to their gas-engines.

Mr. HONORATUS LLOYD said he agreed, from beginning to end, that they had hitherto had something more than that to which they were entitled. "The effect of what the Company were proposing to do was to give them that to which they were entitled; and by saving the expense of not having to manufacture the surplus to which they were not entitled, they would have the benefit of the result by getting that to which they were entitled, at a lower cost. Returning to his criticism of the evidence, he said that Professor Burstall and Mr. Lyster had assumed that the consumer using the flat-flame burner would lose 25 per cent. of efficiency, that the motive power user would lose 15 per cent., and that the incandescent consumer would remain pretty much where he was before, or would possibly gain a little. The 25 per cent. was arrived at by Mr. Carr, who said that the reduction would be 5 candles, which would be a quarter of 20, or 25 per cent., and therefore the flat-flame burner suffered to this extent. But the mistake of the whole thing was that the flat-flame burner did not lose 5 candles at all, or anything like it. The evidence was that the extreme difference would be 2 candles. Then, with regard to calorific power, Mr. Carr and Mr. Newbigging took the loss at 15 per cent., because the loss was 5 candles at 3 per cent. per candle. But the evidence was that the actual variation was $9\frac{1}{2}$ per cent. Not only was the 5-candle loss a mistake, but the 3 per cent. was rubbish. The evidence was that it amounted to 1 per cent. This being so, what became of the apparently important evidence of Mr. Lyster and Professor Burstall, which was based upon 15 per cent.? "Mr. Carr is as bad as the No. 1," said Mr. Lloyd; "he ought to be eradicated."

Turning to the question of the use of gas in gas-engines, Counsel said much had been made of the statement that the pipes and so on would have to be entirely altered. But gas engineers did not lay pipes which were capable of carrying exactly the amount of gas they required. "It is a bogey" he said. The pipes which were in use to-day must be ample for the slight change which would result upon the slight loss of 1 per cent. calorific value. The whole calorific figure given by Mr. Lyster and Professor Burstall had no foundation of any sort, except the loss of 5 candles and the multiplication by 3. And this was absolutely contradicted by those who had had the gas to deal with, and upon whose word there could not be the least doubt. When Mr. Lyster was asked if he had not contemplated the use of producer gas—a very low-grade gas—for some of his purposes, he said "Yes." And that gas was going to be used in these same engines, which were going to suffer a terrible calamity by the loss of 15 per cent. Their evidence was based upon an absolute fallacy.

It was rather a curious position, because the Liverpool Corporation, by their Lighting Committee, passed a resolution some years ago asking for a reduction of the candle power of the gas supplied. It was the Corporation themselves who, at an early stage, when incandescent lighting and gas for heating and cooking was not used to such an extent, thought the time had come for reducing the candle power. Yet the Corporation now came and said: "We want the higher candle power." The Mersey Docks and Harbour Board said the same thing; whereas at one time they were contemplating the use of producer gas. It would be a pity if Liverpool were to be left as the only place in the whole country where 20-candle power gas was provided—a costly article, which was no good to anybody, in the sense that it might be replaced by an article equally satisfactory to everybody and of less cost to both purveyor and consumer.

The suggestion had been made by Mr. Balfour Browne that the saving might be applied in raising the Directors' fees and so on; and although Parliament had provided that the Company should be compelled to reduce their price, Mr. Balfour Browne said: "That is another mistake of Parliament; Parliament did not understand what they were doing; it is a worthless thing." It was provided that the Company must reduce the price automatically, and all the saving must go to the consumer. Then it was said "If the saving is so small, what is the advantage to the Company?" To the Company, *qua* company, *qua* finance in that respect it was no advantage. They were already receiving every single farthing of their dividend. It was amply secured; and there was no risk of the dividend being reduced. But they had to compete more and more, day by day, with the Corporation electricity; and they were anxious to be able to supply an article which was cheaper and on economical terms. The Corporation no longer required a reduction in the candle power. It would enable the gas to be more competitive with their electricity undertaking.

As an illustration of what was the truth with regard to Mr. Carr's suggestion about the terrible injury that was likely to be done by the drop in the candle power and the calorific test, he called attention to Mr. Newbigging's evidence of the state of things in Manchester. The Manchester Corporation has reduced the candle power of their gas, as measured by the batswing burner, from 20 to 14 to 15.30. Did Mr. Newbigging say that all Manchester was up in arms, or the gas-engines required large sums to be spent on them and larger pipes had to be laid, and that the consumers were calling for justice? Then, again,

the candle power had been reduced at various large towns where there were docks; and in the other House the promoters had directed the attention of the Mersey Docks and Harbour Board to this matter. They could have brought evidence from any one of these places; but they had preferred to remain silent on the point. Under all the circumstances, he asked the Committee to say that, although there was this distinction in the case of Liverpool, the burner was inaccurate and unreliable, and it was desirable that they should be in the same category as the other companies.

Mr. FRERE again called attention to the point made by Mr. Lloyd with regard to the Liverpool Act and the inclusion of the burner, and contended that the burner was preserved by the Act of 1882.

Mr. HONORATUS LLOYD said it was provided that: "It shall be the burner or such burner as may be prescribed by any Special Act."

It was found after a discussion that the words in one Act were "any Special Act" and in another "the Special Act."

GAS COMPANIES (STANDARD BURNER) BILL (NO. 2).

House of Commons Committee.—Friday, July 15.

This Bill also proposes the adoption of the "Metropolitan" argand burner No. 2 as the standard burner. The Companies concerned are the Berkhamstead Gas Company, Bournemouth Gas and Water Company, British Gaslight Company (in respect of their Staffordshire Potteries, Trowbridge, and Holywell stations), Cambridge University and Town Gaslight Company, Chigwell, Loughton, and Woodford Gas Company, Faversham Gas Company, Harrow and Stanmore Gas Company, Hatfield Gas Company, Hemel Hempstead District Gas Company, Herne Bay Gas and Coke Company, Newmarket Gas Company, Ormskirk Gaslight Company, Prescott Gas Company, Radcliffe and Pilkington Gas Company, Reading Gas Company, Shrewsbury Gaslight Company, Tunbridge Wells Gas Company, Waltham Abbey and Cheshunt Gas and Coke Company, West Kent Gas Company, and Worthing Gaslight and Coke Company.

The opposition to the proposal came from the Bournemouth, Cambridge, Faversham, Reading, and Hemel Hempstead Corporations, and the Harrow-on-the-Hill Urban District Council. The opponents were represented by Mr. RAM, K.C., Mr. TALBOT, K.C., and Mr. COURTHOPE MUNROE.

Counsel's Opening Speech.

Mr. FITZGERALD, in opening the Bill, said the promoting Companies numbered 20, and represented in all 22 gas undertakings—the British Gaslight Company making the proposal in respect of three of their works. There was opposition in regard to six of these. In each of these cases the test-burner was the argand No. 1; and the quality of the gas varied from 14 to 16 candles. In the case of Bournemouth, the Act prescribed that the burner should be Sugg's argand No. 1, or such other burner as should be approved by the Board of Trade; and it was provided what chimney was to be used. There was the clearest evidence on the face of the Statute as to what Parliament intended—that the burner should do justice to the gas. The only speciality, if it might be called a speciality, in the companies was that the Cambridge Company were supplying 16-candle gas. The others varied from 14 to 15½ candles. When he opened the original case, he said that when in 1868 the Referees prescribed for the London Companies the "London" argand No. 1, it was the best burner that was then known for testing pure coal gas of 16-candle quality; but he also said that, as early as 1890, Mr. Harcourt, who was Senior Referee, had stated publicly that the objection to testing the London gas by this burner was that it exaggerated any deficiency in the gas. If the deficiency was a quarter-of-a-candle, it might have exaggerated it so that it appeared as half-a-candle, and so on. Since 1868, various changes had taken place in the manufacture of gas, and the No. 1 argand was not as satisfactory for testing 16-candle straight coal gas as the No. 2 burner which the Cambridge Company now wished to substitute. The Faversham Company supplied 14-candle gas, the Reading Company the same, and at Harrow it was 15 candles.

Mr. RAM said he was going to submit that, with regard to Cambridge and Bournemouth, there was no case made out, and they ought to be struck out of the Bill. Their test-burner was the No. 1 argand, or such other burner as the Board of Trade might approve. They could go to-day to the Board of Trade, not necessarily for a Provisional Order, and by direction of the Board they could use the No. 2 or any other burner. He asked the Committee to say that the preamble was not proved in respect to these two Companies, because it was provided in the preamble: "Whereas the objects aforesaid cannot be attained without the authority of Parliament."

Mr. FITZGERALD contended that there was absolutely nothing in the point. If they could not do the thing themselves, and could only do it through the intervention of a Public Department, there was no reason at all why they should not come to Parliament. It had been held over and over again that the powers vested in a public department did not prevent them coming direct to Parliament and applying for a Bill.

Mr. William Cash's Evidence.

Mr. William Cash gave evidence in support of the Bill, and handed the Committee a table showing all the relevant statistics with reference to the Companies. Bournemouth were a sliding-scale Company; but only a portion of their capital was subject to the sliding-scale. The price charged by them for gas had been gradually reduced from 3s. 6d. per 1000 cubic feet in 1897 to 2s. 7d. The last reduction was made in the ordinary course of business, quite apart from any consideration with regard to this Bill. The Company had built thoroughly up-to-date works at a cost of £100,000. It was a commercial undertaking, and had great competition with electric light for power and heating; so that it was in the best interests of the Company and the consumers alike that the gas should be sold at the lowest possible price. For a

great number of years they had not paid the additional dividend they were entitled to under the sliding-scale. A reduction of a penny per 1000 cubic feet amounted to nearly £3000. In reference to the maximum capital, the maximum dividend being paid any saving must benefit consumers; and under the sliding-scale, it always had been their policy to give the benefit to the consumers. With regard to Cambridge, the maximum price was 4s., and they were charging 2s. 8d. They were paying their maximum dividend. Both the Bournemouth and the Cambridge Companies had inaugurated a scheme of co-partnership, which was based on the price of gas. In Bournemouth, there was a very large proportion of incandescent burners; flat-flame burners being almost a negligible quantity.

Replying to Mr. RAM, witness said that Bournemouth was a Gas and Water Company; but there were no separate accounts kept. He agreed that if the burner was objected to, they could apply to the Board of Trade for any burner they pleased; and that if the Board of Trade approved, they would be at liberty to use it. But the Company had considered this matter, and were of opinion that the most convenient procedure was by the present Bill.

Mr. RAM: Good as the profit-sharing scheme may be, the amount which the workmen get comes, in the first instance, out of the pockets of the consumers?

Witness: In one sense it does; but I do not think there can be any question but that it inures to the benefit of the consumer.

In reply to Mr. FITZGERALD, witness said the Bournemouth circumstances were special in respect that while they had a small amount of sliding-scale capital, they had a larger amount of maximum-price capital. On the sliding-scale capital they did not divide the amount they were allowed to by Parliament; and the consumer had been getting a larger share than that to which he was entitled. The Cambridge and Reading Gas Companies were both paying maximum dividends; so that the whole of the reduction would go the consumers.

In answer to the CHAIRMAN, witness said the Bournemouth Gas and Water Company had one profit-and-loss account and one capital account. The profits from water went to the common fund. He was aware of another case where the company had separate accounts, and yet the final profit was brought into a common fund.

Mr. Charles Carpenter's Evidence.

Mr. Charles Carpenter said that he confirmed the evidence he had given on the No. 1 Bill. When the No. 1 burner was prescribed for the London Gas Companies in 1868, he believed it was as good a burner as could have been adopted. It was not far out. But there had been changes since then; and one of them was in the composition of the gas. Gas of an equal illuminating power produced at a low temperature had a somewhat different composition. There was more hydrogen and less marsh gas than was the case 30 or 40 years ago. Hydrogen burned with a very small flame indeed, and the defects in the argand burner were accentuated. More air was allowed to rush upwards to burn the gas, with the result that the No. 1 had even greater defects nowadays with 16-candle gas than it had at the time it was prescribed. For the accurate testing of gas, the No. 2 burner was better than the No. 1, quite independent of these ranges in composition. This was very important in the case of Cambridge, because, under their Act, there would be a penalty for any defect; whereas in London there was an allowance of half-a-candle.

In reply to Mr. RAM, witness agreed that he had previously said that with 16-candle gas it made no difference whether the No. 1 or the No. 2 burner was used.

Mr. RAM pointed out that, prior to 1868, the London Gas Companies were supplying gas of 12 candles with the Sugg-Letheby argand. In that year, the City of London obtained parliamentary powers to raise the candle power to 14; and after 1870, it was to be 16. The Company asked for the burner that would give the best light; and they got rid of the Sugg-Letheby burner, and took the "London" argand No. 1.

Re-examined by Mr. FITZGERALD, witness said that, so far as he knew, there was nothing to connect the illuminating power and the burner in any way. At that time, the authorities thought that the higher the illuminating power the better; but it was found that the richer gas was more expensive. A more expensive coal had to be used, which made the unit of light more costly to produce. Owing to the change in the manufacture of gas, the No. 1 burner was not as accurate now as it was then.

The CHAIRMAN said he understood Mr. Ram's point to be that Cambridge had 16-candle gas prescribed; and if the argand No. 1 was good enough for that, why did they want the No. 2?

Witness said 16-candle gas meant gas of about 16½ candles; and as long as they had that, there was not much in it. But as soon as they got down to the border line, the trouble began. The excess of air rushed into the burner, and down would go the light. What he called 16-candle gas was what the gas companies really provided—16½ candles; and with this quality there was no difference. But when they came down to the scientific 16 candles, its illuminating power was unduly reduced by the excess of air. He believed that the uniformity which would result from the adoption of the No. 2 burner would be of great value. In order to know the correct volume of gases, the temperature and the pressure of the testing-room had to be taken into consideration; and there were other matters which the Board of Trade could not prescribe. This was the unfortunate part of that Department's authority. They could prescribe the burner, but not the regulations. These regulations were given in London by the Gas Referees under their powers.

Mr. RAM: Why should this not be done by General Act, instead of piecemeal by different companies?

Witness: Unfortunately the Government and the Board of Trade were so busy that they could not take up an Act. That is why the gas companies are doing it themselves. Sir George Livesey took up the matter; and this was their reply.

Mr. FITZGERALD: We would have been only too glad to have been saved all this expense.

This closed the case for the promoters.

The Case for the Opposition.

Mr. RAM said he did not propose to call any evidence. The Bournemouth Company were supplying 15½-candle gas, and the Cambridge

Company 16-candle gas. With regard to the latter Company, he submitted that there was no necessity for the change of burner. Under their Act, the Company were able to go to the Board of Trade and get the No. 2 burner if they wanted it. Had they chosen to do this, there would have been a local inquiry, and far less expense would have been incurred than in coming to Parliament. The alteration was utterly useless and unnecessary, and would result in no practical advantage. Part of the promoters' case was that they wanted uniformity of testing; but if every company in the Bill were given the burner, there would not be uniformity. Unless there were some provision for an adjustment in each case according to the circumstances, a burner would be imposed upon the consumers which in each different case would produce a different effect, causing greater hardship in some cases and smaller hardship in others. If the Committee decided to pass the Bill, he would ask for the nominal candle power to be raised in some cases, and in others the price should be lowered; or he would ask for a clause that there should be an adjustment made so as to meet the fairness of each case. The main point underlying everything was that, if the companies were given the advantage they were seeking, there ought to be a compensatory advantage given to the consumer.

Mr. FITZGERALD called attention to Mr. Ram's point with regard to the illuminating power of the burner under the Act of 1868; but so far as he could see, there was nothing whatever to be inferred from that Act. There was no evidence upon it; but he contended that the change in the illuminating power of the gas had nothing whatever to do with the provision as to the burner.

Mr. RAM: They were given the burner; and in the same Act the candle power was increased.

Mr. FITZGERALD said the provision as to the burner came under quite a separate heading.

This closed the case on No. 2 Bill.

THE No. 3 BILL.

This Bill is promoted by the following Companies: Aberdare and Aberaman Consumers' Gas Company, Bath Gaslight and Coke Company, Exeter Gaslight and Coke Company, Godalming Gas and Coke Company, Guildford Gaslight and Coke Company, Hampton Court Gas Company, Ipswich Gaslight Company, Mid-Kent Gaslight and Coke Company, Plymouth and Stonehouse Gaslight and Coke Company, Richmond Gas Company, Romford Gas and Coke Company, Southampton Gaslight and Coke Company, Walton-on-Thames and Weybridge Gas Company, Weston-super-Mare Gaslight Company, and Wolverhampton Gas Company.

The Case for the Bill.

There was opposition from the Bath, Exeter, Guildford, and Southampton Corporations, and the Romford Urban District Council. For these authorities Mr. RAM, K.C., Mr. TALBOT, K.C., and Mr. MUNROE appeared.

Mr. FITZGERALD very briefly introduced the Bill, pointing out that there was no opposition with regard to ten of the companies. The Bath Company were supplying gas of 14-candle power, Exeter 14-candle power, and Romford and Guildford 15-candle power. He was not aware of any special feature with regard to any of them.

Mr. William Cash placed before the Committee a table giving statistics relating to the companies. In the case of Bath, he agreed that the prescribed burner was Sugg's argand No. 1, which, with the consent of the Bath Corporation, might be altered to any other burner prescribed and approved by the Board of Trade.

In answer to Mr. FITZGERALD, witness said this provision contemplated that an alteration of the burner was to be made from time to time. The Company were now asking for this alteration; and the Corporation had the opportunity of coming before Parliament and objecting to it if they thought fit.

Mr. Charles Carpenter's evidence was to the effect that what he had already said applied equally to this Bill.

Mr. RAM, in addressing the Committee, said the two cases which stood out from the others were Southampton and Bath. In the case of Southampton, they had the provision, as in the Bath case, with regard to the application to the Board of Trade. The prescribed burner was to be any burner for the time being approved by the Board of Trade, or if there were no such burner, then it was to be Sugg's "London" argand No. 1. It was even more than this, because it was provided that if at any time the Board of Trade approved a certain burner, it became the burner in the constituency. Without further ado, the burner automatically became the test burner. In the case of Bath, the burner was to be Sugg's "London" argand No. 1 or, with the consent of the Corporation, any other burner prescribed or approved by the Board of Trade; and the Corporation of Bath were there before Parliament to refuse their consent. In Richmond, which was also in this Bill, there was a similar provision; but there was now a new clause relating to Richmond which provided: "Nothing in this Act contained shall, unless otherwise agreed between the Mayor, Aldermen, and Burgesses of the Borough of Richmond (Surrey) and the Richmond Gas Company, apply to, or affect, the Borough of Richmond." In the case of Bath, they were now trying to override the consent of the Corporation, and take away the power that had been given to them.

Mr. E. C. Cooper (of Messrs. R. W. Cooper and Sons, Parliamentary Agents to the Bill) was called to give evidence with regard to the clause which had been given in the case of Richmond. He said the Richmond Corporation and the Richmond Company had an agreement by which the Company were entitled to use the standard burner No. 2. But, in addition to supplying the Borough of Richmond, the Company also supplied a considerable district outside; and the agreement related only to the borough. It was necessary, on this account, that they should be included in the Bill.

In reply to Mr. RAM, witness said that there was also an agreement between the Corporation and the Company that the price to be charged in respect of public lamps was to be £3 instead of £3 5s., and the

Company were to furnish and fix flat-flame burners suitable to the quality of gas supplied.

Re-examined by Mr. FITZGERALD, witness said that, under the Gas-Works Clauses Act, the price fixed for gas to the ordinary consumer did not apply to public lighting. If the Local Authority and the Gas Company did not agree as to the price for public lighting, it was to be settled by arbitration; and to avoid arbitration proceedings, the price was agreed between them.

Mr. RAM argued that the agreement was made as the result of the Act of 1901, whereby the Company and the Corporation of Richmond might agree to use other testing apparatus. The Company got the advantage of using the No. 2 burner, and the Corporation obtained the advantage of having 5s. off every one of their lamps; and they secured for the consumers the further advantage of having free burners supplied to them when a change of burner was necessary. These were the circumstances under which Richmond consented to the change. Bath to-day were in the same position; but the promoters were seeking to take away their veto.

Mr. FITZGERALD stated that the agreement was come to two years ago, wholly independent of the promotion of this Bill.

THE COMMITTEE'S DECISION ON ALL THE BILLS.

After the luncheon interval,

The CHAIRMAN delivered the decision of the Committee as follows: The Committee have arrived at the unanimous conclusion to pass the preambles of all these three Bills; and it will be sufficient as to the preambles to say this. But it is perhaps necessary to say a word or two more as to the case made against the Bills. In the first place, the Bills are promoted by 43 companies in all, of whom less than half are opposed by local authorities. The Bills as to the unopposed companies therefore must be taken as going without opposition. As regards the opposition, it really is not against the principle of the Bills at all, because it is common ground to both sides, and to all parties, that the burners hitherto in use have been defective, and that the burner proposed to be established as the standard is, if not perfect, yet as perfect as is at present known for achieving the object of Parliament in giving what they certainly intended to give—that is, a light equal to the light of so many candles. The question between the two parties is whether the burner, which I call a measure (several metaphorical descriptions have been given, but I like the practical word "measure," because it is a measure of the luminosity quite as much as an ordinary gas-meter is a measure of the quantity of gas), was made as much the cardinal point in the bargain as the standard of light. My opinion is that, as the standard of light—and I think that all will agree—Parliament certainly intended to give a light equal to the prescribed number of candles. They pitched, unfortunately, on an instrument which was thought at that time by all the parties to the bargain, including Parliament itself, to be accurate. It turned out not to be an accurate one, and it necessitated the supply, to perform the statutory obligations, of a higher quality gas than the parties at the time thought they were prescribing. However, it was enacted; and for a series of years gas was supplied which cost the companies more. When a more accurate instrument came to be invented, they were able to rectify the difficulty; and a saving was undoubtedly effected by the companies by this operation. This saving, it is suggested, will be made at the expense of the flat-flame consumers, who will get—and it is, perhaps, not absolutely disproved—a little less light (though some of the witnesses said it will be imperceptible) than the prescribed number of candles would entitle them to. Some consumers have contended that, because the companies make a saving or a profit, therefore the consumers ought to be compensated. But the Committee unanimously are unable to see this, and to recognize that the fact of the burner, which was supposed to be perfect and has been found to be imperfect, having perhaps done a wrong to somebody in practice, gives any right to compensation further than the legislation applicable to gas companies will automatically give to them. The legislation affecting gas companies has been a great deal more strict, as regards both the application of capital and profit, than legislation affecting local authorities and municipal corporations, who have a much greater latitude. It has been suggested that the savings might be misapplied, although at the same time wrong-doing was distinctly disclaimed by the petitioners as a charge against the directors of the gas companies. Anyhow, it is quite clear, as regards the maximum-price companies, that the whole of the savings must go, if legally applied, to the benefit of the consumers. The hardest case of all, as regards the consumers, was that of the Mersey Docks and Harbour Board. No doubt they did, on their evidence—rather exaggerated, we think, by their fears—show, or at all events endeavoured to show, that they would incur damage and loss larger than would be compensated by the savings which would be effected by the Company, and which would, they being a maximum-price Company, have to be given to the consumers. The Mersey Docks and Harbour Board being the largest consumer, a reduction, we find on calculation, of 1d., would be equal to about £950 a year; and the expected reduction of possibly 3½d. would give a reduction in the case of the Board of nearly £4000 a year. These figures may not, perhaps in the future work out exactly; but we think, at all events, making an abatement for the exaggeration of their fears, and taking into consideration all that they have put before us as regards any loss and inconvenience they may sustain, they will be practically compensated by the reduction which may be expected from the Company, who appear to have conducted their affairs with honesty and fairness towards consumers as well as towards shareholders. At all events, the contrary is not alleged against them; and we are disposed to give them credit for that. All changes are inconvenient in almost every line of life to somebody or other; and this change may perhaps alter the amount of compensation, or rather may differentiate the amount of compensation, that would be given to some consumers as between them and others. But it is not competent for us, as a Parliamentary Committee in dealing with a gas company, to distinguish between one set of consumers and another. The incandescent burner people would perhaps be greater gainers than any other class of consumer; but we

The CHAIRMAN thought the clause with regard to Richmond was quite justified; and he was going to ask whether the promoters would give Bath a saving clause.

Mr. FITZGERALD did not think it would be at all reasonable, because the positions of the Bath and Richmond Corporations were entirely different. As to Richmond, the Corporation were not 25 years ago in possession of an electrical undertaking; but to-day they were, which altered the condition of things.

The CHAIRMAN remarked that it was a point whether it would be just that the Committee should override this without the consent of the Corporation. He did not think, *prima facie*, that they ought to take away the power of the Corporation by a General Act such as this.

Mr. FITZGERALD said that if the Committee came to the conclusion on the preamble of the Bill that, with regard to the other Companies in the Bill, the No. 2 burner ought to be adopted for testing the gas, there was absolutely nothing in the circumstances of Bath which prevented the burner being applied and doing justice there, as with the other Companies.

Mr. RAM said the Corporation had never been asked to consent to a change of burner.

cannot go into, and differentiate and apportion, the respective profits and savings which would, by distribution in the shape of reduction in price, accrue to the different consumers. For these reasons we think that the Bills should be passed, and we should not be disposed to entertain applications for compensation.

Mr. BALFOUR BROWNE said he was not quite sure that he understood one portion of the Committee's decision. The calculation had been made that 3½d. would give between £3000 and £4000 a year to the Mersey Docks and Harbour Board.

The CHAIRMAN said this was not absolutely proved; but it might go as high as that.

Mr. BALFOUR BROWNE asked if it was the intention that the Company should put this money in their pockets at the expense of his clients.

The CHAIRMAN: Certainly not, it will be applied in the reduction of price.

Mr. BALFOUR BROWNE: Is it your intention that they should reduce the price by this amount?

The CHAIRMAN replied that they were bound to, by the automatic operation of the Gas Act.

Mr. BALFOUR BROWNE remarked that they had dealt with the automatic reduction of price; but this did not touch the question which was submitted to the Committee. He only wanted to know whether it had been dealt with—the enormous expense that the Mersey Docks and Harbour Board would be put to in altering their engines and in increasing again the lighting of their sheds and quays. It might mean £2000 or £5000 in each case; and if it was found to be so—that this was the loss to them—was it the decision of the Committee that they were to bring up a clause and have compensation for this?

The CHAIRMAN answered that the Committee had taken this matter into consideration; and they thought the fears of the Harbour Board were exaggerated. But supposing there was any little alteration of the pipes or engines, the compensation which the working of the Act would give, and the reduction of price consequent upon it, should be ample solution of that question.

Mr. BALFOUR BROWNE pointed out that they would not be compensated for the capital loss; and the question of a reduction in price was entirely in the hands of the Company.

The CHAIRMAN said the arguments for compensation had been very powerful, and the Committee attached weight to what had been said; but they had considered everything.

Mr. RAM then asked whether the decision applied to Bath.

The CHAIRMAN replied that it did. There was an exceptional position; and there was no doubt the Corporation had a right to be heard. They had had this hearing before the Committee; but they had not the right of absolute veto, and they could not override the Board of Trade.

Mr. RAM: The operation of the powers of the Board of Trade could only come into action at all if the Corporation consented.

The CHAIRMAN agreed. He thought that Mr. Ram's view was very forcible; but it was not expedient from the point of view of policy that the Corporation should have the right of saying "No" for ever to any alteration which the Company proposed. The Corporation had been heard; and the Committee had come to the conclusion that, in this case, they should decide in favour of the change.

Mr. RAM then said that, on the decision, there were a number of clauses they were anxious to bring up; but some of them were excluded by the decision. There were other clauses, however, which they asked to be allowed to place before the Committee.

Mr. FITZGERALD, having perused the clauses, said that if they were adopted there would be nothing left in the Bill. The whole question that Bath had desired to raise was on the preamble, and now, after the decision on the preamble, they were seeking, by bringing forward clauses, to cut out of the Bill clauses 4 and 5—the effective clauses.

Mr. RAM also indicated that there was a clause in regard to Liverpool dealing with calorific power.

Mr. FITZGERALD contended that the question of calorific value was entirely outside the purview of the Bill, and had not been suggested throughout the controversy.

The CHAIRMAN: I certainly do not think we should insert a test for calorific power. This is entirely a new move in legislation. A test for calorific power is a new thing. As a matter of general legislation, it is very expedient; and I hope some day we shall arrive at that.

Mr. FITZGERALD said the opponents might just as well ask the Committee, because they were dealing with gas companies, to put in a clause that every gas company should be bound to sell its undertaking within six months.

The CHAIRMAN: With regard to the clause as to calorific power in this Bill, which relates not to the whole kingdom, although it is going

to be a sort of step in general legislation relating to gas, it asks us, for the first time in the history of legislation, to prescribe what shall be the calorific test of the gas supplied by all these companies.

Mr. RAM said he was prepared to argue the matter at the right time.

The CHAIRMAN: No; I think it is outside the Bill. The evidence that we have gone into, which is within the issue (as recognized by both parties) raised by the Bill, has not gone into the question, which is a scientific one, of what shall be the calorific test for gas. It is too large a question.

Mr. RAM said the matter was raised on their petition, and was one on which they were entitled to be heard; and he submitted that it was within their competence to bring up any clause. Then the Committee could say whether it met with their approbation or not.

The CHAIRMAN: No; I think it is too cardinal a matter. It is a question which ought to have been brought up before.

Mr. FITZGERALD said a clause had been handed to him for the protection of the Liverpool Corporation. It began by raising the question about the proportion of carbonic oxide in gas, which had nothing whatever to do with the Bill.

The CHAIRMAN: I do not think we are going to decide any of these scientific questions, when we have not had evidence upon them. It is a new issue. All these are new issues altogether.

Mr. FITZGERALD said the proposal with regard to Liverpool was not a matter which could be properly raised on the Bill. It was proposing to alter the general law of gas supply with regard to the amount of carbonic oxide which might be present in the gas.

The CHAIRMAN thought the Committee were not competent to deal with it.

It was eventually decided that the Committee would consider clauses on Monday (yesterday).

Trading Undertakings at Mansfield.

Satisfactory reports have been issued of the past year's working of the Mansfield Corporation gas, water, and electrical undertakings. As to the gas-works, the receipts from sales were about £750 more than in the previous year; while residuals realized about £1050 more. The expenditure on the manufacture of gas was over £1000 more; this being entirely on account of repairs and maintenance of works and plant. The price of gas has been reduced 1d. per 1000 cubic feet; and to slot-meter consumers the discount has been increased from 1d. to 1½d. per shilling collected. The Committee have decided that the sum of £1500 be paid over to the general district rate at the present time; and the question of any further payment will be considered in October. In connection with the water undertaking, it is reported that the net profit is about £300 more than last year. The Committee have decided to pay over the sum of £2400 to the general district rate, and to appropriate the balance of £154 to the reserve fund. The accounts of the electricity undertaking show a net profit of £135. The Committee have decided to pay over the sum of £100 to the general district rate, and to appropriate the balance of £35 to the reserve fund.

Brixham Gas Company.—It was decided at a meeting of this Company last Thursday (Mr. W. A. Shultz presiding), to raise £5000 on debentures and issue 250 additional ordinary shares of £10 each, for the purpose of laying down electric lighting plant in the town.

Reduction in Price at Leek.—At the meeting of the Leek Urban District Council last Tuesday, it was recommended that, as from the 1st inst., the price of gas to ordinary consumers should be reduced to 2s. 10d. per 1000 cubic feet, subject to the usual discounts; and that in the case of prepayment meters, the discount be at the rate of 5d. instead of 3d. per 1000 cubic feet. An objection was raised by one member, on the ground that, as the gas undertaking belonged to the town, the consumers should pay a reasonable price for their gas; the reduction proposed being equal to an additional rate of 3d. in the pound. Eventually, however, the recommendation was adopted unanimously.

Explosion at the Oswaldtwistle Gas-Works.—An explosion and fire occurred at the Oswaldtwistle Urban District Council gas-works on Monday of last week—resulting in burns and shock to three men, and destruction of property of an estimated value of £500 (which is fully covered by insurance). A man named Drousefield, it appears, was engaged in testing the station-meter on behalf of a firm of manufacturers; and from some cause which is at present unexplained an escape of gas became ignited, and the resultant explosion wrecked the house and caused a fire, which, however, was promptly got under. The men who were in the meter-house at the time declare that there was no light there. Some inconvenience was naturally caused to consumers for a short time; but this was soon put right. The latest reports state that the injured men are making satisfactory progress towards recovery.

Gainsborough Gas Undertaking.—The profit and loss account for the year to March 31 was presented at last week's Council meeting by Mr. Cooper, J.P., the Chairman of the Gainsborough Gas Committee. The receipts were £14,736, and the expenditure £14,038—leaving a profit for the year of £698. For prompt payment of accounts extra discount has been allowed, amounting to £157 more than last year. Coal cost £548 less, and renewals of mains and service pipes were considerably lower than the previous year. The receipts from residuals show a decline of £128. The quantity of gas made was 82,689,000 cubic feet—a decrease of 3,131,000 cubic feet. The make of gas per ton of coal carbonized was 11,314 cubic feet, an increase of 62 cubic feet per ton—more gas having been obtained from each ton of coal than has been done before. Gas-cookers still continue to increase in popularity. The number in use at this date is 946, an increase of 94; and more consumers are being added who are using gas for lighting purposes. The number of consumers is 2752—an increase of 168 as compared with last year. The Committee are satisfied that, considering the state of trade, the result of the past year's working was very satisfactory.

MISCELLANEOUS NEWS.

EUROPEAN GAS COMPANY.

Administrative Changes.

The Annual Meeting of this Company was held last Tuesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES in the chair. Before commencing the proceedings, the Chairman read a letter from Mr. R. S. Gardiner (one of the Directors), who asked that his absence might be excused, owing to the serious illness of his wife. Words of sympathy were expressed by the Chairman.

The SECRETARY (Mr. W. B. Brady) read the notice convening the meeting, and also the Directors' report and the accounts for the year. The report was as follows:

The Directors are gratified to be able to report that, with the exception of Havre (where there has been a slight decrease of $\frac{1}{2}$ per cent.), all the Company's stations show an increase in rental, amounting, in the aggregate, to nearly 2 per cent., although the quantity of gas made is practically the same as last year.

The cost of coals has been less during the year under review; but the return from coke has also been less. The major portion of coke sold by the Company is used for domestic purposes, and when, as last year, the winter proves mild, the value of this residual is much depressed.

The prices obtained for tar have, on the average, been practically the same as those of last year; but sulphate of ammonia shows a slight improvement.

The rate of exchange ruled exceptionally high during the year; so that the loss under this heading shows an unusual increase.

The profits for the year enable the Directors to recommend the payment of the same dividend and bonus as last year, free of income-tax—viz., a dividend of 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, less the interim dividend of 10s. and 7s. 6d. per share respectively paid on Feb. 1 last; also a bonus of 2 per cent. on all shares, according to the amount paid thereon, subject, however, to a deduction for French stamp and transfer duty of 1s. 1d. per fully-paid share, and 10d. per share £7 10s. paid, in respect of all shares held in France.

The Directors have to record certain changes in the Board of Management since the last general meeting. Mr. H. E. Jones, so well known to the shareholders, has been appointed Deputy-Chairman. Mr. W. Williams, who has acted for many years as Secretary and General Manager, has been elected to a seat on the Board as Managing-Director. Mr. N. E. B. Garey has felt it desirable to relinquish his position as Director, after having been connected with the Company, as Auditor and Director, for 34 years. As already notified, Mr. A. T. Eastman has, subject to the confirmation of the shareholders, been appointed to fill the vacancy. The vacancy in the auditorship caused by Mr. Eastman being nominated on the Board, has been temporarily filled by the appointment of Mr. H. J. Luff.

Notice has been given that two Directors (Messrs. H. E. Jones and R. S. Gardiner) and both Auditors (Messrs. J. Reeson and H. J. Luff) retire from office at this meeting; but, all being eligible, they offer themselves for re-election.

The CHAIRMAN, in addressing the shareholders, said he would briefly allude to the present and prospective position of the Company, which he could assure the shareholders was most satisfactory. The notice convening the meeting referred to recent changes in the administration of the affairs of the Company. It would have been noticed that Mr. H. E. Jones had been elected Deputy-Chairman. This came about consequent on an accident he (the Chairman) met with in Paris on March 24, in the course of a visit to the stations, and which prevented him from attending the meetings of the Board for several weeks. His friend and namesake very kindly acted for him during his absence; and to him he now, in the presence of the shareholders, tendered very hearty thanks. This also led him to consider the advisability of appointing Mr. Williams as Managing-Director, in recognition of the valuable services he had rendered to the Company for the past 32 years, and especially during the last eighteen years since the death of Mr. Backler, the former Managing-Director. He felt sure the shareholders would approve of this action of the Board, and offer Mr. Williams their congratulations, hoping that for many years to come he would be able to continue his valued services, which had so much conduced to the prosperity of the Company. The appointment of the Assistant-Secretary (Mr. Brady) as the Secretary followed. The Board missed at their meetings Mr. Garey, who, after a connection of about 34 years with the Company, had now retired at a ripe old age. He (the Chairman) was sure the shareholders would all unite with him in wishing Mr. Garey good health and peaceful enjoyment during the remainder of his life. As to Mr. Eastman, who came before the shareholders that day for their approval to succeed Mr. Garey, he could only say that his personal knowledge of his abilities warranted him in recommending the confirmation of his appointment. He had been a painstaking colleague for twenty years as an Auditor, and also as a Director, in other gas undertakings. With the new Auditor, Mr. Luff, the Secretary of the Oriental Gas Company, he (the Chairman) had been connected for some years as a Director and Chairman of that Company; and he was fully cognizant of his abilities. Turning now to the accounts. Owing to the continued depression of gilt-edged securities, the Directors had written off £10,794 to meet the market value of their securities on March 31 last; and the dividends receivable had been debited in the profit and loss account with this sum. The Directors' report alluded to an aggregate increased revenue from gas of 2 per cent. They had obtained 3648 additional consumers during the year, making the number 83,261. The concessions averaged 25 years. Considerable improvements in the manufacture of the gas at several of the stations had been carried out in the course of the year. Of this, the Deputy-Chairman was more competent to deal with than he. A substantial and steady dividend, and an assurance from the Directors that there appeared nothing in the future to diminish the present prosperity of the Company, were more pleasing to a shareholder than wearisome details of dry statistics; so he would conclude his brief remarks by formally moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. H. E. Jones), in seconding, said that the

report contained, for the first time over a long period, references to several changes. Although their esteemed Chairman had passed over the matter very lightly himself, he (Mr. Jones) was bound to tell the shareholders that the Board were much concerned for a while after their Chairman met with an accident in Paris, which upset his health and condition somewhat considerably for a time. Then it was that their Chairman thought he needed to strengthen the Board; and he took the first step that led to the appointment, as Managing-Director, of their worthy colleague and able General Manager. Before passing to other matters, they must congratulate first very heartily their Chairman, and, secondly, themselves, on the fine, robust health he enjoyed, and which had enabled him to pull through what might have been to a weaker man a very serious accident. For the Board and for that gathering, he might say that they rejoiced exceedingly to again see Mr. Hesketh Jones in the chair, and again receiving his benign and friendly counsels. But feeling there was some possibility of not seeing quite so much of their worthy Chairman in the future as in the past, he (Mr. Jones) had been asked to accept the Deputy-Chairmanship; and this he felt to be a high compliment. So long as he was honoured with their confidence, any experience that he had would be entirely at their service. The next change was that their worthy and highly regarded colleague, Mr. Garey, felt advancing age; and on expressing a wish to be relieved of further responsibility and work, the Board could do no less than accept his resignation. They felt at the same time especial pleasure in being able to place in the vacant position (relying, as he was sure they might, upon the support of the shareholders) Mr. Eastman, who was connected with Mr. Garey, and in whom their late colleague had great confidence. Mr. Eastman having left the auditorship, they also felt very safe in obtaining the services of the Secretary of another Gas Company, who, from his very position, was a professional gas accountant, and therefore was better than an amateur. Regarding their works, he (the Deputy-Chairman) had lately been round them with their Managing-Director; and he could assure the shareholders that the condition they were in—the substantiality and the order in which they were kept—the method, and the success with which all their operations were proceeding, were extremely gratifying to him. At the present time, the gas industry was much exercised over carbonizing methods. Temperatures and machines were now being used for accomplishing their purposes which were never dreamed of a few years ago. The new methods were capable of producing higher results; and they had now at some of their works, and would in a short time have at all their works, some of the best and most up-to-date appliances. All their works were administered by gentlemen whom it was a real pleasure to meet. They were all industrious, careful, and right-minded men; and most of them had been in the service of the Company for many years. The Board were assured they were giving their best efforts and services to the Company. In London, they had in Mr. Brady and his staff exceptional qualification. They were all good linguists, and did their best in the Company's interests.

Mr. L. R. WILKINSON asked whether the small increase in the consumption of gas, of 2 per cent., was due to climatic conditions or to stagnation of trade. He would also be interested in knowing whether at any of the stations of the Company there were vertical retorts; and, if so, of what type they were.

The CHAIRMAN said, in reply to the first question, he must confess they had had stagnation of trade in Normandy. Respecting the second question, they had no vertical retorts.

The motion was unanimously agreed to.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, the dividends and bonus recommended in the report were duly declared.

Proposed by the CHAIRMAN, and seconded by Mr. HENRY C. SMITH, Mr. H. E. Jones was re-elected to his seat at the Board.

The DEPUTY-CHAIRMAN, in the course of his acknowledgment, when referring to the question as to vertical retorts, said they were only suitable for very large gas-works; while the whole of the works of the Company put together would only represent about one-half of the smallest of the London Gas Companies. Such a unit as a vertical retort would be in most of their works absolutely too clumsy. For the largest works, the Board had been considering them; but the Directors would like to have a little more knowledge of their success in different positions. Which system was exactly the best, they did not yet know. The policy of the Directors had been rather a conservative one; and they would not spend capital until they knew they had absolutely the right thing.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, Mr. R. S. Gardiner was re-elected a Director.

The DEPUTY-CHAIRMAN moved the confirmation of the appointment of Mr. Williams as Managing-Director. He remarked that the shareholders could not tell the advantage to a Board of having at their side, with the influence and position of a Director, a man who knew the whole of the business and position of the Company in to out; and in the whole range of his knowledge, he knew of no one more capable, or one who knew more thoroughly the European Gas Company, or who devoted himself more heartily to their service, than Mr. Williams.

Mr. SMITH seconded the motion; and it was cordially carried.

Mr. WILLIAMS said he should like to thank the shareholders very heartily for the honour they had done him in confirming the appointment of the Board. It came as the crowning-point in a career of some 32 years; and although the Deputy-Chairman had been good enough to say some handsome things when proposing his election, still the recognition by the shareholders of services in such a flattering manner as this—a manner especially flattering to an official—was to him most eloquent indeed. He should do everything in his power to justify this extension of confidence, and to devote himself to the utmost to further the interests of a Company which had been very successful in the past, and which, as far as they could see, would be equally successful in the future.

On the motion of the CHAIRMAN, seconded by Mr. SMITH, the appointment as a Director of Mr. Eastman was also confirmed.

Mr. EASTMAN expressed his appreciation of the honour.

The Auditors (Messrs. J. Reeson and H. J. Luff) were reappointed, on the motion of Mr. GOLDSMID, seconded by Mr. L. R. WILKINSON.

The DEPUTY-CHAIRMAN proposed a vote of thanks to the officers and staff at home and abroad. He said he had already spoken of the services rendered to the Company by their staff abroad. Regarding the London staff, Mr. Brady, who now occupied the position of Secretary, was one of the most accomplished linguists he (Mr. Jones) had ever heard. He had been many years in the service of the Company; and he knew his ambition and hope had been that he would some day become Secretary. This ambition and hope had now been realized. Both he and his staff were all men in whom the Board had the greatest reliance.

Mr. WILLIAMS seconded the motion, and confirmed all the Deputy-Chairman had said.

The motion was heartily agreed to.

The SECRETARY thanked the shareholders for the vote on behalf of himself and staff and all his colleagues abroad. It had, he said, been his privilege for 30 years to translate the report of the proceedings, and to send it abroad to his fellow-officers; and they had always expressed their appreciation of the shareholders' vote of thanks. He thanked the Deputy-Chairman for the kind words he had employed regarding himself (Mr. Brady). Whatever services he had rendered in the past, he should endeavour to continue in the future.

Moved by Mr. H. D. ELLIS, seconded by Mr. REESON, the Chairman and Directors were also heartily thanked for their services.

The CHAIRMAN'S acknowledgments terminated the proceedings.

DEVONPORT GAS-WORKS.

£6000 Required for Further Improvements.

An inquiry was held at Devonport on Friday by Mr. E. H. TULLOCH, M.Inst.C.E., a Local Government Board Inspector, respecting an application by the Corporation for power to borrow £6000 for the purpose of the gas undertaking.

The TOWN CLERK (Mr. R. J. Fittall) explained that when the Corporation took over the undertaking in 1902, the works were in a very dilapidated state; the Gas Company not having raised fresh capital for many years previous to that time. The retort-house was in a ruinous state, the purifiers inadequate, the gasholder capacity insufficient, and the coal-stores not large enough. Recognizing that extensive alterations and extensions would have to be made, the Parliamentary Committee gave the Corporation specific powers to borrow £100,000. This amount was founded on a rough estimate, and proved inadequate to carry out all the improvements then contemplated. The works now proposed had been rendered necessary, not only to bring them into a state of efficiency, but to cope with the increase in the output of gas, which was 33 per cent. more than when the Corporation took the works over. It was proposed to spend £1500 in providing new bench-fittings and mains and a new governor in the retort-house. It was estimated that the effect of this would be to save 2d. per 1000 cubic feet of gas made, or over £3000 a year. The existing yard mains were inadequate, and £550 was required for additional 24-inch mains. A further sum of £550 was needed for providing two exhausters of 60,000 cubic feet per hour. The present exhausters were working at their full capacity; and there was no stand-by in case of accident. New washers and scrubbers were wanted; and for these £2000 was put down. The existing plant of this kind was from 50 to 60 per cent. short of present requirements, and had been installed over 50 years. The last item was £1400 for workshops, messrooms, and lavatories—all urgently needed.

Mr. W. P. Tervet, the Gas Engineer and Manager, explained the plans which he had made of the proposed works.

Alderman TOZER, Chairman of the Gas Committee, said that, owing to the enormous number of complaints, especially during last winter, as to the quality of the gas, it had become absolutely necessary to effect further improvements. The saving of 2d. per 1000 cubic feet in the cost of manufacture which the Engineer estimated could be made would more than compensate for the outlay.

Mr. R. J. RENDLE, a former member of the Town Council, strongly opposed the application. He complained that the Gas Committee had pursued a wrong policy in the past, and had not spent money on what was really essential. A new retort-house should have been put up in the first instance.

The INSPECTOR suggested that it was a little inconsistent to say that the retort-house should have been put up in the first instance, and then to oppose it being done now.

Mr. RENDLE replied that he did not want any more money spent. He did not trust the Gas Committee.

The TOWN CLERK explained that the Gas Committee acted originally under the advice of the Engineers who were engaged by the Corporation in connection with the acquisition of the undertaking. When they realized that the £100,000 granted by Parliament for the improvement of the works was running out more quickly than they anticipated, they put the matter in the hands of their own Gas Engineer; and he carried out, so far as the money would go, such of the works as remained to be completed. Everything was by contract. Half the benches in the retort-house had been reconstructed out of revenue.

Mr. H. BANBURY, another ex-member of the Council, also opposed the granting of the loan, on the ground that £50,000 of the previous expenditure had been wasted.

Both the TOWN CLERK and Alderman TOZER denied that any such sum as £50,000 had been wasted.

Mr. Tervet, on being appealed to, said that the gasholder to which Mr. Banbury and Mr. Rendle alluded as unnecessary and a waste of money, was needed. If they had not got it, they would incur great risk of the town running short of gas.

Plans are to be drawn up at Colwyn Bay for the purpose of an application for the borrowing of money for the provision of purifiers, stoking machinery, and other plant and extensions urgently needed at the gas-works.

CARLISLE GAS PROFITS.

Some particulars with regard to the past year's operations of the Carlisle Gas-Works were given to the members of the Town Council last Tuesday by Mr. Buck, who remarked that, in the first place, they had been fortunate last year in increasing the amount of gas consumed. This was a corner that they had long wished to turn. In 1906-7, they sold 301 million cubic feet of gas; in 1907-8, 290 millions; in 1908-9, 289 millions, which showed a continued decrease; but in 1909-10, the consumption went up to 304 million cubic feet. This was very largely due to the early advent of last winter. The City Treasurer reported that the income for the year had increased by £1639, which was very satisfactory, and that public lighting showed an increase of £145. Residuals were again somewhat less. Coal had cost £1431 less, and oil £963 less. The item of repair and maintenance of works and plant showed a reduction of £1524; but the Committee would remember that last year the expenditure was quite abnormal, owing chiefly to the re-sheeting of a gasholder, which cost £1268. As he had pointed out, they had been decreasing their production for a number of years until last year; but he did not think they could look for any great advance unless some method was adopted for increasing consumption. The profit for the year amounted to £5513, after they had deducted a sum of £500 to be placed to a reserve fund. The Committee hoped that this £500 would not be placed to the unappropriated balance, but would really and truly form a reserve fund for future contingencies. It was desirable that the profits of an undertaking like this should be as nearly equal from year to year as it was possible to make them—that they should not hand over everything, and have nothing to fall back upon when an occasion for large expenditure should arise, as was the case the year before last. If they could equalize the profits by some system or other, it would be desirable. Dealing with the net profit of £5513 last year, he said it was true that coal cost £1431 less than in the previous year, and oil £963 less, and they had not to re-sheet the holder at a cost of £1268, which made £3693 less than they had to pay the year before. The profit of the previous year was £4064; but if they were to add to it this sum of £3693, which they had to pay less last year than the year before, they would have had a profit of £4157. Altogether, the undertaking had been very much more successful last year than it had been for many years previously, and compared with previous years last year's balance-sheet was very satisfactory. They had also an Engineer (Mr. Harold Bloor) who was in earnest in his endeavours to safeguard the interests of the Corporation in every possible manner.

DARLINGTON GAS UNDERTAKING.

Accounts for the Past Year.

The accounts of the Gas Department of the Darlington Corporation for the year ended March 31, a copy of which has reached us from the Engineer and Manager (Mr. Frank P. Tarratt), show that the sale of 337,117,596 cubic feet of gas produced £34,378; that residuals brought in £14,201; and that the total revenue was £50,964. The expenditure on the manufacture of gas was £19,763; on purification, &c., £796; wages came to £4087; repairs cost £3734; distribution, £5738; rates and taxes, £2266; management, £1540; and sundry items brought up the total to £39,064. The balance carried to profit and loss account was £11,900; and with the amount brought forward, there was produced a total of £17,223. This has been disposed of as follows: Liquidation of loans, £4208; interest on loans, £2659; transferred to district fund in aid of rates, £4500; transferred to reserve account, £824; net profit carried forward, £5033. The working statement shows that this sum is equal to 2s. 7·963d. per ton of coal carbonized, 3·243d. per 1000 cubic feet of gas made, and 3·582d. per 1000 cubic feet sold. The quantity of coal carbonized was 37,789 tons; and the make of gas 372,507,000 cubic feet, or 9857 cubic feet per ton. The residuals produced were: Coke and breeze, 18,357 tons 5 cwt.; tar, 351,422 gallons; ammoniacal liquor, 847,200 gallons—yielding respectively 11s. 5d., 18s. 8d., and 10s. 10½d. per ton. The capital invested in works and plant amounts to £185,976; being at the rate of £4 18s. 5d. per ton of coal carbonized, and 11s. per 1000 cubic feet of gas sold. The gross profit is 6·399 per cent. upon the total capital employed.

GAS PROFITS AT BURY.

Reporting to the Bury Gas Committee, the Auditors (Messrs. C. M. Merchant and Son) state that the profit on the past year's working was £20,132, compared with £18,469 for the previous year. Adding bank interest on the reserve fund, the amount available on the present occasion was £20,248. Interest and sinking fund charges came to £13,097, leaving a net profit of £7152, against £5721 for the twelve months before. Half of the sum available (£3576) has been transferred in aid of the rates; and the remaining half has been credited to the consumers in reduction of the price of gas for the current year.

When the minutes of the Committee which included this report came before the Town Council, Alderman Ashworth referred to the fact that the gas undertaking had made a profit considerably larger than the charges on the sinking fund. A long time ago, he said, there was a decided set against large profits being made by the Gas Committee, on the ground that practically these profits in a sense "robbed Peter to pay Paul." The profits were exclusively drawn from the consumers of gas; and in many instances large consumers were small ratepayers, while large ratepayers were small gas consumers. Consequently, an extra profit made on the charges for gas necessarily came to be most unequal and inequitable as between one ratepayer and another. In this case, by charging an extra price for gas and raising extra profit on it, they took money out of the pocket of the man who used gas more abundantly, and put it into the pocket of the man who was a large ratepayer and a smaller consumer of gas, because

half the profits on gas went to the relief of the rates. There was a time—not in these degenerate days—when, on principle, the Corporation refused to allow the Gas Committee to make large profits; and the sooner this principle was adopted again, the sooner would they get into a sound condition of working. He hoped the ratepayers who were suffering in consequence of the present arrangement would keep their eyes open.

Several members, on the other hand, spoke in support of the existing practice; and the minutes were then confirmed.

TIPTON GAS-WORKS RESULTS.

In his report to the Gas Committee of the Tipton Urban District Council on the working for the year to March 31, the Auditor (Mr. J. E. Rowley) points out that the result is a net surplus, after payment of interest and instalments on loans, of £1238, as against £272 twelve months previously—or the large increase of £966. The gross sales of gas for the year amounted to £14,267, against £13,730, or an increase of £537; and after allowing for discounts and adjustments for stock, the net sales were £13,545, compared with £13,061, or an increase of £484. All residuals show a slight increase; the net total realized from this source being £177 more. The net result of the trading was a gross profit of £6067, as compared with £5079 for the previous year, or an increase of £988.

From the manufacturing statement of the Engineer and Manager (Mr. S. O. Stephenson), it is seen that the coal carbonized amounted to 10,831 tons last year, and 10,548 tons the year before; the total make of gas being 126,368,000 cubic feet (or 11,667 feet per ton), against 118,343,000 cubic feet (or 11,219 feet per ton). Of this, 1,273,000 cubic feet, or 1 per cent., was water gas, compared with 86,000 cubic feet, or 0·7 per cent., in 1909. The quantity of gas sent out from the works was 126,445,000 cubic feet, against 118,365,000 cubic feet; and of this, 110,083,475 cubic feet was sold, compared with 105,289,350 cubic feet. The amount of gas lost by leakage, condensation, &c., was 13 per cent., against 11 per cent. for the year previous. An average illuminating power of 15·58 candles was maintained.

NEATH CORPORATION GAS UNDERTAKING.

A Good Year's Work—Price of Gas Reduced.

The report of Mr. R. A. Browning, the Gas Engineer and Manager of the Neath Corporation, on the working of the gas undertaking in the past financial year, has lately been presented to the Town Council. It shows that the gross profit was £5657; being an increase of about £1000 on the amount realized in the preceding twelve months. In the carbonizing department there was a saving of upwards of £300, due to improved methods of working, though 360 tons more coal were used. The sulphate plant which the Gas Committee recommended has proved a success, and it yielded an increased profit of more than £247, with the price of sulphate remaining about as before. After paying out of the gross profits £1516 for interest on loans, the sum of £2750 has been reserved for their repayment, £1000 has been allocated in relief of the rates, and £350 carried to the suspense account—leaving a balance of £5321 on the profit and loss account. In the course of his report, Mr. Browning said that for the last two years there had been a strong feeling from all classes of consumers that the price of gas should be reduced; and, in view of the favourable results of last year's working, he recommended a reduction to the ordinary consumers from 3s. to 2s. 10d. per 1000 cubic feet, and for the prepayment consumers an increase from 22 to 24 cubic feet of gas for 1d. The Council adopted the recommendation; and the reduction will be made after the current quarter. In addition to the £1000 handed over in relief of the rates, the charge for the public lighting has been reduced by 10s. per lamp, which represents £250; so that the rates for the next twelve months will be relieved by £1250.

SOWERBY BRIDGE GAS-WORKS EXTENSIONS.

At the Monthly Meeting of the Sowerby Bridge Urban District Council, the minutes submitted by the Gas and Electricity Committee contained a recommendation "that the final scheme and plans in respect of the proposed extension and remodelling of the Sowerby Bridge Gas-Works be approved, and that the Clerk be instructed to make application to the Local Government Board for sanction to borrow £15,900 for the purpose of carrying out the work."

In proposing the adoption of the minutes, Mr. J. W. Whiteley remarked that every Gas Committee elected since he joined nine years ago had been convinced that the gas-works would have to be remodelled and put on modern lines; while at the same time they knew that it would be a suicidal policy to go in for a large scheme involving expenditure of capital, until some of the loans on the works had been paid off. The scheme submitted, if carried out, was one the town would be proud of. They stood in the position of having paid off the loan of £61,906 borrowed for the purchase of the works, thus effecting a saving of £1390 per annum; and in September next year other loans would be paid off, saving an additional £605 a year. The £15,900 proposed to be borrowed would require £991 per annum for interest and sinking fund. They supplied a population approaching 30,000; and in the coming winter they would be put in a tight corner to give an adequate supply. With the proposed new plant, they would produce 1,000,000 cubic feet per day. The figures got out by the Engineer (Mr. A. W. Bissell), based on what was being done at other works, without being too sanguine, showed that they could effect a saving of £1100, or sufficient to

pay the interest and sinking fund on the capital outlay. The proposals included new retort-benches with regenerator furnaces and stoking machinery.

After some little discussion, the minutes were adopted; only one member voting against.

TYLDESLEY-WITH-SHAKERLEY GAS UNDERTAKING.

In his third annual report to the Gas Committee of the Tyldesley-with-Shakerley Urban District Council (dealing with the year to March 31 last), Mr. H. R. S. Williams, the Manager, states that the gross profit for the year is £2818, which, after deducting £2226 paid for interest and sinking-fund charges, leaves a net profit of £591 to be added to the reserve fund, which now amounts to £1913. The capital charges are at the rate of 1s. 0.4d. per 1000 cubic feet sold. The amount of loan capital still owing at the commencement of the year was £21,720, of which £1446 was paid off during the year, leaving a loan capital still owing of £20,274. The gross profit is at the rate of 12.97 per cent. on the capital employed.

There have been 76 new services laid, and 67 repaired. As to consumption, 42,366,900 cubic feet of gas were accounted for—an increase of 733,900 cubic feet, which is equivalent to the increased consumption by prepayment meters. The ordinary meters in Tyldesley show a decrease of 233,700 cubic feet; while the quantity of gas used for cooking and power has increased by 82,200 cubic feet. In Astley there was an increase of 388,000 cubic feet, to which the ordinary and prepayment meters have each contributed about equal shares. Mr. Williams regrets to have to report that the all-round reduction in the price of gas, which came into operation in July last, has not had the effect of stimulating the consumption. Had it not been for the prepayment consumers, the consumption would have been less than the previous year. The closing of certain cotton-mills, short time, and depressed state of trade have all had their bearing on the quantity of gas used. The amount collected from prepayment meters was £1310, an increase of £54. The gas unaccounted for again reached a high figure—11.1 per cent.; but the loss per mile of main (325,460 cubic feet) is quite average. Coal cost 9.77d. per ton less than last year.

A GAS AND WATER COMPANY IN DIFFICULTIES.

Position of the Meldreth and Melbourn Gas and Water Company.

In accordance with the circular issued by Mr. J. W. Barratt, the Receiver in the above-named Company, to which reference was made in the "JOURNAL" last week (p. 146), a meeting of the creditors was held at the offices on the 12th inst. to consider the financial position of the undertaking. Only four creditors were represented, and these met the debenture-holders, who had just come to a decision in regard to the concern.

Mr. BARRATT explained that he had asked the creditors to meet him to redeem the promise he made in February last. At that time, they decided to defer taking any action, in order to give him an opportunity of reconstructing or selling the undertaking. Since then he had been continuously in negotiation with various firms and companies for the sale of the business, but without result. Among others, the Royston Gas Company and the Royston Water Company (the nearest similar concerns to the Company) were asked to purchase either the gas or the water section of the business or both; but these Companies were not disposed to do so. Messrs. Corbet Woodall and Son were also approached; and Mr. Woodall went into the matter chiefly with the desire to help him (the Receiver). The firm sent their engineer to report; and, as a consequence, they wrote saying that they could do nothing in the matter, as it must be many years before the concern could be made to pay. Mr. Woodall, however, expressed the opinion that the Royston Gas Company ought to be able to utilize the Company's system for the supply of high-pressure gas to the district. But, as a matter of fact, the Company had already said they would have to lay so many miles of unproductive main that it would not pay them. The Coalite Company had been asked to take up the gas section of the concern; but, up to the present, no reply, one way or the other, had been received from them. Under all the circumstances, there were only two courses open. They must ascertain whether they could dispose of the undertaking to the local authorities; and if they could not, they must sell it by public auction. This course had been agreed to by the debenture-holders. In any event, he did not see, in the face of the opinions expressed by the gentlemen he had mentioned, that anything could be realized for the creditors; and he doubted if the debenture-holders would see their money in full. They had to face this mournful conclusion; and it was useless to hang on in the hope that something better might happen. At present the concern was being carried on by himself with the assistance of Mr. Hope. The financial position was that they were about £11 to the bad; and either Mr. Hope or he had to put their hands into their pockets to meet current expenses.

A CREDITOR suggested whether it would not pay Mr. Hope to buy the whole concern and carry it on.

Mr. HOPE pointed out that he sold it to the Company in the first place because he found it too large a thing to manage himself.

Mr. BARRATT said that Mr. Hope was not only the original vendor, but also the largest debenture-holder and the largest shareholder. He (Mr. Barratt) did not anticipate that Mr. Hope would allow the concern to get into other hands; but that gentleman was anxious for it to come into the market, so that it could not be said that he made a bargain with the Company when it was in difficulties. In conclusion, Mr. Barratt said the time had come when the Company must go into liquidation; and as there were no assets to pay a liquidator, he supposed the matter would be left in his hands to wind up the whole thing. He suggested the creditors had better leave the matter where it was.

A CREDITOR expressed the opinion that Mr. Barratt had done all he

could, and that the report of such a firm as Messrs. Corbet Woodall and Son could be accepted as final.

The other creditors concurred, and the meeting terminated.

SHEFFIELD CORPORATION WATER DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Water Department of the Sheffield Corporation (Mr. W. Terrey) lately presented to the Water Committee his report for the year ending the 25th of March. It shows that the total capital expenditure on the undertaking up to that date had been £3,517,186, compared with £2,433,518 at the corresponding period last year. The total income from all sources for the year was £170,891, or £2775 higher than that for 1908-9; and the expenses of maintenance and management amounted to £40,939. The net revenue was thus £129,952, or £2124 more than before. Deducting annuities and interest, £111,452, the net profit was £18,500—an increase of £1791. The sinking fund requires £12,473; so that the surplus for the year is £6027—an increase of £1560 compared with 1908-9. The value of the water supplied to the Health Committee without charge, for street watering, public baths, &c., was £3825. The special account relating to the sinking fund shows that the total sum provided out of revenue and appropriated for the repayment of debt to the 25th of March last, with earnings thereon, amounts to £261,278; and the available surplus on that date was £85,633.

The length of new mains laid during the year was 22 miles 534 yards; bringing up the total length to 527 miles. The average estimated population supplied within the statutory district, which covers an area of 128 square miles, was 505,034—an increase of 1.6 per cent. The Corporation also supply water in bulk to Rotherham, Doncaster, the Rotherham rural district, Handsworth, Chapeltown, and other outside areas, representing an additional population of 176,681; and making a total population of 681,715 supplied from the works of the Corporation. The number of houses served was 107,946, or an increase of 1401. The additional number of water-closets supplied was 3613, making a total of 55,960; and of baths 16,733—an increase of 1051. There are 4139 meters in use, against 4105 before. The total number of domestic and trade supplies on the 25th of March was 202,317; being an increase of 6252 new supplies laid on during the year.

The total volume of water sent from the works of the Corporation during the year, including the statutory compensation water to the Rivers Rivelin, Loxley, and Little Don, was 10,248,467,812 gallons. This was disposed of as follows: Trade purposes, by meter, 1,686,451,751 gallons; supplies in bulk to local authorities by meter, 262,949,500 gallons; statutory supplies to Rotherham and Doncaster, 947,288,000 gallons—total supply by meter, 2,896,689,251 gallons. For domestic purposes, including water supplied for extinguishing fires and waste, 2,442,537,679 gallons were delivered; making the total town supply 5,339,226,930 gallons. Adding the compensation water, 4,909,240,882 gallons, makes up the above-named total of 10,248,467,812 gallons, compared with 10,179,980,648 gallons in 1908-9. The average daily supply during the past financial year was 28,077,994 gallons, against 27,890,358 gallons in the preceding twelve months.

QUALITY OF CAMBRIDGE WATER.

Sterilization by Chlorine.

At a recent meeting of the Cambridge Philosophical Society, Professor Sims-Woodhead gave the results of his sterilization experiments on the water supplied to Cambridge. According to particulars contained in the current number of "Nature," sterilization by chlorine and chlorine compounds had given most startling results.

In a series of preliminary experiments, carried out in the laboratory, it had been found that one part of available chlorine to 2 million parts of water was sufficient to kill all non-spore-bearing bacteria of the *Bacillus coli* type, and therefore of the typhoid bacillus type, and probably also of the cholera bacillus type, within half-an-hour, even in the presence of the appreciable amount of organic matter that was necessarily added along with the cultures of *Bacillus coli*. Water to which had been added some hundreds of this bacillus per cubic centimetre was found after treatment to contain not a single living colon bacillus in 50, 60, and 100 c.c. (The unimportant spore-bearing organisms were not killed.)

Having obtained these results in the laboratory, a large experimental plant, capable of sterilizing more than 80,000 gallons of water per twelve hours, erected at Fulbourn, was used, and three sets of experiments were carried out—one being a preliminary series in which the apparatus was run at intervals as required; and then two series in which it was run for some twelve hours daily for more than a fortnight in each series. The standard of the Metropolitan Water Board, that there shall be no *Bacillus coli* in quantities of water less than 200 c.c., was taken as the one to be aimed at. In every case, however, quantities of 500 c.c. were examined; and after certain preliminary difficulties had been surmounted, water was obtained in which none of the observers could find the *Bacillus coli* in 500 c.c.

The amount of chlorine used in these experiments varied from one part in a million to one in six million parts of water. In the earlier experiments, where up to one part of chlorine in four million parts of water was used, it was thought necessary to neutralize any remaining chlorine by the addition of sodium bisulphite. After further experiments, where smaller quantities of chlorine were used, this addition was dispensed with, as the water treated, though sterile, did not retain the slightest taste of chlorine. It was suggested, of course, that water so treated might have some effect upon the human organism. All those who were working at Fulbourn drank considerable quantities of this water, and everyone who tried it accepted it as being a first-class drinking water.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The intimation that Mr. J. D. Smith, the Gas Engineer and Manager to the Stirling Gas Company, has received the appointment of Gas Manager to the Corporation of Belfast will, without doubt, be gladly received among his professional brethren. Mr. Smith has had a remarkably successful career since he first went to Stirling; and, indeed, his work before that, at Selkirk, was, though on a smaller scale, on a par with that which he has done since. He received the Stirling appointment in the summer of 1897, in succession to Mr. Peter Watson, who had held the office for many years. Just prior to Mr. Smith's arrival in Stirling, an attempt to municipalize the gas undertaking had failed—a step which was followed by the consolidation of the Company under an Act of Parliament of their own. This measure was obtained in 1898. Under the powers conferred by it, the work of remodeling the works was begun; and it was only completed about three years ago, when an installation of stoking machinery was introduced. For nearly ten years Mr. Smith was closely engaged in constructional work, all of which he designed himself. At the time he became Manager at Stirling, the Corporation were in no favourable mood towards the Company. Under Mr. Smith's management, the Company has been established on a basis much more secure than it ever occupied before; and so long as it continues to be managed as it has been, its prosperity is assured. Mr. Smith goes to Ireland with the heartiest good wishes of all who have had the pleasure of his acquaintance.

Matters in connection with the gas transfer at Kirkcaldy are assuming shape. On Tuesday a meeting of the Gas Committee of the Town Council was held, at which it was decided that the transfer should be proceeded with by way of arbitration. Mr. W. L. Macindoe, the Town Clerk and Secretary to the Gas Company, tendered his resignation as Law Agent for the town in the proceedings, and Mr. J. Prosser, W.S., of Edinburgh, was appointed in his stead. Mr. A. Silverthorne, of London, was appointed Arbitrator on behalf of the Corporation. It was stated that Mr. Macindoe had also resigned his office of Secretary to the Gas Company. The annual meeting of the Company was held on Wednesday, at which Mr. A. McPherson, the former Manager, presided. He said the shareholders would observe from the report of the Directors that the manufacture of gas was still increasing, although there was not such a huge increase as they had been accustomed to in recent years. They could not expect to have such large increases as in the past, seeing they had the opposition of the electric light; but when they had something like a million cubic feet increase in dull times, it showed that their business was a progressive one. In connection with the proposed purchase of the undertaking by the town, it was quite evident that there was no hope of any arrangement being come to. The Town Council evidently did not mean to make a tender; and the Directors considered that they had waited long enough. They intended to take immediate steps to force arbitration. The action of the Directors was approved. Last night a special meeting of the Town Council was held, to consider the appointments of Mr. Prosser and Mr. Silverthorne. Mr. J. Wright, the Convener of the Gas Committee, explained that though the Council agreed to make the appointments, it did not debar them from making a tender to the Company. The appointments were agreed to.

The Broughty Ferry Town Council had before them on Monday evening the annual reports upon the financial affairs of the burgh. Ex-Bailie Godfrey, the Gas Convener, said that during the past year the gas sold amounted to 60,773,620 cubic feet—an increase of 2,818,220 cubic feet. The revenue derived from gas was £8345. It would be remembered that last year the price was reduced 2d. per 1000 cubic feet. This accounted for the gas revenue being less by £158 than in the previous year. It was pleasing to state that last year's reduction in price benefited the consumers to the extent of £500. The quantity of gas sold during the past year was the highest in the history of the undertaking. The next highest was in 1902, when it reached 60,105,116 cubic feet. The receipts from the sale of residual products last year amounted to £2393, as compared with £2388. Coke sold at an average reduced price of 6½d. per ton, and realized £51 less; while tar and sulphate of ammonia realized £56 more. It was interesting to know that 89 tons of sulphate were made, which was equal to a yield of 29·85 lbs. per ton of coal used—the average yield for the past three years having been 29·25 lbs. The receipts from residual products were equal to 62·10 per cent. of the cost of the coal delivered into store. Stove-rents were increased by £7. The total revenue from all sources was £10,852. The expenditure upon coal showed a decrease of £289. During the year 6680 tons were carbonized, as compared with 7881 tons in 1902, when the make of gas was practically the same. The manufacture of gas cost £5947, as compared with £6031 last year—a decrease of £84. Distribution cost £792—an increase of £483, the increase being accounted for by large sums charged to revenue account in respect of new meters, stoves, &c., purchased during the year. The total expenditure was £7639, which left a credit balance of £3212. Annuities amounted to £436; interest to £964; sinking fund to £1381; and depreciation upon gas-stoves to £269—a total of £3050. The standing charges worked out at 1s. 0·4d. per 1000 feet of gas sold, as compared with 1s. 0·67d. the previous year. The balance at the credit of the net revenue account was £688. During the past year the retort-house roof had been partially renewed; and the works generally had been well maintained out of current revenue. A retort-house governor was installed, and various other improvements were effected out of revenue. It was proposed to reduce the price of gas by 1d. per 1000 cubic feet, making it, to ordinary consumers, 2s. 9d.; to prepayment consumers, 3s. 1d.; and to retain the price for motive power at 2s. 6d. The report was adopted.

The Town Council of Dunfermline this week unanimously advanced the salary of Mr. A. Waddell, their Engineer and Manager, by £50 per annum.

In presiding at the annual meeting of the Cupar Gas Company, Limited, on Thursday, the Hon. Sheriff-Substitute Honeyman said the Directors had again to report a successful year's business, and a gratifying feature was a yearly increase in the sale of gas. As compared

with the previous year, about three-quarters of a million cubic feet more gas was sold. The receipts from gas amounted to £3902, as against £3854. The Directors recommended dividends at the rate of 5 per cent. on the preference stock, and 37s. 6d. per share on the ordinary stock; and that £400 be allowed for depreciation. This was agreed to.

The Kely Gas Company, Limited, have paid a dividend of 6 per cent., and have reduced the price of gas—to ordinary consumers, from 4s. 2d. to 3s. 10d., to prepayment meter consumers from 4s. 5d. to 4s. 2d., and for power purposes from 3s. 9d. to 3s. 5d.

In the Burntisland Gas Committee, on Monday, it was reported that the output of gas during the past year was about 22 million cubic feet—nearly a quarter-of-a-million larger than in the preceding year. The output has doubled during the past ten years. The price of gas was continued at 3s. 4d. per 1000 cubic feet.

At the annual meeting of the Stirling Gas Company, held last week, dividends as last year were declared—9s. 5d. on each £5 7s. 6d. share of original capital, and 11s. per share on £11 of new capital.

The eleventh ordinary general meeting of shareholders of the Saltcoats Gas Company, Limited, was held on Tuesday. The balance at the credit of the profit and loss account, after providing for depreciation on the works, amounted to £1585. Out of this sum, a dividend of 7½ per cent. was paid, absorbing £1200, and the balance of £385 was carried forward. The quantity of gas made was 26,800,000 cubic feet. There was an increase during the year of 35 ordinary and four prepayment meter consumers. The quantity of coal carbonized was 2589 tons, costing £1642; and the yield of gas per ton was 10,350 cubic feet. The revenue from gas was £4110—equal to 36·81d. per 1000 cubic feet made; from the hire of grinders, £2 13s.; and from rent of meters, £55. Tar and liquor realized £413, and coke £487. The total revenue of £5087 was equal to 45·54d. per 1000 cubic feet of gas made. The prices of gas were: To ordinary consumers, 3s. 4d.; to prepayment meter consumers, 4s. 2d.; and for street-lamps, 2s. 11d. per 1000.

The annual meeting of the Hawick Gaslight Company was held yesterday—Provost Melrose in the chair. The Directors reported that the sale of gas during the year had increased by upwards of 2 million cubic feet. The profit for the year amounted to £1800. In moving the adoption of the report, the Chairman said they might look forward to having as good a year as the one that had gone. No change would be made in the price of gas—2s. 3½d. per 1000 cubic feet. The Chairman's motion was adopted. The works are under the management of Mr. W. A. Smith, a brother of the new Engineer and Manager at Belfast.

On Tuesday evening, it was reported to the shareholders of the Bellshill Gas Company, Limited, that the make of gas in the past year was 31,659,000 cubic feet—an increase of 2,234,000 cubic feet. A dividend of 8 per cent., free of income-tax, was declared.

The Alexandria Gas Company, Limited, had a profit last year of £2631. A dividend of 5 per cent. was paid, and £740 was carried forward. It was agreed to reduce the price of gas to ordinary consumers from 3s. 9d. to 3s. 6d. per 1000 cubic feet, and for cooks from 3s. 2d. to 2s. 11d.

The Dumbarton Corporation have resolved to lay a new six-inch gas-main for the supply of the village of Milton, at a cost of £850, to be repaid in not more than seven years.

It was reported to the Hamilton Town Council on Tuesday that the gas accounts for the past year showed a profit of £36, which, with the balance of £2930 brought forward from the previous year, made a net balance of £2966. In arriving at the balance, £1000 had already been applied as a second instalment towards liquidating the cost of the new plant. The Manager's estimate of the profits for the current year is £4163, compared with £4294 last year.

The works of the Lauder Gas Company have been sold as a going concern to Messrs. Watson and Clarkston.

Some time ago, it was intimated that trouble had arisen at Kirkin-tulloch on account of the proposal of the Woodilee Coal and Coke Company to work out coal under the Corporation's gas-works. It has now been agreed that the Corporation are to purchase the coal in the two upper seams, at the price of 2s. 10d. per ton, on the understanding that the coal will be measured when the workings approach the reserved area. The Corporation have resolved to make an endeavour to procure an option from the Colliery Company to purchase further coal, if required, at the same price. The estimate of income and expenditure in the Gas Department having shown a large surplus, it has been agreed to reduce the price of gas from 2s. 2d. to 2s. per 1000 cubic feet, to abolish meter-rents, and to supply gas-cookers free. After allowing for these, there is an apparent balance of £803. In the case of prepayment meters, there will be a reduction of 1d. per 500 cubic feet of gas consumed.

Improved Church Lighting at Surbiton.—We learn from a paragraph in the "Surbiton Times" for the 8th inst. that a great improvement in the lighting of St. Mark's Church has been effected; the building having been fitted out by the Kingston Gas Company with Bland inverted incandescent gas-burners. Originally 202 burners were used; but this number has been reduced to 52, with the result that a more powerful light is given, there is less heat, and a saving of 25 per cent. in gas is secured. The illuminating power of the new burners is 4200 candles.

Gas-Works Loans at Tipton.—Resolutions have been adopted by the Tipton Urban District Council sanctioning the repayment to the Economic Assurance Society of a loan of £19,746, together with interest amounting to £71, and the re-borrowing of this sum from the Ecclesiastical Commissioners; also the obtaining from the same source of a further loan of £750 to cover the cost of certain additions to the gas-works, &c.—making the total of the new loans £20,496. Mr. Robins explained that the Council had been paying 4½ per cent. interest. The money would be re-borrowed at 3½ per cent., and as the amount was nearly £20,000, the new loan would represent a considerable saving. The Clerk (Mr. Stockdale) mentioned that there would be a saving in annual payments of between £50 and £60; so that the gain to the ratepayers in twenty years—the period over which the new loan extended—would be more than £1000.

CURRENT SALES OF GAS PRODUCTS.

. We learn that the Gaslight and Coke Company have given up selling their production of sulphate of ammonia on the old basis, known for so many years as "Beckton terms." They now offer only on the following basis: "A price per ton for 25 per cent. ammonia guaranteed, filled into buyers single bags, at Beckton, net cash." It is necessary to emphasize this change, as the new terms are so different (and much simpler) that buyers might otherwise think that a considerable drop had taken place, whereas that is far from being the case.

Sulphate of Ammonia.

LIVERPOOL, July 16.

The situation remains much as it was a week ago, for, although there has been nothing special about the demand, it has been large enough to absorb current output on the level of last week's prices. At the close, the quotations are £11 15s. per ton f.o.b. Hull, £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith.

For delivery ahead, large inquiries have been coming from abroad, and a fair amount of business has been done at about the level of £11 17s. 6d. per ton for 1910 and £12 per ton for 1911, f.o.b. best ports. At the close, the above prices may be taken as nearest values.

Nitrate of Soda.

This article on spot is very quiet, and quotations are barely maintained at 9s. 3d. per cwt. for 95 per cent. and 9s. 6d. for refined quality, less 2½ per cent.

Tar Products.

LONDON, July 18.

Markets for tar products are still very dull, and prices remain practically unchanged. In pitch, business is quiet; and in nearly every case buyers expect to purchase under the market prices. Creosote is steady, and shipments abroad are fairly large. Benzols are very weak; and buyers are only willing to purchase at low prices. Crude carbolic seems to have again gone flat.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d., ex works. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 31s. 6d. to 32s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 3d.; North, 1s. 2½d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included.

Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

New orders are scarce, and buyers are looking for lower prices. To-day London makes are quoted at £11 5s. to £11s. 6s. 3d.; Leith, £11 15s. to £11 16s. 3d.; Liverpool, £11 13s. 9d.; Hull, £11 12s. 6d. to £11 15s.; Middlesbrough, £11 12s. 6d. to £11 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

There is rather an improvement in the demand for coal, possibly because of the decrease in the prices during the last week or two. Best Northumbrian steams are from about 9s. 10½d. to 10s. per ton f.o.b., second-class steams are 9s., and steam smalls are rather more plentiful at from about 5s. 6d. to 6s. 9d. The shipments are a little more encouraging; and the output seems to be better taken up. In the gas coal trade, the lower quotations are bringing in more orders. Where five weeks ago 10s. 3d. per ton f.o.b. was quoted for best Durham gas coals, 9s. 9d. is quoted now. For second-class, the current price is about 9s. 3d.; while for "Wear specials" 10s. 6d. is the present quotation. There are now more sales of gas coals to Mediterranean ports for delivery over the winter, and in some cases over next year at prices that range from about 16s. 3d. delivered at Genoa, up to 16s. 6d.—prices which seem to show that the current values and freights are not expected to be very materially added to. In the coke trade, prices are steadier, with gas coke rather scarce. Good gas coke is quoted from about 15s. 3d. to 16s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade has been quiet; all being particularly depressed. The only sorts in demand are small. The prices quoted are: Ell 8s. 6d. to 10s. per ton f.o.b. Glasgow, splint 9s. 3d. to 9s. 6d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 322,870 tons—a decrease upon the preceding week of 36,900 tons, and upon the corresponding week of 27,545 tons. For the year to date, the total shipments have been 8,283,194 tons—an increase upon the corresponding period of 595,450 tons.

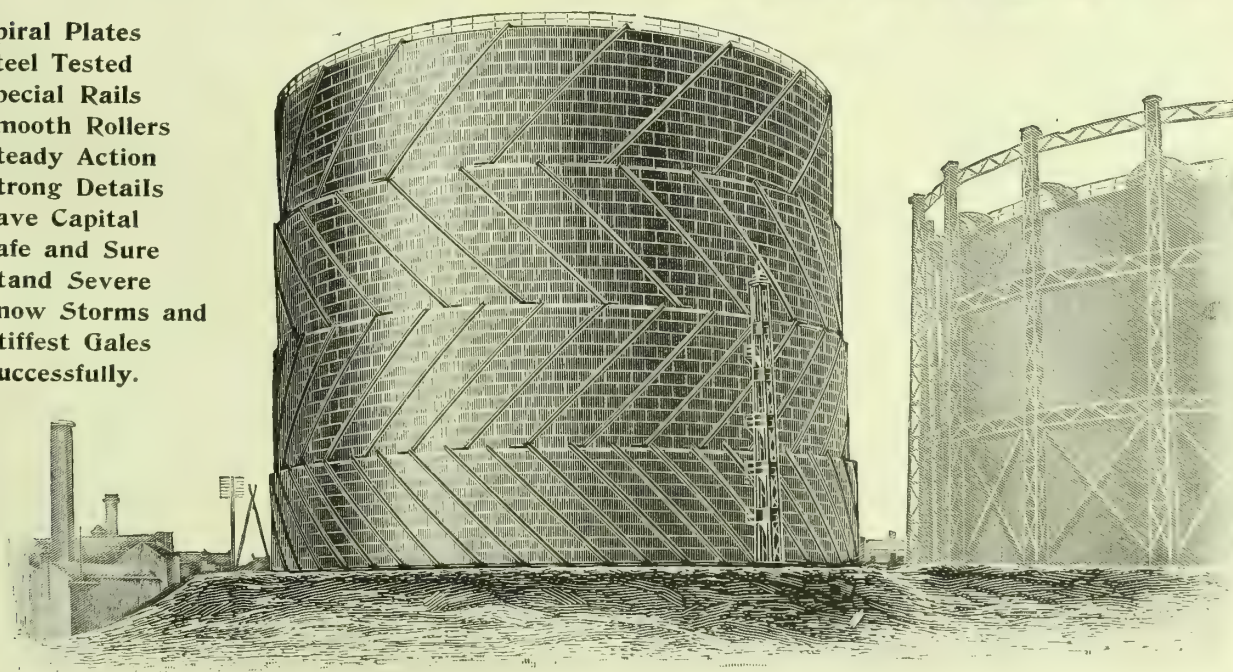
The Ilford Gas Company in the local Hospital Carnival held last Saturday week, arranged, in conjunction with the Richmond Gas Stove and Meter Company, Limited, a car entitled "Where do I come in?" A sweep with his brushes, dirty face, and untidy appearance, looking through a window at a dainty, clean girl-cook, told its own humorous and pleasing story to the quarter-of-a-million sightseers who witnessed the procession. For the last four years the Ilford Gas Company have had a different idea for their car on each occasion.

R. & J. DEMPSTER, LIMITED,

MANCHESTER.

Leading Makers of SPIRAL GUIDED
GASHOLDERS.

Spiral Plates
Steel Tested
Special Rails
Smooth Rollers
Steady Action
Strong Details
Save Capital
Safe and Sure
Stand Severe
Snow Storms and
Stiffest Gales
Successfully.



From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

Swadlincote Gas Undertaking.

According to the annual report of the Gas Manager of the Swadlincote Urban District Council, the quantity of gas manufactured in the past financial year was 48,724,600 cubic feet, compared with 46,734,100 cubic feet in 1908-9. There was an increase of 135 cubic feet in the make of gas per ton of coal; the figures being 11,294 cubic feet last year, against 11,159 cubic feet in 1908-9. The gas consumed through ordinary meters showed an increase of 1,167,042 cubic feet; but the slot meter consumption decreased from 12,627,500 to 12,481,300 cubic feet. The total quantity sold during the year, however, showed an increase of 1,140,020 cubic feet; the respective figures being 37,221,000 cubic feet last year, and 36,080,800 feet in 1908-9. The most disquieting portion of the report is that which deals with the unaccounted-for gas, which showed an increase of $4\frac{1}{2}$ per cent. upon the previous year; having gone up from 17 to 21 $\frac{1}{2}$ per cent. On every ton of coal carbonized there was a loss by escapes of 2500 cubic feet, or, taking the whole year, a clear loss of 10 $\frac{1}{2}$ millions. Represented in money, this loss is equal to £1950, reckoned at the rate of 3s. 8d. per 1000 cubic feet, the price charged to consumers.

Improved Public Lighting at Lowestoft.—At the last meeting of the Lowestoft Town Council, a tender was received from the Lowestoft Water and Gas Company for the supply of gas for the public services for the year ending June 24 next. The Company said they were prepared to convert all the public lamps at present fitted with flat-flame burners to incandescent lighting free of charge, and supply them and all the lamps in the borough with gas, for 2250 hours for the year, for £1 10s. per lamp. The Company will provide the necessary fittings, and clean, light, extinguish, and repair the lamps for 20s. each per annum, provided no lamp is lighted for less than three hours at a time and is lighted every night, unless it is altogether discontinued during such period as may be agreed upon. The tender was accepted.

Good Working at Marple.—At the last monthly meeting of the Marple Urban District Council, the report of the Gas Manager (Mr. J. A. K. Law) for the past financial year was submitted. It showed that the quantity of gas made was 21,869,200 cubic feet, or at the rate of 11,110 cubic feet per ton of coal. The gross profit on the undertaking amounted to £1193, out of which £488 was paid for interest and £298 was applied in reduction of debt; leaving a net profit of £407. Moving the adoption of the Gas Committee's minutes, the Chairman of the Committee (Mr. J. Smith) said the really interesting part of the report, and that which reflected the very highest credit upon the Manager, was the gas saved from leakage, which had been reduced by 420 cubic feet per ton of coal. The gas made had increased by 600 cubic feet per ton, and that sold by 1200 cubic feet per ton, which brought in £300 more profit. As Chairman of the Committee, he complimented Mr. Law on the results he had achieved, which he considered would be satisfactory to the public generally.

Reduction in Price at Leek.—The Leek Urban District Council have agreed to a recommendation of the Lighting Committee that from July 1 the price of gas to ordinary consumers be reduced to 2s. 10d. per 1000 cubic feet, subject to the usual discounts; and that in the case of prepayment meters, the discount be at the rate of 5d. per 1000 cubic feet instead of 3d.

Charge for Street Lighting at Holsworthy.—A discussion took place at the meeting of the Holsworthy District Council yesterday week with reference to the cost of street lighting. The Gas Company offered to do the lighting for £2 per lamp—an advance of 12s. 6d. per lamp on last year. Several members opposed the increase; but Mr. Kivell, the Chairman of the Company, said they could not undertake the lighting for less than the sum named. Last year a great deal of work had been done at the Company's charge to oblige the Council, including the extension of the mains in several directions. It was eventually decided to accept the Company's terms.

Cairo Water Supply.—For nearly three years the question of water supply in Cairo has been under consideration; and the Government have at length arrived at a definite conclusion. It will be remembered that in 1903 it was decided to obtain the water from deep wells at Rod-el-Farag, instead of from the Nile. Subsequently numerous complaints arose as to the quality of the new water, and the native population evinced a very strong feeling in favour of the direct supply from the Nile. The whole subject was submitted to a Committee, who, after experiments and deliberations lasting over nearly eighteen months, recommended that, subject to proper precautions being taken as regards intake and filtration, the wells should be abandoned, and water taken from the river. The Government approved these recommendations; and they have now arranged with the Water Company to revert to the river supply, under conditions as regards intake and filtration laid down by the Public Health Department.

Sale of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale, by order of the Directors, £10,000 of "D" capital water stock of the Barnet District Gas and Water Company, ranking for a maximum dividend of 7 per cent. equally with the Company's existing "D" capital, which has for some time received dividends at the rate of £5 5s. per cent. per annum. It was all sold at from £117 to £118 per £100 of stock. On the same occasion, they sold some gas and water shares under instructions from executors. A few fully-paid additional ordinary £10 shares (7 per cent.) in the Lowestoft Water and Gas Company, carrying 5 $\frac{1}{2}$ per cent. dividend, fetched £11 10s. to £11 12s. 6d. each; 200 new £10 ordinary 5 per cent. shares in the Southend Water Company, bearing 4 $\frac{1}{2}$ per cent. dividend, realized £10 2s. 6d. to £10 7s. 6d. apiece; some original consolidated stock and new ordinary stocks of the Southend Gas Company (both 5 per cent., but entitled to 5 $\frac{1}{2}$ per cent.) fetched £118 to £120 per £100 in the former case, and £117 10s. per £100 in the latter; and 500 new ordinary "B" stock in the same Company, carrying £5 7s. 6d. per cent., realized £110 10s. per £100.



— PATENTED. —



R. & A. MAIN, LTD.,
LONDON, GLASGOW & FALKIRK.

Bucks and Oxon Gas Company.—A meeting of the debenture holders and creditors of this Company was held last Tuesday, under the presidency of Mr. G. Montagu White, the Liquidator and Receiver. After dealing with the figures, Mr. White stated that there was no chance of the assets that had come into his hands paying the debenture holders. The assets in the Company's last balance-sheet were put down at £65,000; but he had made an affidavit that they would not exceed £20,000. He thought there was every need for a proper investigation, and he suggested that a petition for compulsory liquidation should be presented to the Court. A resolution to this effect was passed, after one large creditor had uttered some strong criticism in regard to the promotion of the Company. Referring to the position of the Company, the "Daily Mail" last Thursday said: "By many investors gas and water debentures are regarded as a sound investment of the highest class; and those of the big companies generally are. But the case of the Bucks and Oxon and the cases of other small gas companies which have been before the public of late point the moral that there are gas companies and gas companies, just as there are banks and banks, and brokers and brokers."

Overlapping Local Authorities.—An unusual incident occurred at a Local Board inquiry recently held by Mr. F. H. Tulloch at East Stonehouse. One subject was an application by the East Stonehouse District Council for a loan of £734 for water-works. The district is supplied with water in bulk by the Plymouth Corporation; and among those who attended the inquiry were Mr. F. Howarth, the Water Engineer to the Plymouth Corporation, and Mr. E. Foster, from the office of the Town Clerk. These gentlemen stated that they were present in accordance with a notice of the inquiry which had been sent to the Corporation. Mr. R. R. Rodd, the Clerk to the East Stonehouse Council, however, objected to their presence and to their being heard. The Plymouth Corporation, he said, had no *locus standi*; and he had informed the Town Clerk of this. He had added, as an act of grace, the information that the loan was required solely for the purpose of renewing existing mains and appliances. The Inspector thought there was very little in the objection, but that as the Local Government Board had notified the Plymouth Corporation of the inquiry, the officials had better remain. Mr. C. H. Trounce then gave evidence as to the object of the loan; and, in reply to Mr. Howarth, said that nothing was contemplated which would interfere with the Plymouth connections or with the Government supply now derived from Plymouth. Mr. Howarth explained that Plymouth had no desire to interfere with the internal arrangements of East Stonehouse. Mr. Rodd said they accepted this assurance.

We have received the "Directory of Manufacturers of, and Dealers in, Engineers' and Contractors' Machinery and Supplies," published by "Engineering Record" at No. 239, West Thirty-Ninth Street, New York.

The steel ascension pipes at the new Antwerp Gas-Works, referred to and illustrated on p. 102 of last week's issue of the "JOURNAL," are Mannesmann weldless steel tubes, 8-inch bore, No. 4 gauge, flange and spigot. There are 162 of them in all. A similar installation of 360 Mannesmann weldless steel ascension pipes (8-inch bore) was put in last year by the Alliance and Dublin Consumers' Gas Company.

Mr. J. C. Moon, the Manager of the Vancouver (B.C.) Gas Company, Limited, lately organized a series of cookery lectures and an exhibition of gas appliances in the city, with the idea of popularizing the Company, and giving everyone an idea of what it is possible to accomplish with the aid of gas. The lectures were naturally highly appreciated; and the possibilities of the modern gas-range are now better understood in Vancouver than was the case previously. An excellent set of photographs which we have received show that everything was arranged in a thoroughly up-to-date manner; and the excellence of a gaslight exposure is evidence of the admirable quality of the lighting.

Mr. Palin, addressing the Bradford City Council, complained that while the Electricity Department had been canvassing for consumers in Tong, they had been doing nothing in Tyersal and Thornbury. If, he said, they would only sell electricity in these districts at a slight reduction on the price of gas, they would secure a lot of consumers, and they would be doing a good thing for the Corporation. Alderman Robinson, in reply, remarked that the Electricity Committee would be very pleased to help the Corporation with reference to these out-districts. If the necessary mains could be laid, he, for one, would be prepared to sell electricity at a very cheap rate indeed, in order to compete with the Gas Companies.

APPLICATIONS FOR LETTERS PATENT.

- 15,910.—ESHELBY, G. H. S., "Incandescent burners." July 4.
 15,923.—GRAHAM, J., A., JUN., & D. A., "Reducing valves." July 4.
 15,960.—SIEMENS AND HALSKE AKT.-GES., "Water-meters." July 4.
 15,970.—FABRIK FÜR ROTATIONS COMPRESSOREN "SYSTEM MORELL" G.M.B.H., "Pumping liquids or gases." July 4.
 15,972.—LANGE, A. R., and KRAUSE, A., "Heating and lighting in connection with fluid combustible." July 4.
 16,047.—HUMMEL, H. J. J., "Incandescent gas-lamps." July 5.
 16,068.—STILL, W. M., and SONS, LTD., and STILL, E. H., "Incandescent gas-lamps." July 5.
 16,095.—RILEY, C. W., "Gas cooking-stoves." July 6.
 16,193.—COLLIN, F. J., "Manufacture of sulphate of ammonia from moist gases." July 6.
 16,215.—LYALL, W. A., and DAVIES, J., and SON, LTD., "Measuring the velocity of flow or pressure of gas or other fluid." July 7.
 16,318.—GIDDINGS and DACRE, LTD., and SMITH, F., "Gas-lamp smoke-bell holders." July 8.
 16,322.—PUGH, F., "Gas signs." July 8.
 16,323.—RUPPERT, H., "Lighting burners." July 8.
 16,352.—ATKINSON, T. N., "Regulating the pressure of gas to incandescent burners." July 8.
 16,390.—HARSANT, H., "Combined gas and air burner and incandescent mantle." July 9.



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FITTED WITH
**SAFETY GAS VALVE
AND COLD WATER TAP.**

A New Low-Priced "Chamber Heating" Pattern, delivering Water suitable for drinking, at any temperature to Boiling.

PRICE

WITH GAS TAP AND PILOT ONLY

£3 7s. 6d.

AS ILLUSTRATED

£5 0s. 0d.

May we send you full Particulars?

**THE
PARKINSON STOVE Co., LTD.**

(Incorporating Maughan's
Patent Geyser Co.,)

Stour Street, Spring Hill, BIRMINGHAM,

AND

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. Melbourne Metropolitan Gas Company. Applications by July 29 to J. Terry and Co., 7, Great Winchester Street, E.C.
DRAUGHTSMEN. W. J. Jenkins and Co., Retford.
LABORATORY ASSISTANT. No. 5263.
REPRESENTATIVE. "Gas Works," c/o Streets, Cornhill.

Situations Wanted.

IN GAS OR WATER CONCERN. No. 5265.
MANAGER OR SECRETARY, &c. No. 5267.

Gas Works, &c., for Disposal.

TARPORLEY GAS-WORKS. Tenders by Aug. 2.

Business for Disposal. No. 5266.

Plant (Second-Hand) for Disposal.

OLD PLANT. Aldershot Gas, Water, and District Lighting Company.
PURIFIERS, &c. Oldbury Gas Department.
STEAM ENGINES, &c. Johnson, New Hythe.
WASHER-SCRUBBER. Newark Gas Company.

Meetings.

SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel, Aug. 10, Two o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel, Aug. 5, Three o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Gas-Works, Aug. 6, Three o'clock.

Patent Licence.

LIGHTING AND EXTINGUISHING DEVICE. H. Haddon and Co., Bedford Street, Strand, W.C.

Tank-Waggon for Hire.

CLAYTON ANALINE COMPANY.

TENDERS FOR

Benzol.

WARRINGTON GAS DEPARTMENT. Tenders by July 28.

Coal and Cannel.

CRANLEIGH GAS COMPANY. Tenders by July 25.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by July 25.
MARKET HARBOUROUGH GAS DEPARTMENT. Tenders by July 23.
OLDHAM GAS DEPARTMENT. Tenders by July 26.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by July 26.
STRET福德 GAS COMPANY. Tenders by Aug. 3.

Coke (Wanted). No. 5264.

Gasholder and Tank.

EVESHAM TOWN COUNCIL. Tenders by July 25.

Retort Stack and Mountings.

DOUGLAS GASLIGHT COMPANY. Tenders by July 29.

Roofs.

DOUGLAS GASLIGHT COMPANY. Tenders by July 29.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 174.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Apl. 1	5	Alliance & Dublin Ord. .	81-83	..	6 0 6	4,940,000	Stk.	May 12	8	Imperial Continental	1 8-180	..	£ s. d.
1,474,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	1,235,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	94-96	..	4 8 11
310,000	Stk.	May 12	7	Bombay, Ltd.	6 1/2-6 1/2	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	210-221	..	4 16 9
200,000	Stk.	Feb. 25	15	Do. New, £4 paid .	29-30	..	5 0 0	561,000	Stk.	Feb. 25	10	Liverpool United A. .	164-165	..	4 10 6
40,000	Stk.	Feb. 25	15	Bourne 10 p.c. . .	16 1/2-16 1/2	..	4 3 7	718,100	Stk.	June 29	7	Do. B.	104-106	..	4 4 10
50,000	Stk.	Feb. 25	15	mouth Gas B 7 p.c. and Water Pref. 6 p.c.	15-15 1/2	..	3 17 5	306,083	Stk.	June 29	6	Do. Deb. Stk.	414-414 1/2	..	3 15 6
311,810	Stk.	Feb. 25	15	Brentford Consolidated	251-254	..	4 18 5	75,000	Stk.	June 29	6	Malta & Mediterranean.	100-102	..	6 4 8
75,000	Stk.	Feb. 25	15	Do. New	183-190	..	5 0 0	560,000	Stk.	Apr. 1	5	Met. of 5 p.c. Deb.	100-102	..	4 18 8
380,000	Stk.	Feb. 25	15	Do. 5 p.c. Pref. . .	120-122	..	4 2 0	250,000	Stk.	May 27	3 1/2	Melbourne 4 1/2 p.c. Deb.	124-13	..	4 8 3
300,000	Stk.	Aug. 12	5	Do. 4 p.c. Deb. . .	97-101	..	3 19 3	541,920	Stk.	Feb. 25	3 1/2	Monte Video, Ltd. .	103 1/2-104 1/2	..	5 7 8
50,000	Stk.	June 10	4	Brighton & Hove Orig.	214-217	..	5 1 2	1,775,892	Stk.	June 29	3 1/2	Newcastle & Gt. Tesh'd Con	8-9	..	4 3 9
206,250	Stk.	Mar. 16	8	Do. A Ord. Stk. . .	153-156	..	5 2 7	529,435	Stk.	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	131-134	..	3 16 11
220,000	Stk.	Apr. 1	16	British	44-45	..	4 14 8	55,940	Stk.	Feb. 25	7	North Middlesex 7 p.c.	134-134 1/2	..	5 1 10
246,320	Stk.	Feb. 25	16	Bromley, A 5 p.c. .	118-120	..	5 0 0	300,000	Stk.	Apr. 29	8	Oriental, Ltd. . . .	138-140	..	5 14 4
460,000	Stk.	Feb. 25	16	Do. B 3 1/2 p.c. . .	88-90	..	5 0 0	60,000	Stk.	Apr. 1	8	Ottoman, Ltd. . . .	64-63 1/2	..	6 3 1
109,000	Stk.	June 29	3 1/2	Do. C 5 p.c. . . .	105-107	..	5 2 10	31,800	Stk.	Feb. 25	13	Portsea Island A. .	134-136	..	5 1 7
165,700	Stk.	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	85-87	..	4 0 6	60,000	Stk.	Apr. 1	13	Do. B.	126-128	..	5 19 2
82,278	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	96-98	..	4 1 8	100,000	Stk.	Apr. 1	13	Do. C.	110-121	..	4 19 2
55,000	Stk.	June 29	4	Cape Town & Dis., Ltd.	3-4	..	—	114,800	Stk.	Apr. 1	12	Do. D and E. . . .	100-102	..	4 18 0
250,000	Stk.	May 3	5	Do. 4 1/2 p.c. Pref.	54-64	..	—	398,490	Stk.	Apr. 29	7	Primitiva Ord. . .	74-74 1/2	..	4 13 4
100,000	Stk.	June 29	4 1/2	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	796,980	Stk.	June 29	5	Do. 5 p.c. Pref. . .	54-54 1/2	..	4 10 11
100,000	Stk.	June 29	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	88-90	..	5 0 0	488,902	Stk.	June 29	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10
157,150	Stk.	Feb. 25	5 1/2	Chester 5 p.c. Ord.	109-111	..	4 10 1	312,650	Stk.	Apr. 1	9	River Plate 4 p.c. Deb.	97-99	..	4 0 10
1,513,280	Stk.	Feb. 25	5 1/2	Commercial 4 p.c. Stk.	108-110	..	4 14 7	250,000	Stk.	Apr. 1	9	San Paulo, Ltd. . .	153-164	..	5 10 9
560,000	Stk.	June 29	5	Do. 3 1/2 p.c. do. .	103-105	..	4 15 3	62,500	Stk.	July 1	6	Do. 6 p.c. Pref. . .	113-124	..	4 18 0
475,000	Stk.	June 29	5	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	125,000	Stk.	July 1	5	Do. 5 p.c. Deb. . .	49-50	..	5 0 0
800,000	Stk.	June 10	7	Continental Union, Ltd.	91-94	..	5 6 5	135,000	Stk.	Feb. 25	10	Sheffield A. . . .	234-236	..	4 4 9
200,000	Stk.	June 10	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	209,984	Stk.	Feb. 25	10	Do. B.	234-236	..	4 4 9
492,270	Stk.	June 10	5 1/2	Do. Deb. Stk. . . .	121-123	..	4 9 5	523,500	Stk.	Feb. 25	10	Do. C.	233-235	..	4 5 4
55,000	Stk.	Apr. 1	12	East Hull 5 p.c. Ord.	96-98	..	3 16 2	79,000	Stk.	May 27	7	Do. D.	11-13 1/2	..	6 1 9
148,995	Stk.	July 14	12	European, Ltd. . . .	104-105	..	4 0 0	6,429,895	Stk.	Feb. 10	5 1/2	South African . . .	120 1/2-122 1/2	..	4 9 2
486,090	Stk.	Feb. 10	4 1/2	Do. £ 10s. paid .	24 1/2-24 1/2	..	4 18 0	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb. . .	79-81 1/2	..	3 14 1
354,060	Stk.	Feb. 10	4 1/2	Gas 4 p.c. Ord. . . .	17 1/2-18 1/2	..	4 8 8	209,822	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158	..	5 1 3
16,198,671	Stk.	Feb. 10	4 1/2	light 3 1/2 p.c. max. .	105-106	..	3 17 9	605,000	Stk.	Feb. 25	5 1/2	S'th Suburb'n Ord. 5 p.c.	121-123	..	4 12 0
2,600,000	Stk.	June 29	3 1/2	and 4 p.c. Con. Pref.	88-90	..	3 15 6	117,058	Stk.	July 14	5	Do. 5 p.c. Pref. . .	121-123	..	4 1 4
4,062,235	Stk.	June 29	3 1/2	Coke 3 p.c. Con. Deb.	104-106	..	3 13 2	502,310	Stk.	May 12	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,534,700	Stk.	Mar. 16	5	Hastings & St. L. 3 1/2 p.c.	93-95	..	5 5 3	120,000	Stk.	Feb. 10	6 1/2	Southampton Ord. .	110-112	..	4 9 3
258,740	Stk.	Apr. 29	11	Do. do. 5 p.c. . . .	117-119	..	5 9 3	453,940	Stk.	June 29	5 1/2	Tottenham A 5 p.c.	133-135	..	5 1 9
82,500	Stk.	Mar. 16	7 1/2	Hongkong & China, Ltd.	17-17 1/2	..	4 15 3	149,470	Stk.	July 1	4	Do. B 3 1/2 p.c. . .	113-115	..	4 13 6
70,000	Stk.	Mar. 16	7 1/2	Ilford A and C . . .	145-147	..	4 19 1	182,380	Stk.	Feb. 25	5	Edmonton 4 p.c. Deb.	57-59	..	4 0 10
131,000	Stk.	June 29	4	Do. B	169-111	..	4 19 1	149,900	Stk.	Feb. 25	6 1/2	Tuscan, Ltd. . . .	9-9 1/2	..	8 8 6
65,780	Stk.	June 29	4	Do. 4 p.c. Deb. . . .	98-100	..	4 0 0	236,676	Stk.	Feb. 25	6 1/2	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,500	Stk.	June 29	4					255,646	Stk.	June 29	3	Tynemouth, 5 p.c. max.	113-115	..	4 5 11
								79,416	Stk.	June 29	3	Wands- 1 B 3 1/2 p.c. worth 3 p.c. Deb. Stk.	139-141	..	4 4 0 0

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Experience in the Supervision of Construction a
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Salary, £300. Passage Paid.
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Capacity, 350,000 cubic feet per twenty-four hours.
12-inch Connections. Cost £314.
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TENDERS FOR COAL AND CANNEL.

THE Directors invite Tenders for a
Twelve Months' Supply of GAS COAL and
CANNEL.
Particulars may be obtained from the undersigned,
by whom Tenders will be received until Tuesday, the
26th inst.

JAMES BRADDOCK,
Manager and Secretary.
Gas Offices, Radcliffe,
July 12, 1910.

TENDERS are invited for a Twelve
Months' Supply of Screened GAS COKE for a
large Engineering Works in the Midlands (name will
be disclosed on Application).
Approximate total Quantity, 725 Tons. Delivery to
be taken as required.
Address No. 5261, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE Directors of the Cranleigh Gas and
Coke Company, Limited, invite TENDERS for
the Supply of 950 Tons of Good GAS COAL, to be de-
livered Carriage Paid Cranleigh Station (London
Brighton and South Coast Railway), as ordered by the
Secretary over the Ten Months, Sept. 1, 1910, to June
30, 1911.

Tenders to be sent not later than midday on Monday,
July 25, under cover, marked "Coal," to the SECRETARY,
Cranleigh Gas and Coke Company, Limited, Cranleigh,
SURREY.

THE Haworth Urban District Council
are prepared to receive TENDERS for the Supply
of 2500 Tons of GAS COAL (Screened, Unscreened, and
Gas Nuts) delivered at the Haworth Station during the
ensuing Twelve Months. Sealed Tenders, endorsed
"Gas Coal Tender," to be forwarded to me, the under-
signed, not later than the 25th inst.
No Special Form of Tender.

WILLIAM ROBERTSHAW,
Clerk to the Council.
1, Burlington Chambers,
North Street, Keighley.

DOUGLAS GASLIGHT COMPANY.

THE Gas Company are prepared to re-
ceive TENDERS from Experienced Contractors
for the Erection of RETORT HOUSE ROOF and
COAL STORE ROOF, RETORT STACK, and RETORT
STACK MOUNTINGS, at the Gas-Works, Douglas.

The Drawings and Specification may be seen at the
Gas-Works or at the Offices of the Engineers, Messrs.
Thomas Newbigging and Son, 5, Norfolk Street, Man-
chester. A copy of the Bill of Quantities may be ob-
tained from the Engineers on Deposit of One Guinea,
which will be returnable on receipt of a *bona-fide*
Tender.

Sealed Tenders, endorsed "Cast-Iron and Steelwork
Contract No. 2," to be addressed to the undersigned on or
before the 29th day of July, 1910.

The Company do not bind themselves to accept the
lowest or any Tender.

CHARLES H. KAY,
Secretary and Manager.
Gas Offices, Douglas,
July 14, 1910.

STRETFORD GAS COMPANY.

THE Directors of the Stretford Gas
Company invite TENDERS for the Supply of Un-
screened GAS COALS, NUTS, SLACK, and CANNEL,
to be Delivered at the Gas-Works, Stretford, on the
Bridgewater Canal, or at Stretford Station (M. S. J. &
A. Railway) during the next One, Two, or Three Years,
according to the printed Conditions, commencing Sept.
1, 1910.

Tenders to be delivered to the Gas-Works, Stretford,
not later than noon on Wednesday, the 3rd of August,
1910, endorsed "Coal," and addressed to the Chairman.
The Directors do not bind themselves to accept the
lowest or any Tender.

Forms of Tender and Conditions can be obtained on
Application to the undersigned.

By order of the Board,
H. KENDRICK,
Engineer and Manager.
Stretford, July 15, 1910.

**MARKET HARBOROUGH URBAN DISTRICT
COUNCIL.**
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for
the Supply of the whole or part of 4500 Tons of
Best Screened GAS COAL and NUTS, to be delivered
during the Year ending June 30, 1911, at the London
and North Western or Midland Railways Station,
Market Harborough.

Conditions and Form of Tender may be obtained
from the undersigned, to whom Sealed Tenders, en-
dorsed "Tenders for Gas Coal," must be delivered not
later than Saturday, the 23rd inst.

The lowest or any Tender not necessarily accepted.
ALFRED T. HARRIS,
Manager and Secretary.

Gas Offices, St. Mary's Road,
Market Harborough, July 8, 1910.

BOROUGH OF EVESHAM.

THE Evesham Town Council are pre-
pared to receive TENDERS for the Provision
and Erection of a SINGLE-LIFT GASHOLDER IN
A STEEL TANK ON THE GADD AND MASON
SPIRAL-GUIDED Principle, to be erected on a site
situate at their Gas-Works in the Borough of Evesham.
Copies of the Drawings and Specifications, together
with all other necessary Particulars, may be obtained
on Application to Mr. Percy H. Fletcher, Gas-Works
Manager and Engineer, Gas-Works, Evesham, on pay-
ment of the sum of One Guinea, which will not be
returned.

The Contractor whose Tender is accepted will be re-
quired, at his expense, to enter into a formal Contract
with the Town Council for carrying out the work, and
also a Bond with two approved Sureties, for the due
and proper Performance of the Contract, such Docu-
ments to be prepared by me.

Sealed Tenders, marked "Tender for New Gasholder
and Tank," to be delivered or sent by post to me at my
Offices not later than Monday, the 25th day of July inst.
The Town Council do not bind themselves to accept
the lowest or any Tender.

THOS. A. COX,
Town Clerk.
Town Clerk's Offices,
Evesham, July 7, 1910.

THE Warrington Corporation Gas De-
partment invite TENDERS for 2000 to 5000
Gallons of BENZOL for Delivery during the next
Twelve Months.

Tenders to be sent in not later than the 28th inst.
Further Particulars may be had on Application to
Mr. W. S. Haddock, Engineer, Gas-Works, Warrington.
FREDK. TAYLOR,
Secretary.

Gas Offices, Warrington,
July 15, 1910.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite
TENDERS for the Supply of GAS COALS during
a period of Nine Months commencing the 1st of
October, 1910.

Conditions and Forms of Tender may be obtained on
Application to Mr. A. Andrew, Gas Offices, Oldham, to
whom Tenders are to be delivered not later than
Tuesday, July 26, 1910.

By order,
J. H. HALLSWORTH,
Town Clerk.
July 7, 1910.

URBAN DISTRICT COUNCIL OF OLDBURY.
(GAS DEPARTMENT.)

THE Gas Committee of the above
Council are open to receive TENDERS for the
PURCHASE of Six 15 feet square by 5 feet deep PURI-
FIERS, with 10-inch Valves, Bye-Passes, Connections,
and Travelling Lifting Apparatus, all Complete and in
Good Condition, replaced by larger Plant.

Further Particulars may be had on Application to
the undersigned.
The Gas Committee do not bind themselves to accept
the highest or any Tender.

By order,
A. COOKE,
General Manager.
Gas-Works, Oldbury,
July 4, 1910.

EUROPEAN GAS COMPANY, LIMITED.

SHARE WARRANTS TO BEARER.
NOTICE is Hereby Given, that, in
accordance with a Resolution passed at the
ANNUAL GENERAL MEETING of Shareholders
held on the 12th inst., a Dividend and Bonus of Four-
teen Shillings per share will be payable on and after the
30th inst., on the above Shares, subject, however, to a
deduction of 1s. 1d. per share for French Stamp and
Transfer Duty.

Payment will be made at the Union of London and
Smith's Bank, Limited, Princes Street, London, E.C.,
after Serial Coupon No. 71 has been left Three clear
days for Examination.

W. B. BRADY,
Secretary.
Finsbury House, Blomfield Street,
London, E.C., July 13, 1910.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the
ORDINARY HALF-YEARLY GENERAL
MEETING of the Proprietors of this Company will
be held at De Keyser's Royal Hotel, Victoria Embank-
ment, in the City of London, on Wednesday, the 10th
day of August next, at Two o'clock in the Afternoon
precisely, to receive the Directors' Report and the
Accounts of the Company for the Half Year ended the
30th of June last; to declare a Dividend for the same
period; and to consider a recommendation of the
Directors to increase the Remuneration of the Secretary.
NOTICE is HEREBY ALSO GIVEN, that the Directors
will submit a Resolution to the Proprietors for the
purpose of authorizing the Sale of certain lands, which
are no longer required for the purposes of the under-
taking.

The TRANSFER BOOKS WILL BE CLOSED from
the 27th day of July inst. until after the Meeting.

By order,
F. M'LEOD,
Secretary.

Offices: 709, Old Kent Road, S.E.
July 16, 1910.

**TOTTENHAM AND EDMONTON GASLIGHT
AND COKE COMPANY.**

NOTICE is Hereby Given, that the
ANNUAL ORDINARY GENERAL MEETING
of the Proprietors of this Company will be held at the
Gas-Works, Willoughby Lane, Tottenham, on Saturday,
the 6th day of August next, at Three o'clock in the
afternoon precisely, to receive the Report of the
Directors and Statement of Accounts for the Half Year
ending June 30, 1910; to declare Dividends; to elect
Two Directors and an Auditor for the ensuing Year;
and to transact General Business.

The TRANSFER BOOKS for the "A" and "B"
CONSOLIDATED STOCKS WILL BE CLOSED from
July 23 to Aug. 6, both days inclusive.

By order of the Board,
E. TOPLEY,
Secretary.

Chief Offices of the Company
639, High Road, Tottenham,
July 15, 1910.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the
ORDINARY HALF-YEARLY GENERAL
MEETING of the Proprietors of this Company will
be held at the De Keyser's Royal Hotel, Victoria
Embankment, London, E.C., on Friday, the 5th day
of August, 1910, at Three o'clock in the Afternoon
precisely, to receive the Report of the Directors and
Statement of Accounts for the Half Year ended the
30th of June last; to declare a Dividend for the same
period; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from
the 22nd day of July until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 18, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL, ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

GAS-WORKS, FREEHOLD LAND, AND COTTAGES AT TARPORLEY, CHESHIRE.

FOR SALE BY TENDER

THE Tarporley Gaslight and Coke Company, Limited, all that Freehold plot of Land situate at Tarporley, in the County of Chester, together with the Gas-Works erected thereon and known as THE TARPORLEY GAS-WORKS, and also as a Going Concern, the Business carried on by the said Company as from the 30th day of September, 1910, with the DISTRIBUTING PLANT including MAINS, SERVICES, METERS, COOKERS, and such of the CONSUMERS' FITTINGS as are the property of the Company; and also the benefit of all Pending Contracts and Engagements entered into by the Company.

And also all those FOUR FREEHOLD COTTAGES adjoining situate and Numbered 3, 5, 9, and 11, Eaton Road, Tarporley, aforesaid. Gross rentals £34 9s. per Annum.

Tenders to be sent, under cover and sealed, to the Vendors' Solicitors, on or before the 2nd day of August, 1910.

The Vendors do not bind themselves to accept the highest or any Tender.

Forms of Tender and of the Conditions upon which such Tender is received and further Particulars may be obtained at the Offices of the said Company, Eaton Road, Tarporley, or Messrs. THOS. SMITHurst and Co., Chartered Accountants, 26, Pall Mall, MANCHESTER, or Messrs. RICHARD HIGHAM and Co., Vendors' Solicitors, 49, PRINCESS STREET, MANCHESTER.

AUTOMATICALLY LIGHTING AND EXTINGUISHING GAS FROM A DISTANCE, No. 9392, OF 1908.

THE Patentee is desirous of arranging, by LICENSE or otherwise, on Reasonable Terms, for the Manufacture and Commercial Development of the Invention in this Country. Address, HERBERT HADDAN and Co., Patent Agents, 31-32, Bedford Street, Strand, LONDON, W.C.

Bound in Cloth. Octavo, 174 pp. Price One Guinea.

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HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

ALL the
BOYS CALORIMETERS

which have been in daily use in all the Official Testing-Stations in London for the last Three Years

WERE MADE BY

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— LIMITED —

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Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the Original makers.

Descriptive Catalogue on Application.

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SHEAF WORKS, SHEFFIELD,
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FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
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Owners of the Birtley Iron Works and Pelaw Main Collieries,

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Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

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Telephone 1806.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

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Results obtained which have never been Surpassed by any other System of Carbonization.

Plants at Work and under Construction for the production of 18,000,000 cubic feet of Gas per Day.

See our large Advertisement appearing in alternate issues of the "JOURNAL."

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
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ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

GEORGE WILSON, COVENTRY.

Wet and Dry Gas Meter Manufacturer.

PREPAYMENT METERS for Pennies, Shillings, or any other Coin.

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THOMAS BUGDEN & CO.,

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Largest Manufacturers of Gas Main Bags.

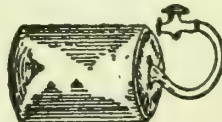
Patentees of the DENMAR BAG,

Impervious to Main Liquor and Climatic Influences.

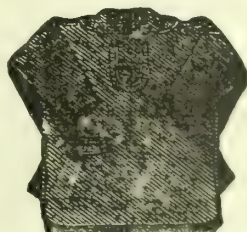
Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.



Gas Bags for repairing Mains. All Seams Stitched and Taped.



Gas Bags for repairing Mains. All Seams Stitched and Taped.



Contractors' and Miners Jackets.



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"the Star of the Mantle World," still **holds the field** for Strength and Light, as users have proved for themselves. The Company have recently quadrupled their powers of production to meet the great demand. **Facts speak for themselves.**

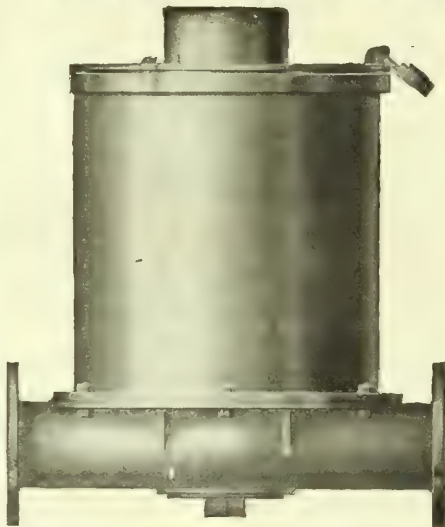
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HIGH PRESSURE MERCURIAL GOVERNOR



THIS Governor has been specially designed to work on high pressure mains, where these have been adopted, to effect the necessary reduction from the high pressure in the main to the low pressure required for normal working.

It can be supplied to suit any desired range of pressures; for example, the standard size reduces from 5 lbs. inlet pressure to ordinary low pressure. At the same time the Governor is correctly compensated and so accurately adjusted that, in the event of the main being temporarily used for low pressure distribution, it will work as an ordinary low pressure governor.

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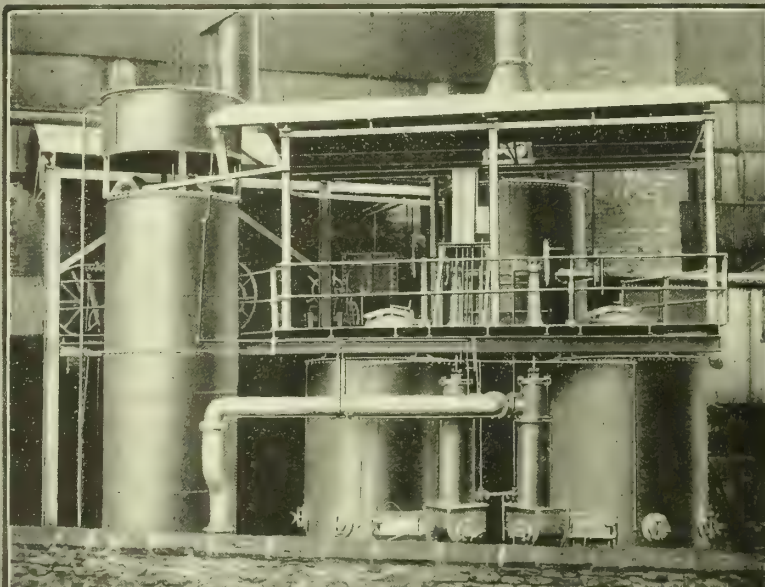
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COMPLETE
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HIGHEST
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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Workop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Workmanship and Materials
of the Highest
Quality.

PECKETT'S LOCOMOTIVES.

PECKETT & SONS,
ATLAS LOCOMOTIVE WORKS, BRISTOL.

Built to any
Specification or Gauge.

JOHN BROWN & CO., LTD., SHEFFIELD,

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ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

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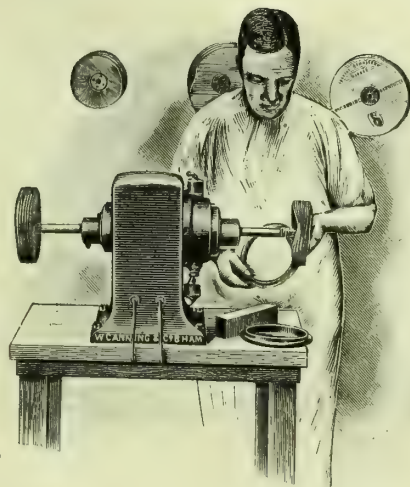
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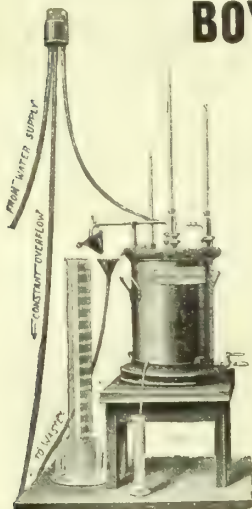
Actual Manufacturers of Machinery and Materials for
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Our Goods are used by all the Leading Manufacturers. Goods Specially Packed for Export.

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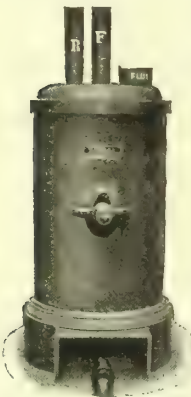
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Aiserstr. 71. WIEN. Aiserstr. 71.**PROJECTS AND INSTALLATIONS
OF WATER-GAS-PLANTS***On the Strache System.***STEAM-CONTROLLER for Water-Gas-Plants**
RAISES the Calorific Value up to 3000 Calories.
REDUCES the CO₂ Contents to 2 per cent.
INCREASES the Capacity of the Unit-Time.
DIMINISHES the Steam Consumption.
INCREASES the Yield.**AUTOLYSATOR**Apparatus for Use in Heating-Plants of All Kinds, registering continuously and visibly the CO₂.**GASOSCOPE**

Apparatus serving to Find out the Leakage in Gas-Mains.

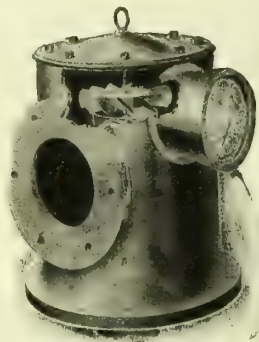
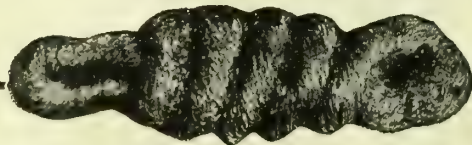
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**"TATSAL"**Is synonymous with "Strength"
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GAS-FIRED STEAM
BOILERS.***Manufactured by***W. BRIGGS,**
5, LAMBETH HILL, LONDON, E.C.**SILICA MACHINE MADE RETORTS.**TRADE "C.O." MARK.
REGISTERED.**THE NEW RETORT**Will withstand high temperatures and is **Guaranteed**
not to Contract or Soften under Heat.**GREATER CONDUCTIVITY THAN ANY
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*PRICE 2s. EACH.***ADDITIONAL REVENUE FOR GAS-WORKS.****COKE SELLING . . AT 11/6 A TON
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LANCASTER.**SPECIAL ROTARY
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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way
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Lead Wool requires no melting and can be used in
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Joints and cost 33½ per cent. less.****THE LEAD WOOL CO., LTD., SNODLAND, KENT.**

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LIMITED
Pepper Rd. Branch, Hunslet, Leeds.**Interior View of Works
Employed in the Manufacture of
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for WATERWORKS Etc.**



OVER 59,500 IN OPERATION

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SUITABLE FOR ALL PRESSURES AND ALL CONDITIONS.

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Telegrams: "DISTANCING LONDON."

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Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity.
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

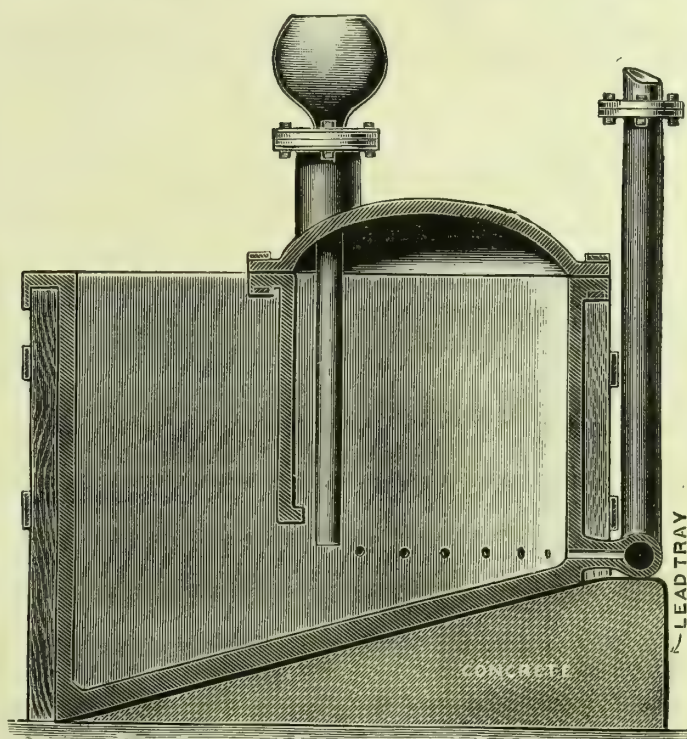
LICENCES TO MAKE MAY BE OBTAINED.

For full Particulars apply to the Sole Proprietors

BIGGS, WALL & CO.

13, Cross Street, Finsbury Pavement,
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Telegrams: "RAGOUT LONDON." Telephone: 273 CENTRAL.



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

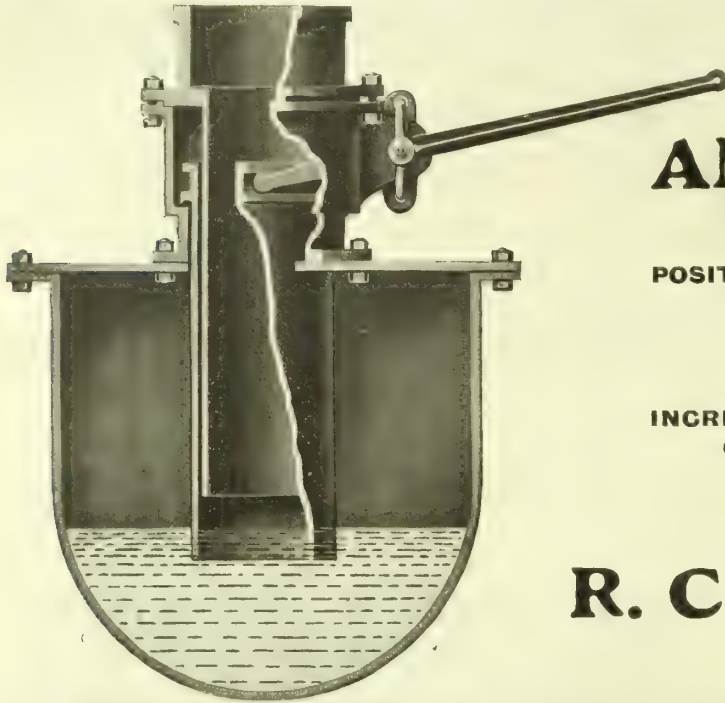
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Construction of

Entire Gas-Works & Coke Oven Plants, Retort Furnaces,

Furnaces for Chamber Settings (Patent), New Coke Ovens (Patent),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.



CORT'S PATENT ANTI-DIP VALVE.

IMPORTANT POINTS:—

POSITIVE IN ACTION,
ABSOLUTELY SAFE,
ALWAYS FULL BORE.

WE GUARANTEE

INCREASED MAKE PER TON,
GREATER ILLUMINATING POWER,
SATISFACTION, &c.

Write for fullest Particulars to—

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READING.

SMOKELESS COAL.

The British Coalite Company having failed in their proceedings against us, we are now prepared to grant **Licenses**, both **at Home and Abroad**, on Reasonable Terms, to Corporations, Gas Companies, and others, for the Manufacture under our Patents of

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By our methods, results superior to other processes can be obtained.

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Specialities:

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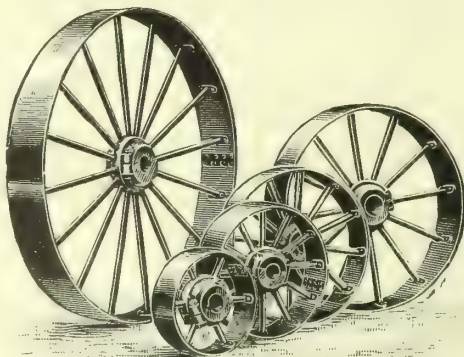
OF

POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals & Fixings.

WORKS:

ABERDEEN,
SCOTLAND.



Specialities:

TRANSMISSION

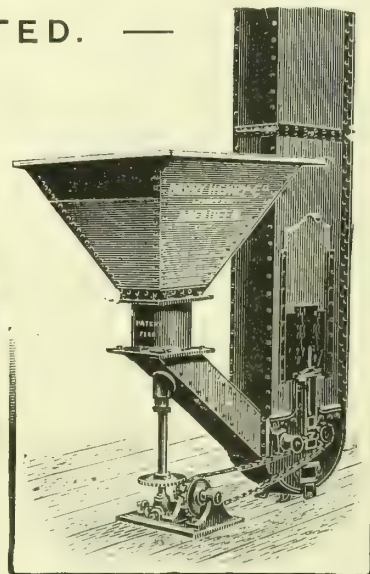
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MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

64, MARK LANE,
LONDON, E.C.



Welsbach

LIGHT

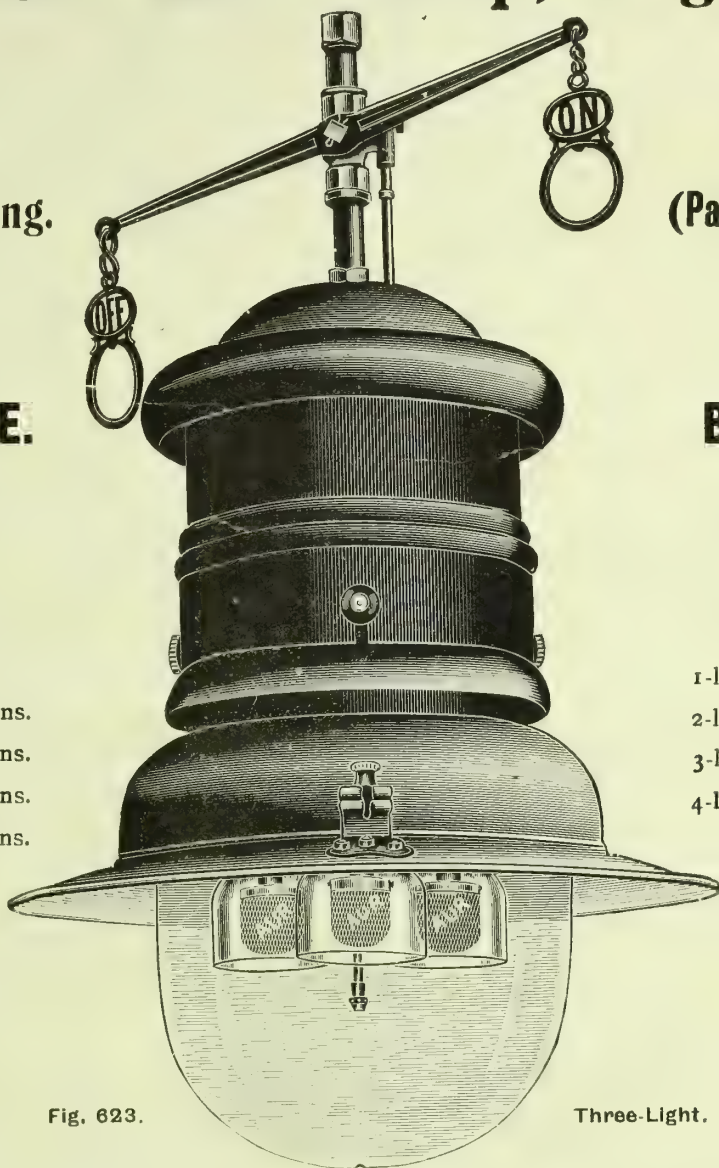
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
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All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	Not made

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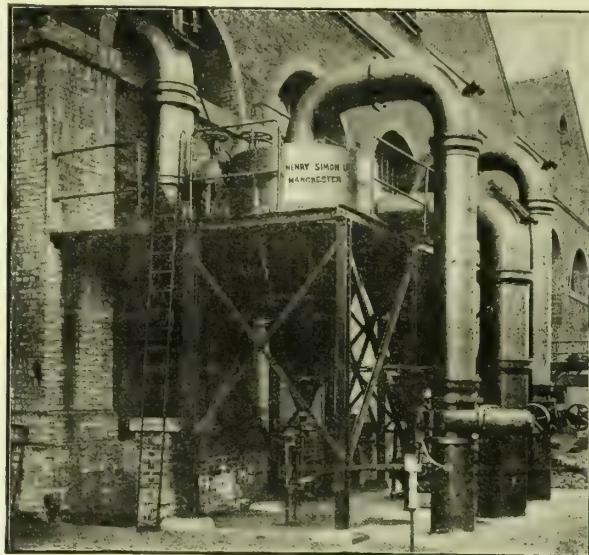
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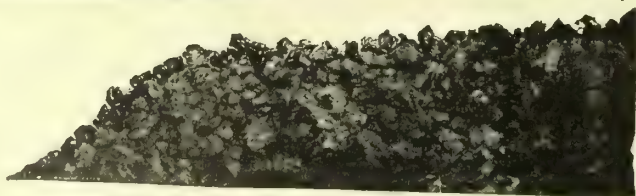
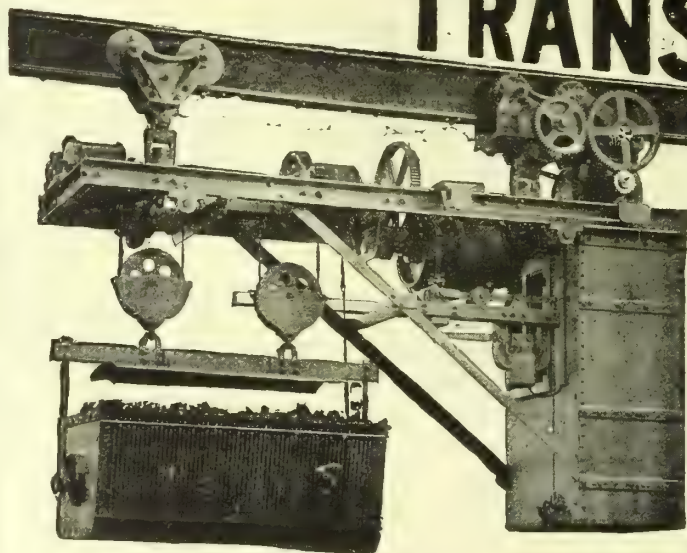
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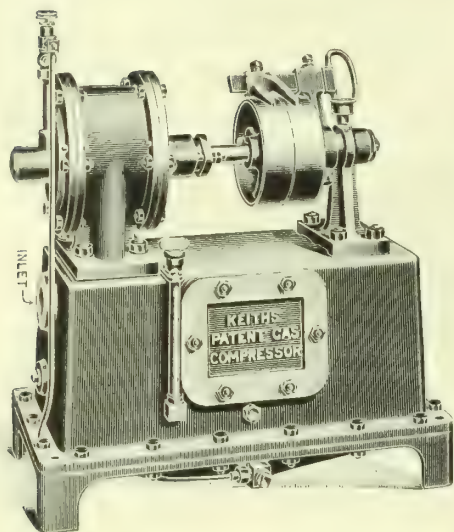
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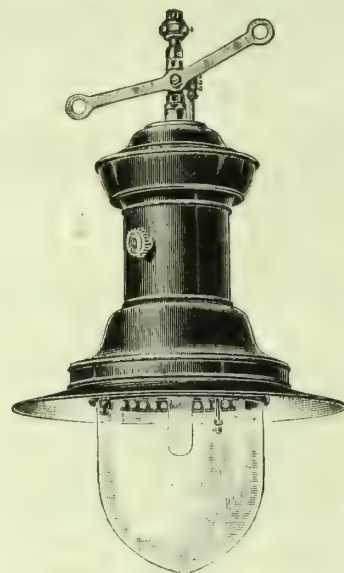
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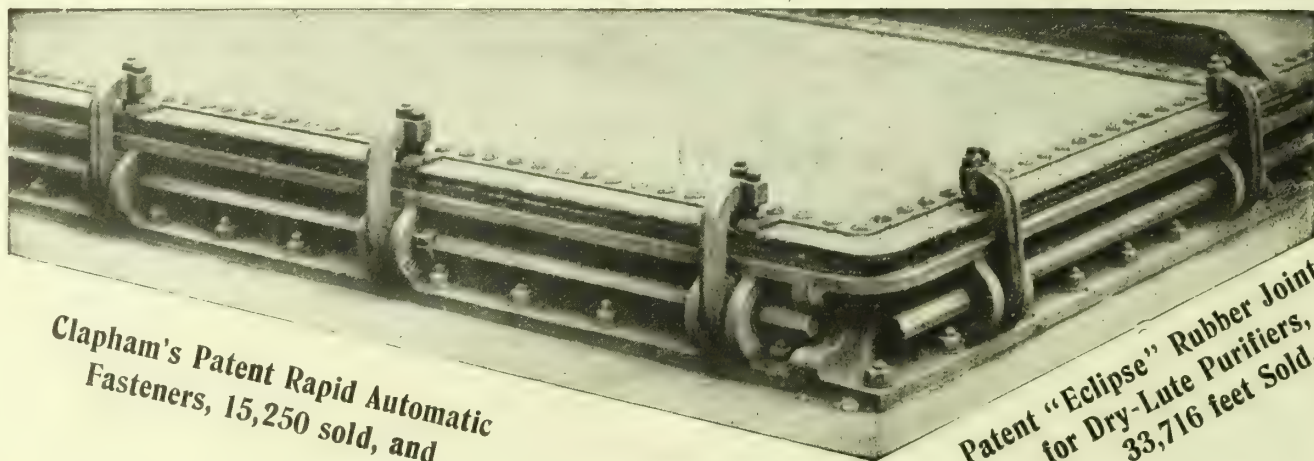
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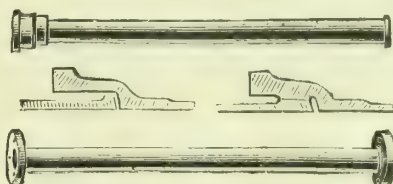
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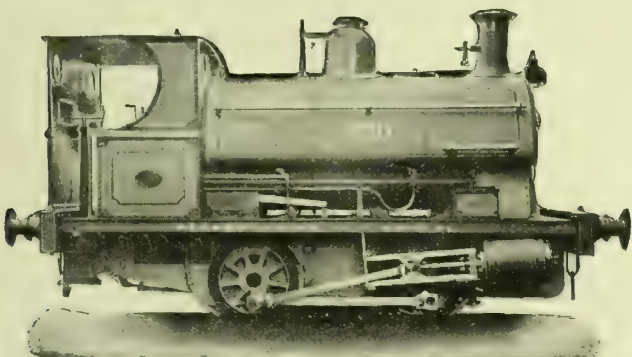
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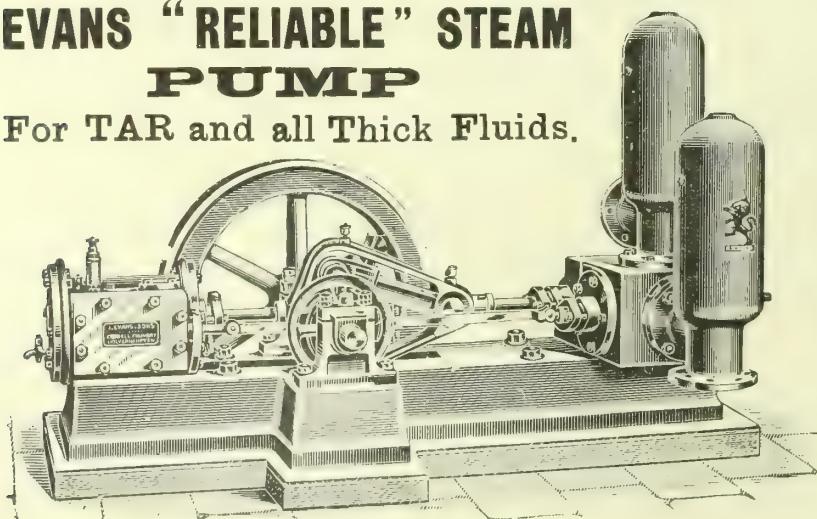
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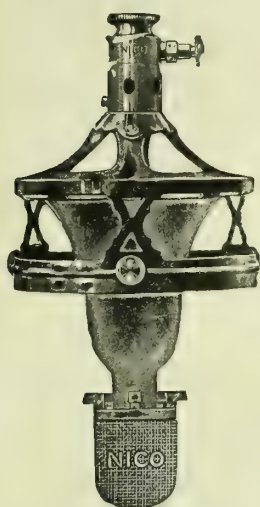
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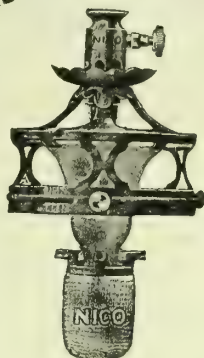
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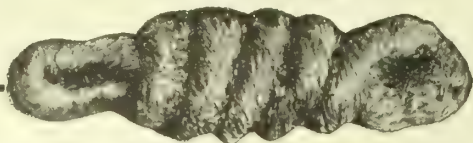
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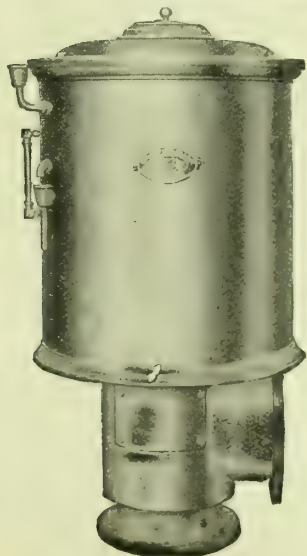


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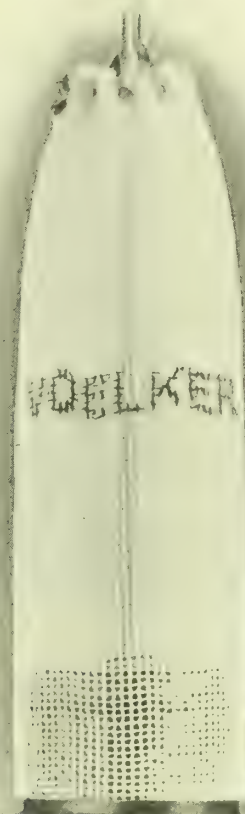
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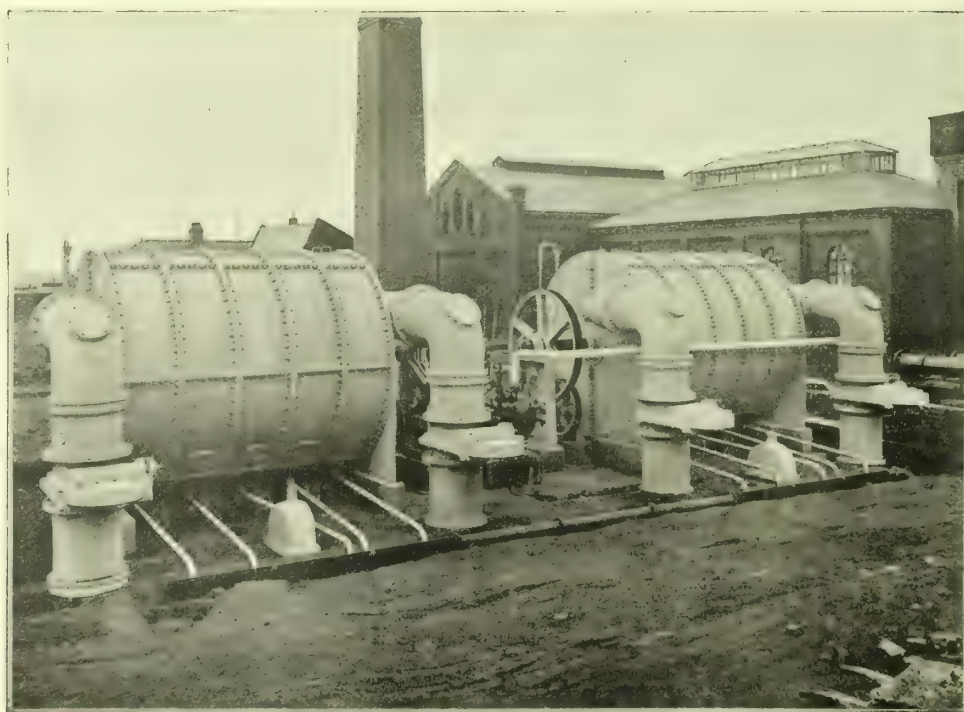
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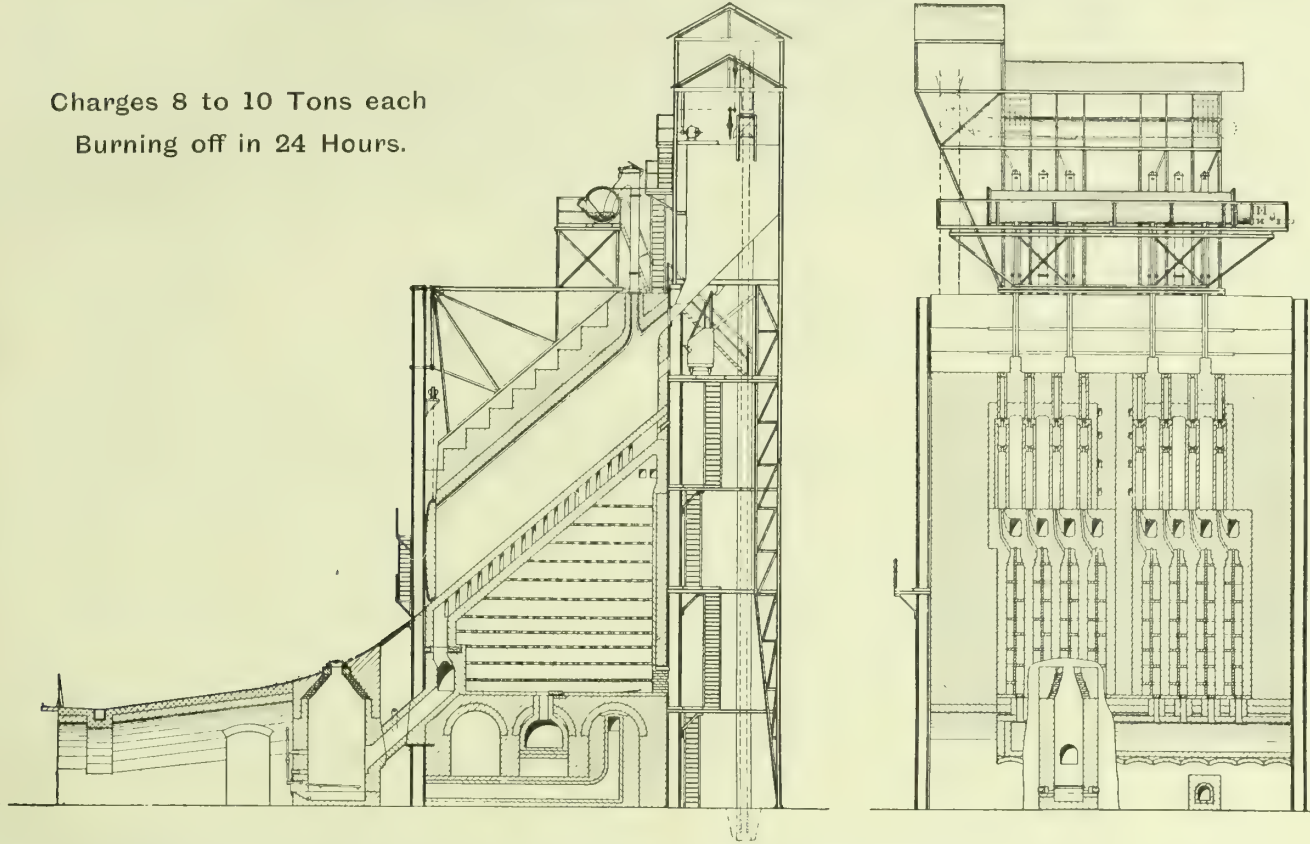
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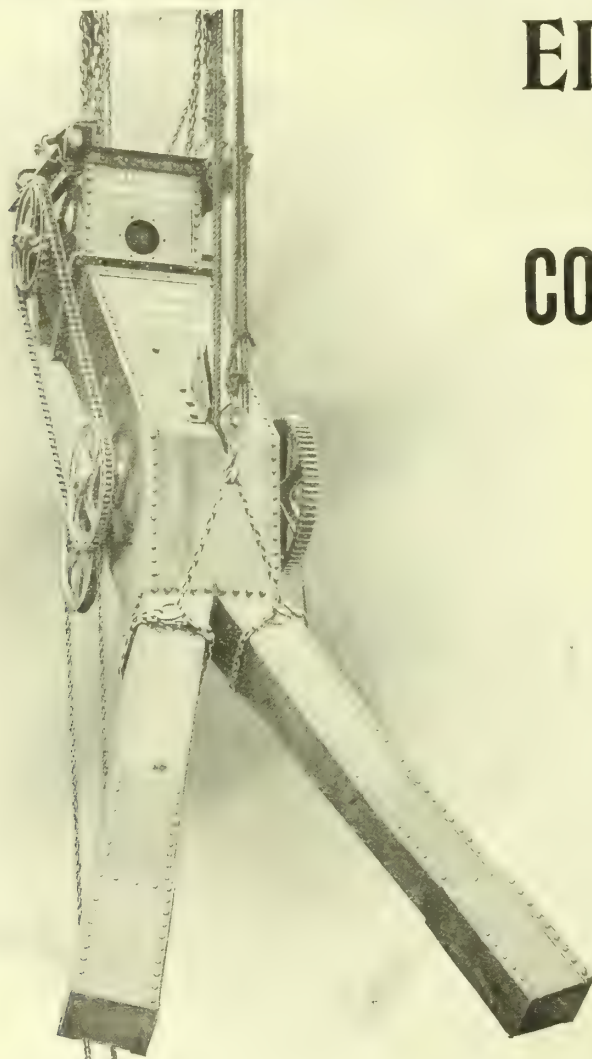
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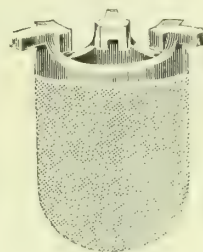
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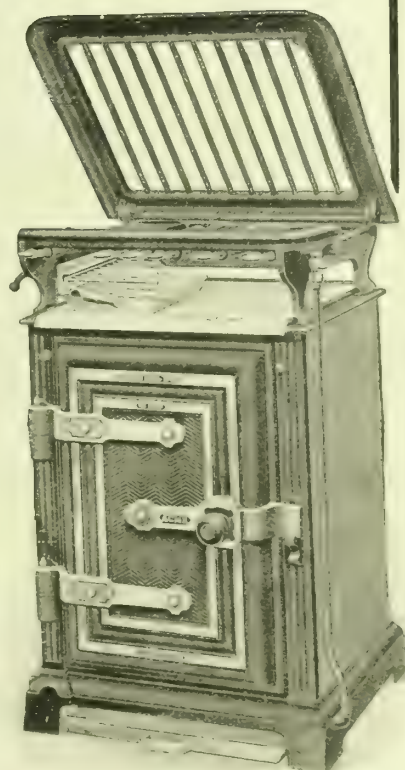
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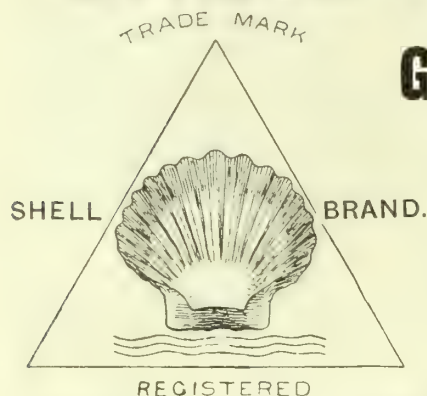
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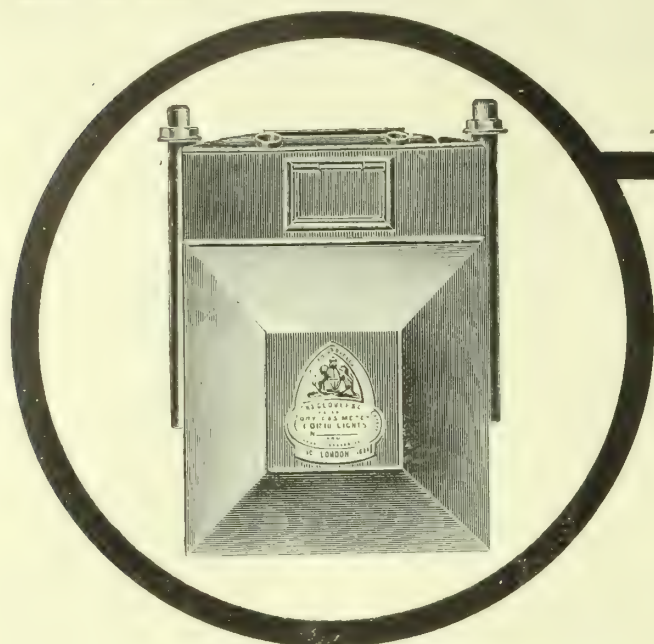
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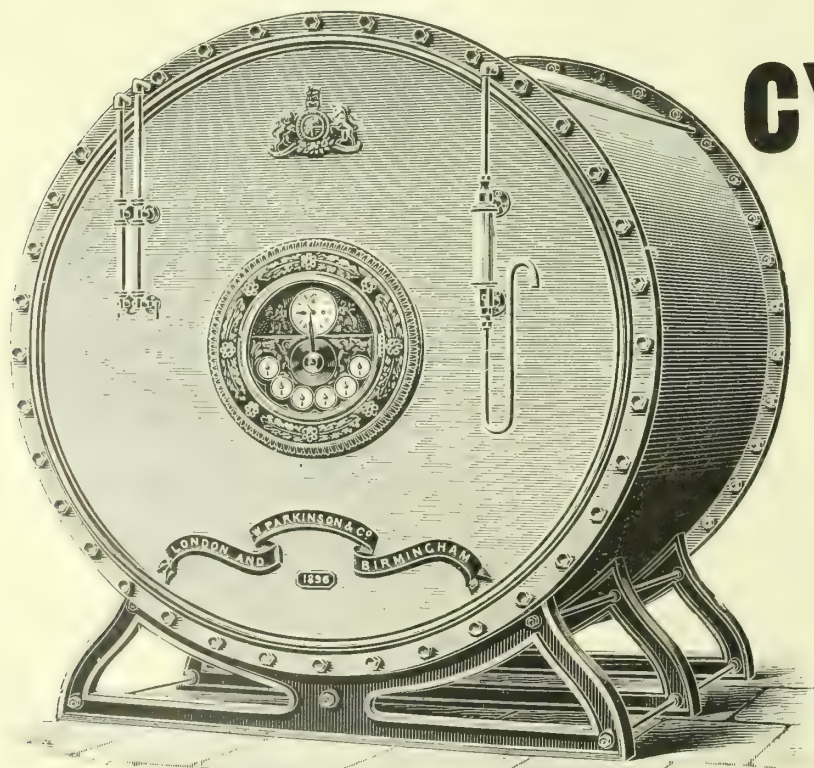
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VOL. CXI., No. 2463.—TUESDAY, JULY 26, 1910.

EDITORIAL NOTES—GAS, &c.

The Burner Victory—And After.

THE victory gained by the Companies who promoted the Standard Burner Bills is so complete, and the overthrow of the opponents so overwhelming, that we feel it our bounden duty to carry the matter a step beyond the point at which it was left in our editorial columns last week. Although the victory is, in the first instance, as complete a one as has ever been gained in the Committee rooms, it is really a victory for the whole gas industry, not only in special relation to the standard burner, but in general relation to other questions of great importance where the issue has to be decided by considerations of commonsense and of justice to a branch of industry which it has too long been the practice, in certain quarters, to malign.

The question that must be to-day uppermost in the minds of those in the technical offices of the gas industry is, What prospective use can be made of the present victory? The resolute commonsense of the House of Commons Committee who adjudicated upon the cases for and against the Joint Burner Bills, as well as their sense of justice, led them to formulate their decision in terms that leave gas companies who have not yet obtained the privilege, or rather the right, of having the illuminating quality of the gas they supply "measured" by a just measure, no alternative but to immediately take the necessary steps to secure it. The right—let this be marked—can now be had for the mere asking. As a matter of fact, we understand that already some companies are moving in this direction; and it is sincerely hoped that the mistake of belated action made in connection with the promotion of the Bills which have been lately occupying so much of our serious attention will not be repeated. The mistake, to be more explicit, was that the resolution to promote a Bill or Bills in the session now fast drawing to a close (the first part of it, at any rate) was arrived at too late to secure the adhesion of anything like the full number of companies who would otherwise have desired to join in the promotion. Obviously the greater the number of companies uniting for this purpose, the less is the expense incurred by the individual companies.

There can now be no room for fear as to the fate of any Bill or Bills which it may be determined to promote. Any and every objection which could possibly be urged, even by the most exacting and narrow-minded local authority has been raised in the course of the recent inquiry. We know with what result. The luminous and unanimous decision of the Commons Committee places the successful result of any future Bill on the subject beyond question, even if there should be opposition, which we can scarcely think any local authority would be likely to offer under the circumstances. Feeling this most sincerely, induces us to say that the Gas Companies' Protection Association (the Chairman of which is Mr. H. E. Jones, whose co-operation throughout the long struggle has been invaluable) owe it to themselves, to the gas industry, and above all to the memory of the late Sir George Livesey—the founder and the first Chairman of the Association—not to let the matter sleep. In the hour of victory, do not let us forget that it was this great leader who first showed the way with the perspicacity and courage that stamped his every action in connection with any movement with which he was identified; and we feel sure that to an appeal to the Association to give its *imprimatur* to the promotion of a Bill in the session of 1911, for the purpose of securing to other companies the opportunity of reaping the harvest of the seed sown in the current session, there will be a very ready response. When it is remembered that perhaps 75 per cent. of the total number of statutory undertakings in the kingdom are at this moment having, and will continue to have (unless they get their Acts changed), their gas tested by burners now formally condemned, it will be seen that there is much yet to be done before the gas in-

dustry, as a whole, is put upon a sound and sensible footing in this respect. When that is done, the way will be clear for the still larger change to which the Chairman of the House of Commons Committee referred more than once during the recent proceedings—namely, the abolition of all tests for illuminating quality and the substitution of a calorific standard.

We therefore urge every company, no less in the interests of their consumers as in their own interests, who have not yet secured the right to have their gas tested by the new standard burner, to lose no time in securing it; and we would suggest that the furtherance of any such movement will be hastened by communicating at once with the Secretary of the Gas Companies' Protection Association, Mr. F. E. Cooper (5, Victoria Street, S.W.), and asking for any information that may be desired. From previous experience, we know there will be a willing and immediate response.

Blocking the Burner Bills in the House.

THE chagrin of the opposition to the Standard Burner Bills at their perfect defeat has found vent in a number of notices against the measures on their introduction for third reading. These notices appeared in the "Votes" last week; and were first entered for consideration on Friday, and subsequently for yesterday afternoon. Then they were successively objected to; and so were again postponed—until to-day. These proceedings on the part of the opposition were threatened when smarting in the Committee-rooms under the first blow of the complete victory of the promoters, and consequently their own discomfiture and condemnation. The notices have for their purpose first the destruction of the Bills; or, failing that, their amendment by inserting a clause to ensure that, from Jan. 1 next, the price of gas in the case of each of the promoting companies "shall be such "as will secure that the consumers of the company shall "not be prejudiced by the provisions of this Act"—the price to be charged to be by agreement between the local authorities and companies concerned, or, failing agreement, fixed by an arbitrator agreed upon by the parties, or alternatively appointed by the Board of Trade. Another requirement is the deletion of the Liverpool Gas Company from Bill No. 1. Regarding the unjust proposal as to amendment by making the price to be charged for gas dependent not upon administrative judgment as controlled by the Companies' private statutes, but upon outside influences and judgment, it is on a level with all the attempts of the local authorities at inflicting injustice upon the promoters throughout the earlier course of the measures, and which attempts were rendered altogether nugatory by their obvious intention. Just as well might the Companies claim the right of fixing the amounts of the rates that the local governing bodies (who are also their competitors in business) impose upon the community. But there is no likelihood of anything on third reading but the entire ratification of the decision of the Committee by the House. The Bills were referred to them by a special vote on Second Reading; and the Committee have given their decision. That decision was unanimous, and reasons were adduced for it. Such a decision the Government and the House are bound to respect and uphold.

From the Scenes of their Labours.

ONE by one those who have led the gas industry in the years ago are passing from our midst—honoured and mourned not only by those near to them by the ties of kinship, but by those of the industry for which they laboured. We need look but a little way back in our rolls of the departed to find there inscribed the names of Livesey, Foulis, Valon, and Alfred Colson; and now, sorrowfully, we have to append that of George Careless Trewby. What a fund of memories these names arouse; and what a considerable part their owners, each in his especial place and according to his light and opportunities, played in making history for the industry! It can with truth be said of these contemporaries in the gas profession that, though they are dead, their work

liveth. They all helped, in greater or less degree, to make the gas industry what it is to-day; and their examples are an inspiration to the carrying on of the work they have laid down with that same broad-minded progressivism that they themselves displayed, in which the animating source was the desire that their work should be of real lasting benefit in the development of the industry into which they had thrown their lot.

There are few living to-day in the gas profession who entered it 57 years ago, as did Mr. Trewby, when he became pupil to Mr. F. J. Evans, the accomplished gas engineer who laid the foundations of Beckton; and there was an uninterrupted official identification of Mr. Trewby with the gas industry from the time when he completed his articles to the day of his retirement from the position of chief technical official of the Gaslight and Coke Company. There was, in fact, only the short severance of service in that Company during the few years, early in his professional career, that our now deceased friend spent in Constantinople and at Brentford. But from 1865 to 1904, the record of service for the Company was unbroken. Not astonishing was it that the large Company in 1900, when first there was definite talk about the retirement of Mr. Trewby, should have found difficulty in replacing experience and knowledge so unique as that possessed by their Technical Chief. Capacity of the right order in the gas industry there undoubtedly was; but the most gifted capacity could not be dumped into the responsible position without experience of the particular conditions. And so the length of liberty from responsibility was shortened by the four years from 1900 to 1904, during which Mr. Goulden was making complete his qualifications as prospective successor by garnering experience at the head office in association with his chief.

Among his professional colleagues, there was always an amount of sympathy with Mr. Trewby in his position under the old *régime* of the Company. The whole system of administration was such, for the major part of the time he was the Technical Chief of the manufacturing department, that he was shorn of as much responsibility and power as possible. Under the circumstances, the Company were bound to, as it did, suffer. And it fell into concrete practices into which it was difficult to introduce and insist upon the economies from which other gas companies were reaping reward. The noxious weeds of custom, cherished by an autocratic, inexorable, and technically untrained management, choked all the efforts of the chief to produce reformation. All this has changed under the new *régime*. But this we must say for Mr. Trewby, that where he was denied greater success by a system that confined his actions and power, there his successor and the new administration have reaped copiously of economy and profit. The financial solidification by leaps and bounds of the past few years is the greatest condemnation that could possibly have been produced of the system under which Mr. Trewby chafed so many years, and which system, objectionable as it was to him, he had often to defend in the Parliamentary Committee-Rooms out of very loyalty to the Company with whom he had thrown his lot. Had it not been for him, things would have been much worse than they were; and until the present Governor (Mr. Corbet Woodall) appeared on the scene, first as an ordinary Director, Mr. Trewby had to struggle single-handed with those baneful things which he knew only too well existed, and for the survival of which, through his reserve, professional pride, and conscientious loyalty, many censorious ones were (as is all too frequently the case, without full knowledge) prone to blame the technical head.

But he has gone from us, after a few years' rest from the turmoils and the hardships of a long official life largely spent under (we are glad to say) exceptional circumstances. He did much good constructional work in his day, about which something is said elsewhere; and he was a firm friend and ardent supporter of those who were in a position to work more openly and more prominently than he for the common welfare of the industry. He filled (we claim, ably) a position which few could, or would, have filled under like circumstances; and those of his contemporaries who knew him best revered him for it. A happier professional sphere than was a large part of his, needs no forced conception, for such exist freely around us; but that this sphere could have been more honourably or conscientiously occupied, with the repressive influences at every point, cannot be gainsaid by anyone who was intimately acquainted with him—one of the technical builders of the industry—who has so recently passed to his eternal rest.

Some Effects of Change and Experience.

PERFUNCTORINESS is not a characteristic of Heer J. van Rossum du Chattel, the Engineer of the Amsterdam Municipal Gas-Works. He is an Engineer with reasons for all that he does; he is also a critical observer of the current trend of matters in the gas industry. His address as President of the Institution of Dutch Gas Engineers exhibits this particular trait of critical observation. The address induces reflection. It is remarkable how largely in the gas industry new developments and new experiences have undermined, and in part destroyed, long-established doctrines and practices. It is also noteworthy how considerably, in the study of cause and effect, one can in the latter frequently trace the former. The disasters of Hamburg and Geneva are fresh in the memory of Heer du Chattel, as they are in the memories of all gas engineers who are interested in the affairs of, and gather experiences from, the larger world outside their own works' gates and supply areas. Those disasters have their lessons for the gas engineer. The effects of the accidents tell us, in the first place, of the wisdom of not having gas-works overcrowded, of having plenty of room between the various parts of the plant, and of making a well-considered allocation of one part in relation to another for the prevention of the spread of the effects of accidents. Extension work at as cheap a rate as possible is responsible for the bunching together of buildings and plant, and the creation of uneconomical conditions under which to carry on operations, and at the same time of conditions that increase risks. Therefore, having regard to the accidents at Hamburg and Geneva, Heer du Chattel advises that the necessity of room for safety about gas-works should be considered as of importance equal to the provision of extensions themselves. Another thing he counsels is, as the result of his observation of the causes of accident, that no engineer should put perfect trust in the gas-tightness of his valves. Then one looks to Paris, and to the effects of the recent floods (when in large districts, in the hour of their sorest need, the inhabitants were deprived of both gas and electricity); and a nasty shock is administered to the ancient rule as to the placing of gas-works at the lowest, or nearly the lowest, level in the area of supply. But, fortunately, such devastating floods are not of very frequent occurrence; while the maintenance of pressure, and the getting of all possible pressure advantage naturally by the low-level situation of works, have continuous importance, as has also the availability of a waterway (also generally found, where such exist, at about the lowest level of a district) for transport purposes.

There is also a reference in the address to recent strikes at Continental gas-works, and to the successes of the administrations of those works in the struggles. Indubitably, it can be said that these successes are largely due to the changed conditions on gas-works themselves. The larger use of labour-saving machinery in manufacture, the receding dependence on labour per unit of product, are to the good on the side of employers in any concerted contest with unreasonable employees. It has also to be remembered that, while the gas industry is as dependent as ever on labour, and indeed now in the total employ more hands than formerly, the changed circumstances have made an alteration in the classes and the disposition of labour employed. The stokers and yardmen in a gas-works were at one time all-powerful. Where there is mechanical operation, and under the new methods of carbonization and material handling, they are so no longer—either in numbers in relation to the total of the employees, or in the matter of the requisite skill needed for the work. In numbers, they are greatly over-weighted in the other departments by men, mostly artisans, of an altogether different stamp—men who are not so easily moved to quarrel with the occupation that produces their daily bread without, at any rate, a certain amount of cause that they feel can be appreciated when examined from their point of view. The retort-house men and yardmen were the ones formerly most susceptible to discontent, unrest, and ruptured relations with their employers. The transfer, however, from one side to the other of the weights of the elements in the composition of employment has had its effect, combined with other considerations—such as improved pay and more congenial environment—in both extending composure and lessening those disturbances in gas-works that were in the past heard of more frequently than now.

In another part of the address, Heer du Chattel places his finger upon various points in the operations of a gas undertaking where improvement and development must be sought

for, so that ground may not be lost. We cannot afford to sit still, without putting forth some effort in self-protection, while, for instance, the residuals markets are being invaded so largely as is the case by the products of recovery coke-ovens. Only recently, we saw how big was the addition from this source to the available supply of sulphate of ammonia last year; and Heer du Chattel alludes to the extra burden placed on an already over-burdened tar market from the same quarter. We cannot, nor should we desire to, stop the progress of the world's economy in any one direction, nor the increased supplies of commodities issuing from that economy. But when it affects market values, the line of action is to see whether fresh compensating outlets cannot be discovered. For tar, Heer du Chattel says "briquettes." Of briquettes we have heard for decades past; but the demand for them has never, so far as we have been able to detect, had any appreciable effect on the absorption of tar. While speaking of the secondary products of gas manufacture, we have it from the President of the Dutch Institution that, in his opinion, coalite is not going to affect gas undertakings. It is palpable that he does not regard the process as an economical one. Quite apart from the direct results of the so-called arrested-temperature carbonization, more than twice the quantity of coal has to be handled in comparison with that required for gas production by the ordinary processes, and the storage required for the inflated material named coalite when there is not a ready sale (as in the summer) is considerable. Neither commercially nor technically, can experienced carbonizers regard the process as economical. Looking to other directions, change calls for the production of greater facility in the matter of cleaning and maintaining in good condition inverted incandescent gas-burners. The efficiency and the economy of the burners are good; and there ought to be a little fortune for someone who is clever enough to invent means for reducing the labour required in connection with them. We do not think that consumers have had sufficient information communicated to them as to the service of the needle regulator in keeping clear the nipples of the burners. Although the address is only compounded of points produced by observation, it is certainly highly suggestive.

The Consultants' Preserves.

THERE appears to be much that is rather ambiguous about the objects of the new Association of Consulting Engineers, to the formation of which reference was made in our columns last week. Though the matter of the creation of such an organization has been under consideration for the past two years, information concerning it is, on the matter being made public, of the most superficial and airy kind; and we have misgivings as to whether any such organization in connection with such a profession as engineering will benefit the members or anyone else—anyway, in the gas industry. The cardinal intention seems to be to form a sort of close preserve within a high ring-fence; while the published objects are the protection of consultants, the protection of the public by keeping out incompetents, and guarding against malpractices and unprofessional conduct. The objects are partly selfish, partly good. But when the year 1910 has arrived, and the world has made vast progress through engineering knowledge, without the assistance of any such body, the necessity for its creation now seems to be no more pressing than it was (say) two or three decades ago, other than that a larger number of men now profess and call themselves consultants, and a larger number of men in official engineering capacity supplement their incomes by developing a consulting practice.

As we understand the exact position, membership of the Association of Consulting Engineers is to be limited to those who are members of the Institution of Civil Engineers, and who are engaged purely as consulting engineers. This draws the rope pretty tightly round those who the founders of the Association are prepared to admit to membership. In the Institution of Gas Engineers, we have many who are members of the Institution of Civil Engineers, whose incomes are partly derived from official service, and partly from consulting work. From membership of the new Association, these are apparently to be interdicted. But we do not think it will make an atom of difference to them; and they will be in a position to smile broadly at the ring-fence over which their position will prevent them climbing. The gas industry would set its face very sternly against any attempt to suppress those men who are not at present engaged

solely as consultants, but who from their position in daily practice and from their capacity are very much qualified to act as consultants. In the gas industry, we all know very well the men who from their practice past and present and their experience are fully competent to act as consultants; and no register of membership of the Association of Consulting Engineers will need to be investigated as a certificate or advertisement of their credentials and probity. Therefore so far as the gas industry is concerned, there is no real use for the new Association. In gas, electrical, and water engineering, there is no similarity between the positions of consulting engineers and the members of the medical and legal professions. In the two latter, the organizations that have been formed for their protection and the protection of the public incorporate all who through qualification certified by examination are in practice; and there is no discrimination. In the branches of gas, electrical, and water engineering, those who are in practice purely as consultants form only a section of the whole of these specialized professions; and it may be that, for special purposes, there are men in official service whose experience would be more valuable than that of the engineer whose work is purely and solely consultative. There is no sense whatever in attempting, as has been attempted, to set up a parallel between consulting engineers and medical and legal practitioners.

One of the professed aims of the new body is the protection of the public, if the public will accept the Association's own estimate as to its capacity for protecting them, which we doubt. The public will see in the Association a self-constituted tribunal as to competency—a tribunal strongly dominated by self-interest; and there is doubt as to the public accepting the Association upon its own qualification valuation in this respect. The Association will have no power to prevent local authorities, companies, or private individuals from employing whom they like; and whatever the Association may do cannot stop the infraction of the unwritten law as to touting for professional work, or check the writing of "C.E." after the name of the draughtsman, or the man who has had a few jobs as clerk of works. Membership of the Association can be no more a guarantee against malpractices or violation of professional etiquette than is membership of the Church or other religious body against ethical offences. As a matter of fact, the Association may be, by some with elastic consciences, made the palladium for professional transgression; and it is a very big question whether such an Association would be powerful enough to deal with matters affecting the personal honour of anyone who had been admitted to membership, unless it was of such notoriety that the Council felt themselves on particularly safe ground. It is thought, too, that membership of such an Association will carry weight in Courts of Law and before other tribunals. There will be just as much weight as ever there was given to the views of men who hold official positions of high engineering responsibility. We are also inclined to the view that local authorities, companies, and individuals from among whom clients are drawn will be prone to associate expense with a body designedly formed primarily to protect its members.

Corporation Conditions at Manchester.

A report which has been long looked-for was a few days ago issued by the Special Committee of the Manchester Corporation who have had the matter under consideration, relative to the conditions of service of the officials. It may be recalled that last March, the consideration of proposed advances of salary was deferred pending the report of the Special Committee, who state that in the course of their investigations attention was given to information obtained from municipal and civil service authorities. It was, however, felt that, owing to administrative differences, a common basis hardly existed for comparative purposes. As a result of the deliberations, a series of resolutions are submitted for confirmation by the Council. The effect of these is that no person holding the position of consultant is to be included; that, in formulating proposals as to salaries and wages for adoption by the Council, the Committee contemplate that they will be operative for at least five years, and that there will be no variations therefrom in the future without the express sanction of the Council; that all advances be annually considered by the different Committees; that where the maximum salary or wages fixed for any position is less than that received by the present

occupant of such position, the existing holder shall continue in office at the present salary or wages; and, in the case of the promotion of an official, it shall be competent for the employing Committee, if the official is then in receipt of a higher salary or wages than the minimum for the new appointment, to start such official at a higher remuneration than the minimum that is stated for the position. The Committee then proceed to suggest various alterations of the existing standing orders as to salaries and wages, and the exemption of the police, fire brigade, and persons employed by the Education Committee, and to re-affirm recommendations in an interim report of some months ago, which have already been approved by the Council. These recommendations are that a preliminary open competitive examination be necessary to qualify for an official position in the Corporation service; that a retiring age should be fixed, as well as some form of retiring allowance; and that future appointments of permanent employees under the age of twenty-one should be subject to the applicant passing a satisfactory medical examination. The Committee feel that the consideration of the questions of a retiring age and a retiring allowance should be deferred until the other recommendations contained in the report have received the approval of the Council. Office hours and holidays are dealt with; and a scale of pay is set forth for officials. In many cases the ultimate effect of the adoption of the scale would mean a saving on present salaries; but, of course, as already remarked, it is not proposed in any instance to interfere with the remuneration of existing officers—the revised scale being intended to apply only to new appointments. The report is apparently causing a good deal of dissatisfaction.

Growth of the Rates.

The growing increase in rates, owing to Parliament passing Statutes throwing upon local authorities increased expenditure in connection with education and other services of a semi-national character, without making provision for some equitable contribution from the Imperial Exchequer, has been the subject of a conference at Preston of representatives of educational and other authorities. The chair was taken by Sir Henry Hibbert, who expressed the opinion that it was of great importance to let ratepayers know that a large proportion of the recent increase in the rates was owing to Parliament not paying its fair share for services rendered by the local authorities to the nation, and to their hands being forced by Government departments to incur expenditure which they might otherwise have avoided. They objected strongly to the growing increase in the rates owing to Parliament throwing increased expenditure on to the local authorities, without making provision for some equitable contribution from the Imperial Exchequer. The feeling which he himself had on the matter was that, in face of the present growing charges for education, no new expenditure should be placed upon local authorities, unless the Government itself was prepared to pay about two-thirds towards it. This may be a very good suggestion; but meanwhile the ordinary ratepayer will probably be inclined to say that the total amount of the rates is what he is chiefly concerned with, and if increases are necessary in the directions pointed to, he would like to see reductions made in others. It is quite true, as the Chairman said, that Lancashire is not alone in its protest against the increased expenditure placed upon the shoulders of the ratepayers every year. One speaker thought the mind of the conference might be summed up in the very short sentence: "We want more money and less interference;" while another said they might protest and protest, but they would never do anything unless they fought the Board of Education—it was no use passing pious resolutions. However, a lengthy (and perhaps pious) resolution was adopted ultimately, in the following terms: "That the conference should call the attention of ratepayers throughout the county to the growing increase in the rates, owing to Parliament passing Statutes throwing upon local authorities increased expenditure in connection with education and other services of a semi-national character, without making provision for an equitable contribution from the Imperial Exchequer, and also owing to the arbitrary action of Government Departments in forcing expenditure on the local authorities against their judgment, and without regard to the capacity of the ratepayers to bear the increased burdens; and, further, that the time has arrived for a united and strong stand to be made by local authorities against the tendency of the Board of Education and some other Government departments to endeavour

gradually to transfer the direction and control of expenditure out of rates to a bureaucracy in London, and so to undermine the principles on which local administration has been founded." An Executive Committee was also appointed.

The Law of Compensation.

On many occasions attention has been drawn in different quarters to decisions in regard to claims under the Workmen's Compensation Acts; and it will be admitted that even now a good deal of uncertainty remains. This is a matter to which last week "The Times" drew attention in a leading article, that opened by pointing out that the Courts continue to wrestle more or less successfully with the meaning of the Workmen's Compensation Act, and to extract from apparently simple words somewhat surprising results. The typical course of proceedings is, says our contemporary, a finding by the County Court Judge as to a certain mixed question of law and fact; prompt reversal by the Court of Appeal, or, at all events, disagreement among its members; followed by reversal in the House of Lords, or disagreement among the Law Lords. If this is the case—and there has been no lack of evidence to prove that it is—can there be any wonder that litigants, and others who have followed the proceedings at all closely, have felt bewildered? Of course, under the earlier Acts, all sorts of points had to be decided—such as "What is a building?" and other problems of a similar character. Now, however, the question that chiefly arises is as to whether an accident arises out of and in the course of the sufferer's employment; and it is difficult to see how litigation on this head can ever be altogether obviated—as long as the Act remains as at present. That there is a tendency to make these words bear the widest possible meaning is evident. In fact, as "The Times" remarks, it cannot be denied that there is a subtly operating temptation to slide into a vein of uncritical generosity, and to strain, sometimes to breaking point, facts and law to the benefit of the claimant. While admitting it would have been unfortunate if the statutory remedy had been cut down to accidents occurring while a worker's tools were in his hands, it is pointed out that perplexity must arise when the remedy is extended to cases in which the workman's duties are apparently over or distinctly interrupted. That the benefits of the Act are being so extended is clear—as the decision in a case which is cited proves. A stoker on board a vessel lying in port went on shore to buy some things of which he was in need. He had some drink; and when returning to the ship by a ladder laid from it to the quay, he fell into the water and was drowned. By a majority, the Law Lords have held that this was an accident arising out of and in the course of his employment. If the provisions of the Act are capable of so wide a construction, it seems hopeless to expect any other than conflicts of judicial opinion. The question of what constitutes an accident has also been similarly generously dealt with; and altogether whatever employers may have to say, workmen have little cause to find fault with the way the Compensation Acts have been administered. At the same time, there should be general agreement with the assertion in the article referred to that no one would maintain it was justifiable that, the Legislature not having thought fit to give under the Act of 1906 an unqualified right of compensation to workmen, Judges should as far as possible repair the defect, and covertly give what they have not openly got.

Results of the Patents Act.

Though in some respects opinions may differ as to the operation of the Patent Law, it is unlikely that there will be any other feeling than satisfaction on the part of inhabitants of the United Kingdom when perusing particulars which have been compiled by Messrs. Leopold Farmer and Sons, and published in the "Financial Times," with respect to the working of the Patents and Designs Act of 1907. The duties which this Act imposed on foreign holders of patents, of opening works in this country, instead of merely importing the finished articles as hitherto, are so well known by this time that it is unnecessary to set them forth; but it is in connection with this provision that the statistics have been prepared. The firm named, who are well-known as surveyors and factory specialists, remark that, through their instrumentality in fixing up foreign patent holders, and their close contact with the working of the Act, they are able to summarize the results of the two-and-a-half years' working. They put the value of land and premises in this country acquired by such

patent holders for the purpose of fulfilling the conditions of the Act, at £198,000; the amount expended, and being expended, in buildings, housing workpeople, &c., at £320,000; and the outlay on plant, machinery and equipment, at £452,000. These figures mean that practically £1,000,000 is invested in this country by foreign holders of patents, in consequence of the passing of the Act. The value of the annual assessment on which rates will be paid is put at £60,000; and the amount contributed per annum as rates, at £20,000. Then it is calculated the works referred to will give employment to about 8200 male and female workpeople, and that the weekly wages bill will amount to over £9000. The number of foreign firms working under these conditions is 40; and in addition there are 25 English firms manufacturing for foreign firms on a royalty basis. The trades are, of course, very varied in character; and the firms concerned are of German, American, Swiss, Dutch, and French nationality. The works are distributed pretty well all over the country; and besides those included in the statistics, it is pointed out that there are several firms at present on the look-out for factories.

The New "Mars" Inverted Burner.

In a communication to the Société Technique du Gaz, M. Cramer, the inventor of the "Mars" burner, described the improvements made since its introduction last September. In indicating to the members the features of the perfected burner, he referred to the causes, technical and commercial, of the slight favour accorded to burners of the inverted type by makers in France. The chief of these were stated to be the adoption of a lateral admission of air and the want of an adjustable injector. Makers were, he said, compelled to construct burners of the lateral air-supply type owing to the existence of patent rights in those having direct air supply; but the latter having recently been declared void, he now makes the "Mars" burner on these lines, and has, moreover, worked out an adjustable injector. The chief points of superiority claimed for the new burner over the one first placed on the market are these: Direct air supply similar to that of an upright burner, and with a small gauzed inlet chamber to break the sudden access of air and prevent lighting-back in the bunsen tube. In consequence of the adoption of this form, the burner can be made of better appearance. The adjustable injector is so contrived that the burner remains fixed and the adjustment made, even while the burner is alight, by the horizontal shifting of a small handle provided with a non-conducting knob. The novel feature of the injector is the application of a stuffing-box between the two parts, which ensures tightness of the injector, and retains its parts in absolute alignment. The burner is likewise fitted with an adjustable air supply, which prevents noise during use, of which complaint was sometimes made in the case of the burner constructed according to the previous model. Lastly, the burner tip is made of magnesia. This allows of the tip being attached by a fairly coarse screw-thread; thus remedying the liability, which was a defect in the original burner, of the tip to become detached owing to the expansion caused by the heat.

At the Hotel Great Central, Marylebone, last Tuesday, Mr. Rees Jeffreys was entertained at a farewell dinner by the Motor Union of Great Britain and Ireland, on his relinquishing the position of Secretary of the Union to take up the secretaryship of the Road Board. Mr. W. Joynson Hicks, who presided, proposed the health of Mr. Jeffreys, and made a presentation to him of an inscribed gold stop-watch and a cheque for £500. He said that in Mr. Jeffreys they had a born organizer. He had organized and brought to great practical success several bodies, including the Motor Union, the Incorporated Institution of Automobile Engineers, the Commercial Motor Users' Association, and the Roads Improvement Association; and he was mainly responsible for the formation of the Motor Union Insurance Company. No one had done more for the improvement of roads.

About a year ago, Dr. Putzeys, Professor of Hygiene at the Liège University, M. Putzeys, the Chief Engineer of the City of Brussels, and M. Rutot announced the discovery in the Campine region of a subterranean sheet of water of considerable extent, which would suffice for the supply of all Lower Belgium. To determine if this announcement was justified, the Government immediately decided to have borings made so as to ascertain as exactly as possible the volume of water in this underground reservoir and of arranging for its utilization. The soundings have now been completed, and the results published. According to some particulars in the Engineering Supplement to "The Times," the area of the reservoir is, in round figures, 160,500 acres, and has been found to be from 80 to 100 feet deep. The hygienic quality of the water has been carefully investigated, and, although slightly ferruginous, it has been shown to be exceedingly pure, owing to the filtering properties of the soil. MM. Putzeys and Rutot prove that this underground lake provides the only source capable of supplying water to the population of the provinces of Antwerp and Flanders.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 281.)

THE Stock Exchange had a quieter time last week, and gave off some signs of the approaching slack season, which seems inclined to begin earlier and earlier every year. Perhaps, too, there was some reaction after the strain of the previous week's settlement, and some relief felt that it was over as well as might be. The depressing factor last week was the monstrous railway strike, unheralded and, as yet, unexplained. This, with its potentialities for mischief, brought prices down. The opening was rather weak. Government issues were most irregular; Consols falling $\frac{1}{8}$. Rails drooped on further realization; and Americans closed weaker. Tuesday's business was on a light scale, most things continuing weak. Consols fell another $\frac{1}{8}$ for the account. Rails, of course, were pulled down by the strike; and Continental selling lowered the Foreign Market. On Wednesday, everything pointed downwards. Foreigners were no better; and, spite of some dividend announcements, the spread of the strike afflicted rails. Thursday opened heavy, but brightened up somewhat on rumours that the Associated Society were discountenancing the strike. Prices in Rails looked up; but there was not much movement elsewhere. The rumours proving true, Friday's tone became cheerful at the collapse of the strike, and some improving factors abroad aided the improvement. Government issues were brighter, and Consols firm; but before the close a disappointing dividend announcement and a sharp drop in Americans spoil the day. Saturday was but a dull day; many markets suffering from weakness caused to some extent by internal operations. In the Money Market, there was an ample supply to meet all the demands. Discount rates grew stiffer, but closed below the best of the week. Business in the Gas Market was well up to the mark without any holiday-advent falling off; and transactions were pretty evenly distributed. The tendency, too, was firm and buoyant. Several issues made moderate advances, while none showed a counter-march. In Gaslight and Coke issues, the ordinary was strong and active, with transactions ranging between 105 $\frac{1}{2}$ and 106 $\frac{1}{2}$. The quotation rose $\frac{1}{2}$, and might have gone still better if the announcement of dividend had come out earlier. In the secured issues, the maximum marked 88 $\frac{3}{4}$ and 89 $\frac{1}{2}$ (a rise of 1), the preference 104 $\frac{1}{2}$ and 104 $\frac{3}{4}$, the debenture from 80 $\frac{3}{4}$ to 81 $\frac{1}{2}$. South Metropolitan was $\frac{1}{2}$ higher, changing hands at from 120 $\frac{1}{2}$ to 122 $\frac{1}{2}$; and the debenture realized from 79 $\frac{1}{2}$ to 80 $\frac{1}{2}$. In Commercial, the debenture was done at 80 and 80 $\frac{1}{2}$. Among the Suburban and Provincial group, Brentford old made 254 $\frac{1}{2}$ (a rise of 1), British from 44 $\frac{1}{2}$ to 44 $\frac{3}{4}$, South Suburban 121 $\frac{1}{2}$ free, ditto debenture 120 $\frac{1}{2}$ free, and Tottenham "B" 114 and 114 $\frac{1}{2}$. Sheffield "C" marked 233. In the Continental companies, Imperial was 1 higher, at from 179 to 180 $\frac{1}{2}$, ditto debenture marked 94, Union 91, and European 23 $\frac{3}{4}$ and 24. Among the undertakings of the remoter world, Bombay realized 6 $\frac{1}{2}$ and 6 $\frac{5}{8}$, Cape Town 3, Primitiva 7 $\frac{1}{16}$ and 7 $\frac{7}{16}$, ditto preference from 51 $\frac{1}{16}$ to 51 $\frac{7}{16}$, Buenos Ayres debenture 97 $\frac{1}{4}$ (a rise of 1), and San Paulo preference 12 $\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Replying to the Extravaganza of Electricians—"Metalite" Lamp Developments and Company Promotion—Speculation in Wiring and Fittings—Public Lighting Profit Misconceptions—Abolition of the House Fire.

THE recent extravagant statements in electrical advertisement articles have had their reply in a two-column gas advertisement article that appeared in the "Daily Mail"—probably also in other papers—yesterday week; and through it the public will no doubt see the wisdom of not accepting as gospel the *ex parte* declarations of one commercial interest, without hearing what the other side has to say, and intelligently weighing the respective cases. The electricians in their public announcements are spoiling themselves by their wild flights of fancy, instead of keeping to facts; and their efforts must in the end redound to their disadvantage. The gas advertisement-article is headed "Economy in Lighting: Gas at its Worst Cheaper than Electricity at its Best." The article is signed by "John C. Kirkwood." We have an idea that that is not the true patronymic of the author, nor would the writer's god-fathers and godmother recognize in "John C." the individual whom they took under their wings in his nascent temporal stage. If we are correct in this surmise, that and the assertion that 2s. 2d. per 1000 cubic feet is the prevailing price of gas in London are the only two pieces of deception (the latter is probably only a slip of the pen) that are to be found in the article. Otherwise, one can conscientiously subscribe to all the remaining statements in the two columns. The writer of the article takes economy as the ground for the capital point in the case for gas lighting; he being sure—as we all are in the gas industry—that on the comparative costs of lighting, a plain word has been much needed. The writer does not follow the stupid blundering, vituperative methods of the electricians, and go bull-headed for the competitor. After a clear and frank statement as to how the public can compare the costs of lighting, he asks that his readers shall not think his attitude towards electricity as an illuminating agent is one of complete antagonism, and that, if he could, he would banish the electric lamp. All he tries to do, and successfully, is

to show that gas for lighting is very much more economical than electricity. In his writing there is nothing of the murderous intention as, for example, there was a week or so ago in the "Electrician," in a paragraph on the Osram lamp. Says that organ of high accomplishment in the art of politeness: "Its [the metallic filament lamp] economies have all along been appreciated; and now that the fragility of its filament is no longer a nightmare, it supplies the most fitting of weapons with which to fight the gas bogies—Let there be war to the death!"

The writer of these terrible words surely wants a holiday. We urge it on his own behalf, and in the interests of the "Electrician." And after order has been restored where disorder now exists, he might study, with a reasonable chance of appreciating truth, the calm and straightforward case that "John C. Kirkwood" places before the public. The advertisement article is educational as to how to reckon the cost of gas and electric lighting. Months and months ago, we advocated more interest in educating the public in the matter of cost calculation. A 50-candle-power metallic lamp (not an 8-candle power one as in the case of the "Metalite" advertisements), on a 250-volt circuit, with electricity at 3d. per unit, is taken by the writer. Of the price adopted, electricians cannot complain. Such a lamp (costing 3s. 9d., and requiring renewal at the end of 1000 hours' use) would, at 60 watts per hour, in the 1000 hours, consume 15s. worth of current at 3d. per unit. A 50-candle power ($2\frac{1}{2}$ cubic feet per hour) inverted gas-burner would consume in 1000 hours 2500 cubic feet of gas, which, at 2s. 2d. per 1000 cubic feet, would work out to 5s. 5d. in the 1000 hours, when the mantle (costing 4d.) would require renewal. Comparing electrical current and gas, there is a saving of 9s. 7d. for one light in 1000 hours. This gives the answer to the insensate mendacity seen in electrical advertisements, which talks of gas having to come down to $7\frac{1}{2}$ d. per 1000 cubic feet before it can compete with electricity! The reference to 2s. 2d. per 1000 cubic feet suggests—2s. 2d. being the price of gas prevailing in South London—that it is to the South Metropolitan Gas Company that thanks are due for this particular answer to the advertisements that have lately had electrical origin. The progress and the advantages of incandescent gas lighting are set forth in the advertisement, as well as the cost of maintenance. It will serve as a model for the advertisements of other gas authorities. It is popularly written, the points are put tersely; and "in the face of the facts and figures, the case for gas on the score of economy, to say nothing of its efficiency as an illuminant, is complete." Of course, in a two-column advertisement article all points cannot be treated upon; but there is much more that has to be said to the public. Installation costs have to be dealt with; in speaking of candle-powers, it has to be explained that the markings on metallic filament lamps are generally purely nominal representations, and not the actual ones; in dealing with maintenance, the brittleness of the metallic filament when cold requires mention; in connection with effective illumination, the injury to the eye-sight by metallic filament lamps needs emphasizing, together with the famous statement of Mr. Mordey, ex-President of the Institution of Electrical Engineers, as to the "whip-lash" of such lights on the eyes; and many other points might be treated upon in later advertisement articles. Meanwhile are the plans maturing to bring about co-operative advertising in the gas industry, and not leave the work to the loyalty of a couple of undertakings?

Talking of advertisement articles, our recent surmise that the recent examples in the Daily Press from the "Metalite" lamp people were only the prelude to the flotation of a new Company is correct. On Monday last week, the promoters of the new Company followed the anything but original course of their kind by giving a demonstration of the lamp to representatives of the Press and others, and then sumptuously feeding their guests, so as to put them into a happy frame of mind and full of bright notions before dispatching them to write and talk in laudatory terms of the wonders of the lamp that, it is hoped (by the promoters) the public will understand, in view of the issue of the prospectus, is going to revolutionize the lighting world. We were not invited to view the lamp, nor to take part in the Hotel Cecil function; but we gather from one of our electrical contemporaries that "broad hints" were given to the representatives of the lay press "as to gas and its lethal qualities." An abridged copy of the prospectus appeared in the newspapers on Sunday and Monday; and the most generous estimates are made as to the value of the lamp. Half a million of capital is proposed, of which £380,000 is considered sufficient to go on with. There are many things said that the public will hardly be inclined to accept on the mere *ipse dixit* of company promoters. There is the catch phrase of the "Metalite" puff advertisements as to "40 hours' brilliant light for 1d."—"brilliant," interpreted, meaning the light given by one 8-candle power lamp! There is also the deliberate untruth that the lamp "makes electricity much cheaper than gas." These statements appear as radiations from the picture of a lamp held up by a diademed lady who does not seem to be particularly happy over her allotted duty. It is remarked that the vendors—the Bryant Trading Syndicate, Limited, and the International Filaments, Limited—have arranged for a pretty big picking out of the concern as a reward for their benevolence in allowing the public to participate in this veritable gold mine, which it is predicted will yield a dividend "exceeding 30 per cent. on the entire capital." There is dead-silence as to the profits that have been made hitherto; but the prospects are glorious. At present the estimated minimum consumption of incandescent electric lamps in the United Kingdom is 40 millions per annum; and the

promoters claim contracts in hand for 15 million filaments per annum during the next five years. Gas is credited with supplying 90 per cent. of the artificial lighting in the country at present; but—the gas industry must beware—the Metalite lamp is going to alter all that. Gas-works are to become the scenes of desolation, the millions of the industry's capital are to be depreciated to the vanishing point, and the shareholders, officers, and workmen will be permitted asylum in the workhouses of the country. Meanwhile, the shareholders in Metalite Limited will be living on the fat of the land, and pocketing "exceeding 30 per cent." dividends. Profits are estimated at £255,000 per annum. From this on administration, advertising, general expenses, reserves, depreciation, and contingencies, £85,000 can be scattered; and there will be £170,000 for the shareholders, who will get all their capital back in a couple of years or so. Happy thought for the shareholders! Nothing more generous has been witnessed in the financial world for a long time. We can see future monuments to those who were so disinterested as to share their good fortune promiscuously with the public in this way. But off with banter. Seeing that the "Metalite" lamps do not appear to have any virtues that can be regarded as anything more than on a level with those of other excellent makes of metallic filament lamps, the public had better take seriously into consideration the question of future severe competition before investing money in this fresh trading concern, and remember at the same time that the electrical manufacturing business almost generally has not experienced roseate results now for some years. The Metalite prospectus will be worth preserving for future reference.

It is likely that in the next parliamentary session, a large number of municipal electricity undertakings will be promoting a joint Bill for enabling them to adopt free wiring and to trade in fittings. Quietly there is activity in organizing support for a Bill. The Electrical Contractors' Association, who succeeded in getting exterminated a similar power in the last General Electric Supply Act, which amended its predecessors in several important respects, will keep an eye on what is being done in this connection. So must the large ratepaying gas companies; and they will be able to follow the example the municipal authorities gave in connection with the Standard Burner Bills this session, and amalgamate in opposition. There are a few things about municipal electrical speculation it will interest Parliamentary Committees to hear. There has been all too much of this speculation; and gas companies among the chief ratepayers of the districts have felt it. Touching this question, an interesting statement was made by Mr. Dykes at a recent meeting of the Beckenham District Council. He asked the members of that body to give careful attention to the returns for the last financial year as to free wiring. There were, he said, 27 consumers; and the average cost per lamp was 23s. 4d., while the average receipt from the sale of current had gone down to 3s. 9d. Some time ago the average receipts were 7s. 9½d. per lamp. But they had gradually fallen to 3s. 9d., while at the same time the cost of connecting-up the installations was increasing. One consumer with ten lamps cost £15 7s. 8d., or 30s. a light. The return obtained for this was 15s. 10d. Another consumer with twenty lamps cost £24 8s. 10d.; and his return was £4 17s. 6d., or 4s. 10d. per lamp. A third consumer with twenty lamps cost the Council practically the same; but the receipts were £2 3s. 9d., or only 2s. 1d. per lamp. There is no justification for such an expenditure; and the receipts do not pay the standing charges. These will be useful figures when opposing the proposed further speculation of municipal authorities.

Plain truths are not tolerated by some folks at Hastings. Because of this, the public lighting question is continually in a state of ebullition there. The cost of converting the street-lamps to electricity means a considerable sum. This is being charged on the rates annually; whereas a much smaller amount would give the ratepayers the benefit of inverted gas-lamps such as are being adopted by borough councils—including electricity-supplying authorities—in the districts of the two largest gas companies in London. The intelligence of these authorities is not in any way inferior to that of the governing body at Hastings, whose administration has required a Special Committee of Investigation to attempt to correct the muddles that have accumulated from past procedure. It is the increased economy and efficiency of the inverted gas-lamp that has enabled it to leave the metallic filament electric lamp behind where local government pursues its legitimate functions untrammelled by an electricity undertaking, or undue affection for one. There is thus initial and perpetual financial loss to the ratepayers by the mistaken policy of the Hastings Corporation. Take things as they are, the Gas Company now charge annually 2s. 6d. per lamp less than the electricity undertaking. There is another aspect. The writer of "Flotsam and Jetsam" in the "Hastings Observer" says that "whereas the profits secured by lighting the public lamps with gas go to the Gas Company, the profits secured by lighting them with electricity go to the Electricity Department—in other words, to the ratepayers." Do they? The question is: Are there any profits accruing to the Electricity Department from this public lighting at £3 5s. per lamp? It is no use our journalistic friend writing on this question without going to its substratum. Has he investigated the whole costs of electricity generation, and establishment and capital charges? Has he asked himself the question whether the units charged at extraordinarily low prices, which do not comprehend the whole of the charges per unit of electricity accounted for, contribute more than the higher priced units (which do comprehend the whole of these charges)

to the large annual deficits of the undertaking? Does he know that the public lighting low-priced units form the peak to the high-priced unit lighting load, and that the generating costs of the peak are always higher than those forming the private lighting base? We strongly advise him to look into these questions before he again speaks of "profits" going to the ratepayers, more especially while the ratepayers have annually to fill a deficiency in respect of want of profits. It is a pity to unconsciously play the puppet even with the best motives in the world. The same writer argues that the Electricity Department is the property of the ratepayers; and therefore it is to the "interest of the latter that the consumption of the light [? electricity] should be increased." This takes us to the very large question as to the legitimate functions of a municipal body, and as to whether it is not their duty to administer each public service independently on the lines of the utmost economy and efficiency. It cannot be to the interest of the ratepayers to have nominal equality in the price paid for public electric lighting with that paid for gas lighting, with less illuminating power and efficiency, and then have to pay heavily for conversion of the lamps, and have a big deficiency to meet on the electricity concern—a deficiency brought about by the charges for electricity not supplying sufficient revenue for meeting financial responsibilities, and the while nothing is being put by for the morrow of the undertaking.

The Engineering Correspondent of "The Times" recently called attention to Mr. C. H. Merz's evidence before the Local Legislation Committee of the House of Commons when the smoke clauses of the London County Council Bill were under consideration. Mr. Merz has always been one of the champions of plant concentration; and he estimates that, if the electrical power required for London was all generated at a few large stations, there would be a saving in coal of about 6 million tons a year. Having mentioned this striking estimate, the Engineering Correspondent permits himself to continue in this manner: "It has for some years past been evident that by far the best, and, indeed, the only practical, way of reducing the smoke nuisance, is for local authorities to do all in their power to encourage the erection of large power stations with very tall chimneys. The number of domestic contributors could thus be diminished, because electric cooking and heating would be much cheaper. . . . There is no one more anxious than the modern central station engineer to reduce smoke pollution by coal economy, by the substitution of one tall chimney for hundreds of short chimneys, and by the gradual abolition of the house fire." We should like to know why the erection of large electrical power stations is "the best, and, indeed, the only practical, way of reducing the smoke nuisance." Was not Mr. John Burns telling a deputation he received a short time ago, that the Gaslight and Coke and the South Metropolitan Companies (excluding the Commercial and other concerns operating on the borders of the two large Companies named) had fixed, not counting privately purchased ones, no less than 1,300,000 gas-fires, gas-cookers, ring-burners, and gas water-heaters? We quite agree there is no one more anxious than the modern central station engineer to bring about the gradual abolition of the house fire. But it so happens that gas-heated appliances are the more economical way of doing this. Naturally, the Engineering Correspondent of "The Times" cannot know everything; and the facts as to gas seem, so far as he is concerned, to have missed their way.

The Livesey Professorship at Leeds University.

In the "JOURNAL" for the 21st ult. (p. 861), it was mentioned that the Council of the Leeds University had passed a resolution recording their deep sense of the honour done to the University by the offer of the fund raised as a memorial to the late Sir George Livesey for the endowment of a Professorship of Applied Chemistry relating to the Coal Gas and Fuel Industries. They have now issued a circular conveying to the donors of the fund their grateful acknowledgments for the munificent gift. They regard it as a signal honour that a professorship commemorating the life and work of Sir George Livesey should be associated with the University of Leeds. They point out that their efforts for the provision of higher education in Applied Science will thereby be greatly strengthened and encouraged; and they express the earnest hope that the work carried out by the department of the University to which the new professorship is assigned will amply justify the generosity and confidence of the founders.

The erosion of reservoir banks by wave action may be reduced greatly, according to a bulletin of the United States Department of Agriculture by Mr. P. E. Fuller, by floating a boom of old railroad ties or other timber round the inner banks. The ties should be held together by cleats securely nailed, and the entire boom anchored in a line 3 feet from the banks.

At a recent meeting of the Council of the Roads Improvement Association, the resignation of Mr. Rees Jeffreys as Hon. Secretary was received; and the Council unanimously congratulated him on his selection for the position of Secretary to the Road Board. Mr. Wallace E. Riche was appointed Secretary, in succession to Mr. Rees Jeffreys. A statement of the future policy of the Association was approved, and ordered to be issued, in which it was set forth that a new and important field of activity is now open—viz., to select and materialize schemes for the construction and improvement of roads, and to lay such schemes before the Road Board for consideration.

OBITUARY.

GEORGE CARELESS TREWBY.

WE learnt with much regret last Wednesday of the sudden death on the previous day, as the result of heart failure, at his residence, Fenton House, Hampstead Heath, N.W., of Mr. George Careless Trewby, late Chief and Consulting Engineer of the Gaslight and Coke Company. He was in his 72nd year. It may be remembered that towards the close of 1900 arrangements were made by the Directors to relieve Mr. Trewby of active work; but they could not be carried into effect till about four years later, when Mr. Thomas Goulden succeeded him as Chief Engineer. When Mr. Trewby's retirement was in contemplation, we published a full account of his life-work; so that it is only necessary now to give an outline of it.

Mr. Trewby entered the gas industry in 1853, when he became pupil of the late Mr. F. J. Evans, the then Chief Engineer of the Gaslight and Coke Company. His principal work was the supervision of the construction of a gasholder and tank which were being erected at Page Street, Westminster. He afterwards went to Constantinople to fill the position of Engineer to the Ottoman Government. On the termination of this engagement, he returned to England, and took charge of the Brentford Gas-Works; but early in 1865 he again entered the service of the Gaslight and Coke Company, and was the Resident Engineer at the Horseferry Road station till 1870. He was that year transferred to Beckton, where the works which had been started there were only partly finished; and upon him devolved the duty of organizing the undertaking. Two years later came the memorable strike of stokers, every one of whom left the works. However, such was the firmness displayed by Mr. Trewby in those trying circumstances, that the men were completely beaten; and for seventeen years afterwards the works were conducted in peace and quietness and were brought to a high state of perfection. In 1884, Mr. Trewby was appointed Constructing and Carbonizing Engineer of the Company; and he carried on the duties of this office with notable results till August, 1891, when a further change was made in his official designation—it being altered to Consulting and Constructing Engineer. From 1884, all extensions and reconstructions had been carried out under his supervision; and he introduced a large number of labour-saving appliances at the different works—the new pier at Beckton being one of his masterpieces. Its equipment includes powerful hydraulic cranes and grabs for unloading coal in the Thames, and transmitting it to waggons for conveying it to different parts of the establishment; and it speaks well for the installation that it has been copied by several other companies and firms for unloading their ships. The foregoing particulars, in conjunction with those contained in the previous article, will show the extensive character of Mr. Trewby's work for the Company with whom his name was for so many years associated.

Mr. Trewby gave important evidence before the Departmental Committee appointed in 1898, and presided over by Lord Belper, to inquire into the manufacture and use of water gas in the Metropolis; also before the Powers of Charge Committee, presided over by Mr. Oldroyd, in 1900, and before Lord Rayleigh's Committee on Gas Testing in the Metropolis in 1904. He was one of the witnesses in the action brought by Messrs. Graham, Morton, and Co. against the Compagnie L'Union des Gaz in connection with the Milan Gas-Works contract. But since then he had lived a good deal in retirement.

Mr. Trewby joined the British Association of Gas Managers in 1870, and passed into the Gas Institute, of the Council of which he eventually became a member. He was one of the Vice-Presidents for 1887-8. But, in association with a number of his colleagues, he severed his connection with the body, and actively assisted in the formation in 1891 of the original Institution of Gas Engineers, of which he was the first President. On the constitution of the present Institution in 1903, he became a member; and his name was on the roll at the time of his death. He was admitted as an associate member of the Institution of Civil Engineers in 1866, and was transferred to the class of members in 1875.

The funeral took place at Hampstead Cemetery on Saturday afternoon; the interment being preceded by a service at Christ Church, Hampstead, where Mr. Trewby had worshipped for 25 years, and of which at the time of his death he was Churchwarden for the third year in succession. He was a member of the Committee of the Mount Vernon Hospital for Consumption, &c., and also of the Committee at Northwood, the Home for Sailors' Daughters, and many other bodies. He will consequently be greatly missed not only by his relations and friends, but by a large circle of acquaintances with whom he worked or came in contact. The death of Mr. Trewby will not dissociate the name from the gas industry, inasmuch as his son, Mr. Lawrie Trewby, is Engineer and Manager of the North Middlesex Gas Company.

We have just learnt of the death of Mr. FRANK LEIGH, son of Mr. Arthur Lea Leigh, the Managing-Director of the Witney Gas-Works, at the early age of 28, from the combined effects of pleurisy and double pneumonia, complicated by a weak heart. Mr. Frank Leigh assisted his father in the management of the gas-works at Witney, and was a young man of great promise, and of a very bright and genial disposition. It will be remembered, from a

recent notice in our columns, that he had just patented an automatic pressure regulator for gas-governors, and had introduced into the works at Witney several improvements in the mode of working, as may be judged from the fact that during the half year ending June 30 he had produced from 498 tons of coal 6,483,000 cubic feet of gas, or 13,018 cubic feet per ton, of which 11,968 cubic feet were accounted for. Mr. Leigh gained a bronze medal in the City and Guilds examinations last year in "Gas Supply," and promised, had he been favoured with robust health, to occupy a high position in his profession.

PERSONAL.

Mr. WILLIAM TOMLINSON, Manager of the Rochdale Corporation Water-Works, is about to resign, owing to ill-health and advancing years. He has 51 years' service to his credit, 26 as Manager; and he is one of the oldest officials of the Corporation. It was in 1859 that he entered the employ of the old Water Company; and in 1866, when the undertaking was acquired by the Corporation, he was taken over with other officials. He was appointed Deputy-Manager in 1875, and Manager in 1884; and since then the works have been greatly extended.

An interesting and picturesque ceremony recently took place in the Council Chamber of the Town Hall, Great Yarmouth, when the Mayor (Mr. T. W. Swindell) presented the honorary freedom of the borough to Sir R. H. INGLIS PALGRAVE, F.R.S., "as a token of the appreciation by the Council and by the burgesses at large of the eminent services rendered by him to the State and to the borough." The occasion was the opening of the new Grammar School, of the Governors of which institution Sir Inglis is the Chairman. He is also, as some readers are aware, Chairman of the Great Yarmouth Gas Company.

THE RELATION OF CALORIFIC VALUE
TO ILLUMINATING POWER IN LONDON GAS.

THE results of the tests made in the testing places controlled by the London County Council, of which summaries have been from time to time presented in the "JOURNAL" [vide the article on "The Quality of London Gas" in last week's issue, p. 179, and the earlier articles referred to therein] admit of some interesting inferences being made as to the relation between calorific value and the illuminating power of the gas supplied. The comparison is the more interesting at the moment because Professor Frankland and other witnesses before the House of Commons Committee on the Standard Burner Bills, from the results of these testings, drew deductions as to the relation between the calorific value and the illuminating power of gas supplies in general.

In the Metropolis, as is well known, two of the Companies are supplying, in the greater part of their districts at least, a mixture of coal gas and carburetted water gas; while the third Company—the South Metropolitan—are still supplying neat coal gas. The figures published in the "JOURNAL" from time to time show, *inter alia*, the average calorific power and average illuminating power for each quarter of the gas supplied by each Company, as shown by the testings made at all the testing-places for each Company. The figures for the calorific tests are not strictly comparable with those for the photometric tests, because there are three testings for illuminating power made each day at each testing-place, and only one testing for calorific power, which testing, moreover, is not necessarily made immediately before or after either of the testings of illuminating power. This lack of synchronism between the calorific and the photometric testings becomes very important when the results of only a few testings are compared, as it may be that the calorific power reported refers to gas of very different illuminating power from that reported for the same period. The supply necessarily varies in quality from hour to hour, and the six or seven testings

of calorific power made at a testing-place in one week may none of them have been made within one hour of any one of the eighteen or more testings of illuminating power made during the same week. Hence on such a short period of time it would be totally unfair to make any deduction as to the relation between the calorific value and the illuminating power of the gas supplied. If, however, a longer period is taken—say, one quarter, or thirteen weeks, and if the results from a number of testing-places are averaged for that quarter—it may fairly be assumed that the defect of any lack of synchronism between the two sets of testings will be relatively small, and conclusions may more reasonably be drawn from the averages of such extended series of testings as to the relation between calorific and photometric values. Acting on these considerations, we have drawn up from the quarterly results, published in the "JOURNAL" at intervals, the following table showing the average net calorific power corresponding to the average illuminating power of the gas for each quarter of the last 3½ years for each of the three Metropolitan Gas Companies. The results are arranged in order, according to the rise in the average illuminating power of the gas instead of chronologically; but the year and quarter are indicated in each case.

Dealing first with the coal gas supplied by the South Metropolitan Company, it will be observed that the extreme difference between the lowest average illuminating power for any one quarter and the highest is 0.93 candle, and the difference in calorific power for the same quarters is 3.1 calories. This is equivalent to a fall of 2.47 per cent. in net calorific power for a fall of one candle in illuminating power. This deduction might be reasonably applied generally if the two quarters which happen to begin and end the statement could be taken by themselves as fairly representative of the correspondence between calorific value and illuminating power at the particular candle powers shown. But that it is not fair to take any two quarters, extreme or otherwise, and argue from the average figures obtained for them that a certain relation subsists between the illuminating power and the calorific value of coal gas, may be illustrated by referring to two other quarters in the list, which display totally different relationship.

Corresponding to an average illuminating power of 16.21 candles for one quarter, we find an average net calorific power of 134.3 calories; while corresponding to an average illuminating power of 16.64 candles, we have an average net calorific power of 132.8 calories—that is to say, an increase of 0.43 candle is attended by a decrease in calorific power of 1.5 calories. From these two quarters' figures—which, be it noted, are not results of isolated testings, or even the mean results for a short period, such as one week, or for one out of six testing-places, but the average results of daily testings at six testing-places for the whole of a quarter in each case—it may be deduced that a fall in illuminating power of one candle is attended by a rise in net calorific power of 3.5 calories, or 2.6 per cent. Thus, taking individual quarters, and excluding the rest, it may be legitimately inferred that a fall of one candle in illuminating power is accompanied either by a fall of 2.47 per cent. or by a rise of 2.60 per cent. in calorific value. It would be unfair to say that one conclusion should be preferred to the other in the absence of other evidence.

Glancing down the columns for coal gas, it will be seen that there is no continuous or uniform increase in calorific value corresponding to an increase in illuminating power. The results are erratic; and by selecting particular quarters for comparison, it is easy to obtain support for the theory that the net calorific value of coal gas falls with a fall in illuminating power, or for the converse theory that the net calorific value of coal gas rises with a fall in illuminating power. If we review the whole of the figures for the fourteen quarters, it would not be altogether unreasonable to infer that the calorific value of coal gas falls, on the average, by two calories, or 1.5 per cent. for a fall of one candle in illuminating power; but this conclusion takes into account the results for the first and second quarters of the present year, which appear to represent (as was pointed out in the article on the "Quality of London Gas" in last week's "JOURNAL") a new departure in methods of carbonization on the part of the South Metropolitan Company. In fact, the results for the last twelve months stand on a somewhat different basis from earlier results.

If the earlier results—that is, those extending over 2½ years continuously—are taken, the only legitimate conclusion which can be drawn from them is that there is no fall in net calorific power

SOUTH METROPOLITAN GAS COMPANY—(Coal Gas).				GASLIGHT AND COKE COMPANY—(Mixed Gas).				COMMERCIAL GAS COMPANY—(Mixed Gas).			
Year.	Quarter of Year.	Illuminating Power.	Net Calorific Power.	Year.	Quarter of Year.	Illuminating Power.	Net Calorific Power.	Year.	Quarter of Year.	Illuminating Power.	Net Calorific Power.
		Candles.	Cal. per Cub. Ft.			Candles.	Cal. per Cub. Ft.			Candles.	Cal. per Cub. Ft.
1910	I.	15.86	130.9	1910	II.	15.14	122.2	1910	I.	14.47	122.7
1910	II.	16.00	131.0	1910	I.	15.40	124.3	1909	IV.	14.57	125.0
1909	IV.	16.12	132.1	1909	IV.	15.82	125.5	1909	III.	14.71	125.5
1907	I.	16.21	134.3	1907	II.	16.60	131.4	1910	II.	14.73	123.3
1909	III.	16.23	130.5	1907	I.	16.65	133.4	1909	I.	14.81	120.1
1908	I.	16.24	132.9	1907	IV.	16.70	132.7	1908	IV.	14.85	121.1
1909	I.	16.37	133.0	1909	I.	16.73	130.7	1909	II.	14.90	126.0
1907	III.	16.40	132.4	1909	II.	16.75	130.0	1907	IV.	15.01	127.3
1907	IV.	16.45	133.0	1909	III.	16.77	129.1	1908	I.	15.05	127.3
1907	II.	16.50	133.4	1908	I.	16.77	132.1	1908	II.	15.19	127.3
1908	II.	16.54	132.6	1908	II.	16.92	131.4	1907	I.	15.25	127.3
1909	II.	16.64	132.8	1907	III.	16.95	133.8	1908	III.	15.36	127.5
1908	IV.	16.71	133.9	1908	IV.	16.96	132.0	1907	III.	15.43	127.4
1908	III.	16.79	134.0	1908	III.	17.09	131.5	1907	II.	15.72	128.5

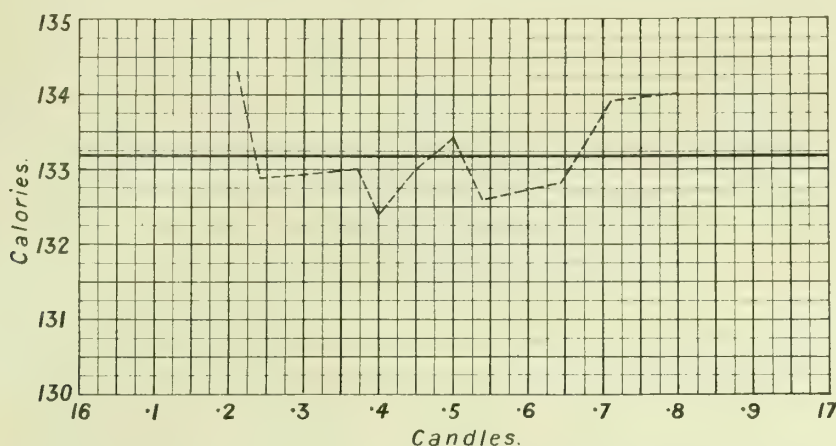


Diagram showing the Relation between the Illuminating Power and the Net Calorific Value of Coal Gas—Deduced from the Results of Two-and-a-Half Years' Testings by the London County Council of the Gas Supplied by the South Metropolitan Company.

with a fall in illuminating power. This is clear from the annexed diagram, in which the average results for each quarter from Jan. 1, 1907, to July 1, 1909, have been plotted out, as shown by the dotted line, and a curve (the continuous line) drawn therefrom showing the relationship between calorific power and illuminating power. It will be seen that this curve approximates to a straight line, showing an average net calorific value of 133.2 calories per cubic foot, applicable equally to gas of 16-candle power and to gas of 17-candle power. How much further in either direction the curve continues in a straight line it is impossible from the results of these testings to predict. About the 1st of July, 1909, there appears to have been a change in the character of the gas produced by the South Metropolitan Company, and with a gradual and continuous fall in illuminating power, there was a sudden and appreciable fall in the net calorific power. If we exclude the effect of this sudden drop—due, doubtless, to some change in methods of working—we find that since that date the calorific power of the gas supplied has shown no falling off corresponding to the gradual reduction taking place in illuminating power.

Having regard to the foregoing conclusions, especially those referring to the results obtained for a continuous period of 2½ years, it is interesting to observe a statement made in evidence before the House of Commons Committee on the Standard Burner Bills on the 13th inst., by Professor Percy Frankland. In answer to Question 3300, he said: "I have examined the reports by the London County Council on the daily examinations of the London gas; and in the case of the South Metropolitan Company, I have set out here the averages for each week at each of their stations. It is put in this way: Taking the highest average candle power and the lowest average candle power, we get such and such a drop in candle power, and the corresponding heating values of those gases has been put down, and in every case there is a diminution in the heating power when the illuminating power goes down. What is more, the average for the percentage lost in calories per one candle works out to 2.9 calories; so that bears out exactly what I said in respect of the experiments which I made at Liverpool—that for a drop of one candle there is an average reduction in calorific power of 2.9 per cent. I said 3.1 per cent."

We have shown that, taking the extreme cases in favour of Professor Frankland's contention, the average reduction in calorific power is 2.47 per cent., instead of 2.9 per cent. for one candle; while equally legitimately it may be contended that there is an average increase in calorific power of 2.6 per cent. for a drop of one candle. Excluding the ups and downs of individual quarters, we may say, broadly, that the testings of coal gas in the case of the South Metropolitan Company for a period of 2½ years continuously at all their testing-places show that there is no reduction in calorific power for a drop in illuminating power. Professor Frankland must have founded his statement, which is disproved by the figures here quoted, on averages for too short a period, which, as we have explained, and as is clear from the tabular statement, are likely to lead to wholly erroneous conclusions. Nevertheless, it is a pity that such statements, based on inadequate data, should be given in evidence before a Parliamentary Committee who are dealing with a question of such immense industrial and economical importance as that of the adoption of the "Metropolitan" No. 2 argand as the standard burner.

The results of testings of the mixed gas supplied by the Gas-light and Coke Company do not admit of any very definite conclusions being drawn as to the correspondence between a fall in illuminating power and a fall in calorific value, because there are not yet sufficient figures available since the standard of quality of the Company's gas has been reduced from 16 to 14 candles. When the Company were working to a 16-candle standard—i.e., prior to Oct. 1, 1909—the results do not show any consistent fall in calorific value corresponding to a fall in illuminating power. With the adoption of the 14-candle standard, however, there has been a sudden drop in calorific power, the exact bearing or intensity of which it would be unfair to estimate until more figures are available for gas which has been supplied by the Company to the lower standard.

Passing on to the Commercial Gas Company's results, it will

be seen that the mixed gas supplied by them shows pretty consistently for a drop of one candle a fall of about 4 calories, or about 3.1 per cent. This corresponds fairly closely with Professor Frankland's figure for the fall in calorific power corresponding to a drop of one candle in the gas supplied by the Liverpool Corporation, which likewise is a mixed gas. It is in respect of his evidence in regard to the calorific power of coal gas that he was seriously at fault.

INSTITUTION OF DUTCH GAS ENGINEERS.

Annual Meeting in Brussels.

THE Annual Meeting of the Institution of Dutch Gas Engineers was held in the Congress Hall at the Brussels Exhibition from the 6th to the 8th inst., under the presidency of Heer J. VAN ROSSUM DU CHATTEL, the Engineer of the Amsterdam Municipal Gas-Works. The following are some extracts from

THE PRESIDENTIAL ADDRESS.

The address opened with a cordial welcome by the President to his fellow-members of the Institution, and to the members of sister Institutions who were present. This was, he said, the first time they had met abroad; and he thanked all who had made it possible for the Committee to look forward with much confidence to a successful issue of the meeting. He also thanked the Committee of the Exhibition for placing the Congress Hall at their disposal gratis, and the members of the Institution for electing him President. He then passed on to deal as follows with some of the principal topics of interest to his colleagues.

SOME ACCIDENTS AND THEIR LESSONS.

The terrible disasters at Hamburg and Geneva, which, alas! besides causing loss of capital, also claimed a great number of victims, are still foremost in your memories; and they teach us that in the midst of life we always find ourselves in death. Besides this, they teach us that our industry may still be called a dangerous one, if all the necessary precautions have not been taken for ensuring safety, both in construction and working. To the "Golden Rules" of Mr. Newbigging, one more might be added—viz., "Do not trust the absolute gas-tightness of your valves." If one has to disconnect mains, loosen joints, or open and close valves, one must always bear in mind that these valves may also convey gas; and some measures should be taken to render the gas harmless. There ought to be written regulations, and everybody assigned his place and work; and none but competent hands should be entrusted with the duty of turning valves. The control of the work should really be in the hands of only one person. Beyond this, all other ordinary measures to ensure safety must not be neglected.

The recent disasters have further taught us that it is desirable to leave sufficient room between the different buildings, the gas-holders, &c., on gas-works—in a word, not to crowd up the works. In course of time, in consequence of too rapid extensions, conditions have arisen in gas-works of which, from the point of view of safety, one cannot possibly approve. If the necessary room for movement is wanting, the danger of an explosion or other accident is much greater than when there is ample space. I am aware that criticism is easy, and that before indulging in it one ought to consider all the circumstances. For example, at the new South Gas-Works in course of construction at Amsterdam, the erection of a gasholder on the Amstel has drawn forth a protest for æsthetic reasons. People have forgotten that, from the point of view of safety, a decision has been come to—and very rightly, as Hamburg has taught us—to build the retort-house and gasholder as far from each other as possible. If the gasholder had not been erected on the Amstel, the retort-house would have been put up there, in the neighbourhood of the villa-park afterwards to spring up there; and then people would have had still greater reason to protest than they have now. These outcries about disfigurement seem to me to be much exaggerated.

"One man's fault is another man's lesson," says the proverb; and, for our watery country, the lesson taught by the recent French inundations may also be of use. Though only one or two works were obliged to stop the supply of gas, and the electric light and power plants were much more seriously affected by the high water than the gas-works, yet a doubt has arisen as to whether the old dogma that these works should be erected on the lowest part of the district of supply may not be accepted too strictly. Anyhow, in future the designer of gas-works will have to keep in view the fact that the water in the rivers may rise to an abnormal height, and that the retort-settings should be built in such a manner that even then the furnaces will be able to continue working.

THE LABOUR QUESTION.

The labour question still demands our attention. Though it cannot be denied that in many places the conditions of labour leave much to be desired—the wages being too low, and too little being done for the labourer—yet some recent strikes prove that the way in which people proceed is sometimes reckless, and often criminal. Our colleagues in North Italy can bear witness to this. Workmen who were in very favourable circumstances, and found themselves in a better condition than most of their class on the Continent, or even in Great Britain, struck when their most unreasonable demands were not complied with. It is most fortunate that the Italian Gas Companies, in the very difficult circumstances in which they were placed, knew how to oppose such shameful compulsion, and that the strikes were an utter failure. The same result has attended the great strike at the Stockholm Gas-Works, which took place against the wish of the organized labourers and others who were willing to work. The strike had been expected; but, thanks to the excellent measures adopted—the formation of a reserve, consisting of engineers and technicians, clerks, collectors, meter-takers, &c., with soldiers to watch the works where necessary—the strike totally failed, and its only fortunate consequence was the very desirable removal of some bad elements. The experience has been gained that the gas-works are able to go on with the assistance of a voluntary staff, consisting chiefly of their own hands; while the stricter obligations since the strike imposed by the Government on workmen engaged in those industries of which the continuance is indispensable to the general safety of the community, may guarantee us against a repetition of what has happened.

NEW PROCESSES AFFECTING THE GAS INDUSTRY.

There are certain industries which, without actually belonging to that with which we are connected, are worth notice, because they may have great influence on it. Last year my predecessor drew your attention to the product coalite; and now it is being made in a few English gas-works. It is made at Plymouth and also at Wednesfield. Some tons of it were placed at my disposal, and the fuel appeared to be highly satisfactory in heating-stoves, in which usually anthracite was burned, and also in the Singhalang (Dutch) coke-stove. We had to deal with a very pure fuel, containing only 3.65 per cent. of ash, 81.65 per cent. of carbon, 3.63 per cent. of hydrogen, 1.48 per cent. of nitrogen, 1.20 per cent. of sulphur, and 6.04 per cent. of oxygen, which at the same time gave 13,743 B.Th.U. gross, and therefore would be only slightly inferior to Belgian anthracite. It was a much better fuel, therefore, than had been obtained in 1907, the results of the examination of which were published by me at the time in the pages of "Het Gas."

Apart from other reasons, it seems to me that coalite will never be manufactured on so large a scale as to cause fear of any serious dangers for the gas industry, because, in the first place, the quantity of coal to be carbonized is twice as much as it is for coal gas. Consequently, twice the present quantity would have to be stored, either in the shed or in the open air; and this is almost impracticable. In the second place, the coalite produced would be about twice as much in bulk as the coke now resulting from making gas; and storage-room for it would be wanted. Thirdly, though the tar is certainly of better quality than that which is now produced in ordinary carbonization, the same remarks that have been made about coke will apply. Therefore, at the most, I see a future for coalite only in very special cases.

Another subject that claims our attention is the preparation of fuel from peat, according to Dr. Ekenberg's process. Briquettes containing 3 to 4 per cent. of water are made out of compressed peat. They are very hard, and when lighted will burn with a luminous flame. A briquette analyzed in the laboratory at the Western Gas-Works at Amsterdam contained the following constituents (represented in percentages): Water, 3.59; carbon, 63.19; hydrogen, 7.08; nitrogen, 1.34; sulphur, 0.31; oxygen, 21.48; ash, 3.01; and it had a calorific value of 12,815 B.Th.U. In addition to briquettes, charcoal and coke can be made out of the compressed cakes. We can also gasify them, with a production of 16,316 cubic feet of \pm 584 B.Th.U. gross per ton. With this process, therefore, various substances of different values can be obtained; and as our country (Holland) is very rich in peat, the process cannot be immaterial to us. Factories are being erected for its production. It will be necessary to await results; but we must not lose sight of this matter.

Another process which may be of some importance to us is the manufacture of briquettes from house refuse. By means of steel crushers, the refuse is broken up and afterwards combined and formed into briquettes, which may be used as fuel. As in this process coal tar may be utilized, as proved experimentally at the

Municipal Gas-Works of Amsterdam, possibly means have been found by which we may get rid of our tar to better advantage than has been the case in recent years, in consequence of the existence of syndicates and over-production by coke-ovens. The manufacture of briquettes from house refuse is already being carried on by the Borough Council of Southwark, in London, and by the Société des Nouveaux Agglo Mérés Combustibles at St. Ouen. It will therefore be wise to follow the development of this process.

REVIEW OF THE INDUSTRY LAST YEAR.

The year 1909 was not disadvantageous to the gas industry. The general depression in trade came to an end, and a gradual improvement might be perceived. The population, which in many towns did not increase and even was declining, began to augment; and so did the production of gas. The prospect was consequently promising. If present expectations are realized, considerable extensions of plant or new buildings may well be expected in many gas-works.

The price of coal was moderate last year. But December brought us no winter; and, everything considered, by the lower price realized for coke, we lost part of the advantage gained by the low price of coal.

The progress of our industry is proved by the construction of new works and the extension of those in existence. At Amsterdam, a resolution has been passed for pushing on the construction of the third gas-works; Rotterdam has also decided to construct a third works; while at Deventer the existing works are being replaced by entirely new ones. Some weeks ago, the money for carrying out a large extension was granted at Tilburg. New gas-works have been constructed, or are in progress, at other places. At Doesburg, the works have passed from private hands into those of the Municipality. The gas supply of smaller municipalities by large ones is not at present favoured in Holland.

IMPROVEMENTS IN PLANT AND LIGHTING APPLIANCES.

Our fellow-member, Heer Bauduin, has again deserved well of our industry, for he has invented a gasholder without water-lute, for which the firm of Aug. Klönne, of Dortmund, took out a German patent in September, 1908. It has been cleverly designed.

Last year my predecessor showed that much remains to be done by lamp manufacturers in regard to the easy manipulation of gaslight. In connection with this subject, it is a pleasure for me to be able to call your attention to the new gas-lighters which have of late been placed on the market. [The President gave some particulars of the "Dacolight" and Horstman controllers.] Another automatic lighter which is to be tried on a large scale at Amsterdam is the Robson,* the clock of which needs winding only three times a year. However, for this apparatus an increase of pressure, though but very slight, is necessary. I think this an objection, especially for Amsterdam, with its many district governors. As the manufacturer offered to allow a trial of some fifty of these controllers gratis, and my staff's opinion about them being very favourable, we shall carry out the trial in the course of the year; and if the result is satisfactory, we shall procure some of them.

As a novelty in the manufacturing department, I should mention the Burkheiser system for the purification of gas from sulphur and ammonia, which has already been applied in a testing plant at Hamburg.† The gas first passes through a purifier filled with peculiarly prepared oxide, which acts very powerfully, and afterwards a washer with a water-spray. If the oxide is saturated with sulphuretted hydrogen, the stream of gas is reversed, and passes through a second purifier, after which the air in purifier No. 1 is exhausted. The sulphur is converted into sulphur dioxide, which, combined with ammonia, forms sulphate. By the use of the apparatus, there is economy of space, labour, and steam; and a very fine sulphate is obtained. It will thus be seen that the chemists are not idle, and are assisting in the development of our industry.

CARBONIZING CHAMBERS v. VERTICAL RETORTS.

It still remains for me to offer a few remarks on the important question of the use of chamber ovens as opposed to settings of vertical retorts. From every direction something good may come, as pictorial art has proved; and that is the case here. Circumstances will have to determine the choice. Among the various systems of vertical retorts one would be inclined to prefer greatly those with continuous carbonization. But it does not yet seem certain that experience has sufficiently shown whether all technical objections may be considered as removed. What I have seen as well as heard in reference to this in England makes me greatly doubt it.

In the meantime, the Bueb retort continues its triumphant course; and at the April meeting of the Märkischer Verein von Gasfach Männern at Berlin my impression was that the chamber ovens could only with much difficulty maintain their standing against the vertical systems. What the future will bring us, time will show. I do not think that this will be far off; for, if I am rightly informed, chamber ovens and vertical retorts will soon be constructed in Holland, and this will enable me to decide with better judgment, for one or two short visits to gas-works where both can be seen in operation allow of only a superficial impression.

The President concluded by declaring the meeting open.

* See "JOURNAL," Vol. CIV., p. 332.

† See "JOURNAL," Vol. CVIII., pp. 311, 326, 477.

THE DEVELOPMENTS OF HIGH-PRESSURE GAS LIGHTING.



An Example of Parade Lighting by Keith High-Pressure Inverted Lamps.

THE progress of high-pressure gas lighting, from all points—efficiency, costs, and as an important auxiliary in the commercial work of the gas-supply industry—has been by such rapid and large strides that one has to deliberately turn one's mind to the subject, and meditate upon it, to fully realize the current position. In this article, however, we will confine ourselves to some of the latest intelligence concerning the work in different directions that has been, and is being, done which has a bearing on the trading interests of gas supply. Considering those interests, there should not in these days be a single gas company or municipal gas department without an installation of high-pressure and high-power lamps somewhere in the district of supply to demonstrate, if only for advertising purposes, the remarkable efficiency and light-yielding power of such lamps. Examples of some of the best of modern lamps of various types ought to be kept constantly in evidence as an illustration of what gas can do, and as a standing answer to the claims of electrical origin as to the superiority of their particular forms of lamp. There is no question about it that high-pressure gas lighting is playing a valuable part in the gas industry, and is destined to play a still larger part in shaping its destiny. This branch of business is a very live one at the present time; and, therefore, there is no occasion for any apology for keeping readers absolutely up to date as to what is happening.

PARADE LIGHTING.

If gas authorities have been unsuccessful in getting installed high-pressure lamps for main street lighting, there is a branch in connection with such lighting—a lucrative branch and a helpful one in maintaining prestige—that can be immediately taken in hand and developed. It forms, as our American friends would call it, a good business proposition, and has already been classified and named "parade lighting."

Apart from the public lighting developments, one cannot avoid, in travelling in and about London, being struck by the growing frequency of examples of high-pressure lighting. On investigation, it is found that most of the London and Suburban Gas Companies are now prepared to instal gas-compressing plants in any situation where there is a reasonable prospect of the tradesmen availing themselves of the advantages—primarily the one of raising the attractions of the neighbourhood of their business premises—of high-pressure lighting. Most tradesmen go in for some form of outside lighting; and in the high-pressure system, there is the ready means of vastly improving the lighting, and of increasing the magnetic influences of a good shopping centre. We believe in the main arteries of cities and towns being well, but not extravagantly, illuminated. At the same time we have great sympathy for the tradesmen carrying on their businesses away from the main streets who complain that, as ratepayers, they must contribute to the expense of adding to the attractions of the neighbourhood in which are the establishments of their more favoured and opulent competitors, who have already the advantages of situation, influence, and purse on their side. This complaint would not have the same weight, if the lighting of the main streets at the ratepayers' expense were kept at a reasonable level, and the tradesmen located there were to themselves pay for any extra illumination they required immediately in front of their premises. Parade lighting by high-pressure gas-lamps is the very thing they want.

We are under the impression that Mr. A. E. Broadberry, Engineer and Manager of the Tottenham and Edmonton Gas Company, initiated the idea of the business that comes under the designation of parade lighting, under which rows of tradesmen's premises

are illuminated outside by high-pressure gas-lamps at a fixed scale rate per annum for an arranged number of lighting hours. At the present time, within the Tottenham Company's area of supply, there are approaching 600 lamps outside business premises supplied from gas-compressing plants on the plan of fixed terms; and these lamps are of the Keith inverted type, and are almost without exception of the 600-candle power size. It is manifestly a popular system; and shopkeepers are infinitely better pleased with the lamps and the results than they are with the flickering and glaring flame-arc lamp, which is dependent for the continuity of its service on all being well from generating plant to the light-giving source. Tradesmen have so frequently experienced trouble from the *bizarre* conduct of electric lighting that they are learning more and more to appreciate that which is absolutely reliable in the matter of illumination, and does not play them false at inconvenient seasons.

There is one point in connection with this question of parade lighting by high-pressure lamps supplied on a fixed tariff about which gas undertakings who have not yet entered into the business will be glad of information from actual experience, and that is the question of mantle maintenance. We know that our electrical friends, when they attempt to compete with high-pressure gas-lamps, present very imaginative figures as to the number of mantles required for renewals per lamp per annum. Under this parade lighting system, the number of mantles required is not a matter that need in the slightest concern the tradesman. But Mr. Broadberry has kindly consented to the publication of the following table, showing the actual mantle maintenance, during the winter quarter, January to March last, for the lamps then in use in this branch of business; and from the figures it will be seen that mantle maintenance is by no means excessive:

Parade Lighting in the Tottenham and Edmonton Company's Area.

Mantle Maintenance during the Quarter ending March 10, 1910.

Station.	No. of Lamps.	No. of Mantles.	Average Per Lamp.
Lower Wood Green . . .	207	292	1'4
Upper Wood Green . . .	33	96	2'9
Middle Wood Green . . .	23	53	2'3
Myddelton Road . . .	46	77	1'6
Harringay . . .	74	94	1'2

The system of parade lighting has commended itself to many gas undertakings; and it is seen from the information available that shopkeepers are responding freely with their favour to the opportunity afforded them. In London there are already several hundreds of lamps installed on the system. The Gaslight and Coke Company have many installations, some of them exceeding a hundred lamps each. The South Metropolitan Gas Company are also exploiting the system; and there has likewise been successful work in the same direction by the Brentford, North Middlesex, Hornsey, Croydon, Wandsworth and Putney, Ilford, Ipswich, Tunbridge, and other Gas Companies. And it is safe to say that these Companies would not now be without this powerful aid to maintaining the shop lighting business. Half a loaf is better than none; and if the outside lighting of a shop can be retained (should the shopkeeper prefer electricity inside), it is better than not having any of the custom of the premises. It frequently happens that, when the outside lighting gives increased satisfaction, if gas lighting is used inside, the tradesman has a desire that it shall also be improved; or if electric lighting is there, it is often evicted—if not at once, then later; and to this end collapses of the electricity supply serve as effective promptings. Already, the James Keith and Blackman Company inform us they have supplied

upwards of 2000 high-pressure inverted lamps for application on this system; and gas companies who have entered into the business report parade lighting on fixed terms per annum as an inestimable means of meeting the competition of flame-arc lamps.

RAILWAY STATION LIGHTING.

The use of high-pressure gas-lamps for the lighting of factories, works, markets, and so forth has been often alluded to in our columns; but railway stations are excellent public places in which to get such lighting installed. As allusions in the "JOURNAL" have previously informed readers, a large gas compressing and lighting plant has evicted the electric light from the Brighton Station goods-sheds, yards, and sidings, of the L., B., and S.C. Railway. The evidence that this plant must have given the management of the Company every satisfaction (we know as a matter of fact that it has been working perfectly without a single hitch) is found in the fact that the Company have lately placed with the Keith and Blackman Company an order for a large high-pressure lighting plant for their new Lancing carriage works. It will consist of a compressing plant, capable of dealing comfortably with 10,000 cubic feet of gas an hour, with the necessary number of lamps to fill the requirements of the shops at present erected, which represent about a fourth part of the total scheme. The Company have likewise given an order for plant for the lighting of their engine-sheds and goods yards at Eastbourne. Such confidence and satisfaction as these new orders express must be very gratifying to the contractors. The lighting of the railway station or stations in the district of a gas undertaking by high-pressure plant is a business well worth trying to secure, as being commercially advantageous from every point of view.

CITY STREET LIGHTING AND CENTRAL SUSPENSION.

Turning from the lighting of business premises and railway stations to the public illumination of the streets, there are two or three pieces of information as to what is being done to meet the views of local authorities in connection with the use of high-pressure gas-lamps. In the first place, it will be remembered the deputation from the City Corporation who visited the Continent to investigate the street-lighting methods there returned enamoured of the high-pressure inverted gas-lamp, and of central suspension, with raising and lowering gear, so that the lamps can be cleaned and "trimmed" from the street level without impeding the road traffic. The electricians were angered over the preference for the high-pressure inverted gas-lamp; but they found an unholy joy in the imagined impracticability of having central suspension of the lamps, raising and lowering gear, and maintenance at ground level. Their joy was short-lived. They have seen lamps on columns with raising and lowering gear at Blackfriars Bridge Approach; and news has floated to them from abroad that there are examples to be found on the Continent of lamps so treated. The central suspension of such lamps, with travelling and raising and lowering gear, forms part of the experiment that is shortly to be made in the City. The venue of the trial is to be from the island opposite the west side of Cannon Street Station to the last island by King William Street. The trial installation will include two column inverted gas-lamps of the Keith pattern and of 1500-candle power each, and seven centrally suspended lamps of 2000-candle power each. The suspension gear will be fixed at a height of 30 feet; the lamp itself being slightly over 25 feet from the road level. The lowering tackle is to be so contrived that the lamps can be drawn to the side of the street, and lowered so as to be attended to from the pavement; or, as a matter of fact, at any point between the supporting wall and the centre of the roadway. There will be a special safety catch on the running support for each lamp; so that, when the lamp has been fixed in position, all strain will be taken off the wire ropes. The winches, which have double drums, will be fixed in convenient positions on the side walls of the buildings, some within reach of the pavement, and others at *facia* height, in which case short ladders will be used to operate them. But all maintenance work will be done at the ground level.

This, of course, is rather an important experiment, because only odd lamps here and there have hitherto been fixed with raising and lowering devices, which necessitate flexible tubing. It will be interesting to see how the cost of maintenance of the apparatus will run out; and on this head the trial will give an opportunity of learning something as to the best system to adopt, and the best form of construction for the metallic tubing.

THE WEST-END HIGH-PRESSURE LIGHTING CONTRACT.

The success of high-pressure gas lighting in ousting electricity from the very heart of the West-end is still fresh in memory; and full details surrounding the matter have been published. But there are one or two fresh points of some interest concerning the actual carrying out of the contract that may be placed on record. In the "JOURNAL" for June 14 (p. 691), we illustrated a pattern of the new Keith lamp of high-candle power, and that is the one that has been selected for use in the West-end. The trial lamps fixed in Aldwych (two of column type and four of the suspended type) have resulted in the column type being chosen for the whole of the high-pressure lighting included in the contract secured by the Gaslight and Coke Company in the district of the Westminster City Council. The only alteration from the lamp as illustrated on June 14 is that the reflector is to be perfectly flat. It will be remembered that, in Mr. Abady's paper before the Institution of Gas Engineers, he reproduced some clauses from

the contract; and one of them provides that the reflectors are to be "horizontally flat or slightly convex or otherwise as may be approved by the City Engineer, so as to disperse the rays." Choice has fallen on the horizontally flat reflector. To meet immediate requirements, twenty three-burner lamps, giving a maximum of 4500-candle power each, and 172 of the two-burner lamps, giving a maximum of 3000-candle power, have now been ordered.

With all this expansion in high-pressure lighting, business high-pressure is being felt by the James Keith and Blackman Company. In order to properly handle the glass and enamels only, they have had to take possession of a warehouse with a superficial area of some 15,000 square feet; and it is hoped that this will enable them to meet the season's trade without experiencing any undue delays. The position of the high-pressure lighting business, mainly through the new developments, is extremely interesting.

AMERICAN PRODUCER GAS PRACTICE.*

FOR a general treatise on modern producer gas practice, including gas testing, the preheating of air, and other incidental matters connected with this rapidly growing industry, it would be difficult to find a better work than this. The author has taken special precautions, he says, to "maintain an impartial attitude and to narrate as accurately as possible, without prejudice or undue influence, the various features of producer gas engineering at present in vogue in the industrial field," and he has succeeded well in his endeavour.

The work consists of twenty-two chapters and an appendix, and is copiously illustrated. The general construction of gas producers is first described; special attention being paid to the effect of steam on the fuel and on the heating power of gas itself. Then follows a chapter on cleaning the gas, so that it may be used in engines; and then there is a particularly interesting chapter, entitled "Works Details," which deals with vaporizers, charging appliances, insurance requirements, and right treatment during asphyxiation.

The chapter devoted to types of producers is good so far as it goes; but the number of types described is somewhat limited. It includes a number of producers never seen in Great Britain; while several of those best known in this country, and in Europe generally, are omitted. A chapter on fans and others on the physical and chemical properties of gases contain several valuable tables, and should prove useful for reference.

Various automatic appliances for gas analysis are described—including the "Uehlung Composimeter," the "Sarco Recorder," and the "Wise CO₂ Indicator." But the fact that the determination of carbonic acid without the carbonic oxide is useless, does not appear to be mentioned.

The subject of gas for power in engines is treated rather superficially, as is also that of the application of producer gas in various industries; but the treatment is amply full enough for the general reader interested in producer gas. The same is true as to the chapter on furnaces and kilns; the types chosen being by no means the best for this purpose, with the possible exception of the Schmatolla high temperature kiln. Curiously enough, no mention is made of Mr. Schmatolla's lime kiln—though one is illustrated under the indefinite title of a "German Kiln." Yet this is the one for which he is best known and on which his reputation, both in Europe and in the States, has been founded.

The chapters on preheating, on combustion in furnaces, temperature, radiation, conduction, pyrometry, and calorimetry are good; but the appliances for reversing the gas currents in the regenerators would be considered primitive in this country, and the author does not appear to be well acquainted with Seger cones.

The volume contains an abundance of tables and diagrams on a great variety of subjects, a short glossary of technical terms, and an appendix on oil-gas producers. The index is copious and well selected; and the illustrations are exceptionally clear.

* "American Producer Gas Practice." By Nisbet Latta. London Crosby Lockwood and Son; 1910. [25s. net.]

Prevention of Gas and Water Accumulations in Electric Junction Boxes.—Mr. A. Champion, an assistant in the electrical and highways branch of the Chief Engineer's department of the London County Council, applied, under the Standing Orders, for permission to obtain full patent rights in respect of an invention in connection with the construction of electric junction-boxes and similar chambers for the prevention of gas and water accumulation therein. The Chief Engineer reported that the work on which Mr. Champion was engaged had brought prominently to his notice the desirability for some arrangement to prevent such accumulation, but that by his official position he had not directly enjoyed any facilities for originating, working out, and perfecting his invention. At the meeting of the Council last Tuesday, it was decided, on the recommendation of the General Purposes Committee, that Mr. Champion should be permitted to obtain full patent rights in respect of his invention, subject to the condition that the Council be allowed to use the patent without payment, should they so desire.

EXAMINATIONS IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

[FOURTH ARTICLE.]

- 5 (a). Give the equivalent of 54 inches of water pressure in pounds per square inch. (b) Define explosion, and state the explosive limits of coal gas and air. (c) What is the law of diffusion of gases?

The pressure of an average atmosphere is 34 feet of water, or 14.7 lbs. per square inch. Therefore, a pressure of 54 inches is

$$4.5 \times 14.7 = 1.945 \text{ lbs. per square inch.}$$

(b) Explosion is a bursting with violence and loud report due to the sudden expansion of an elastic fluid. It may also be looked upon as an intensely rapid chemical action, giving rise to gases or vapours which, being greatly expanded at the moment they are formed by the heat developed during the action, occupy an enormously larger volume than the original substance. The limits of explosion are: The gas must not get less in proportion to air than 1 to 13, nor greater than 1 to 5. Varying compositions of gases slightly affect these figures.

(c) The relative velocities of diffusion of any two gases are inversely as the square roots of their densities.

- 6 (a) How may the variations of flame temperature be measured? (b) State briefly a method of estimating radiant energy sensible as heat from a gas-fire; (c) Why is a highly aerated bunsen flame hotter than a less aerated one?

(a) Flame temperature may be measured by a thermo-couple, as described by Professor Smithells (fig. 6). This consists of two wires of different metals in contact. Its utility depends on the fact that when the point of

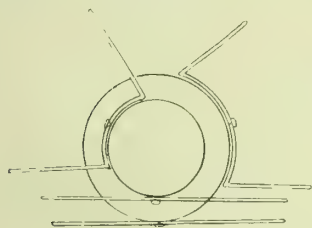


Fig. 6.

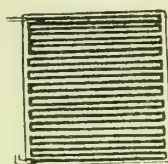


Fig. 7.

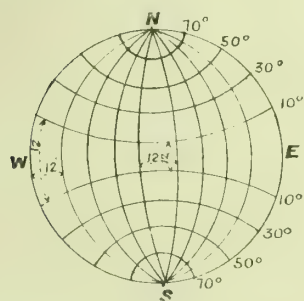


Fig. 8.

contact is heated, an electromotive force is developed, the intensity of which is definitely related to the temperature of the junction. Suitable metals are platinum and palladium. The free ends of the wires are connected with a galvanometer which has been standardized by known temperature. By inserting the couple in the flame, the deflections, and consequently the temperatures and changes of temperatures, can be noted. The sketch shows the couple in the flame.

(b) A method of estimating radiant energy sensible as heat is described in the report of the Gas-Heating Research Committee, 1909. The radiant heat emitted from a gas-fire is represented as falling on the inner surface of a hemisphere, and the method aims at measuring the radiant energy falling on this hemisphere. Professor Smith's radiometer (fig. 7) was used, consisting of a coil of flattened copper tube 12 inches square, through which a current of water is caused to flow at an even rate. Thermometers at the inlet and outlet are inserted to ascertain the change of the temperature of the water. The weight of water passed through in a given time being known, the quantity of heat in calories can be ascertained. Fig. 8 shows how the hemisphere was divided—viz., 81 areas,

the relation of the areas between 10 deg. south and 10 deg. north are to the areas between 10 deg. south and 30 deg. south, or 10 deg. north and 30 deg. north, as 1 : .94; to areas between 30 deg. south and 50 deg. south, and 30 deg. north and 50 deg. north as 1 : .766; to areas between 50 deg. south and 70 deg. south, and 50 deg. north and 70 deg. north as 1 : .5; and to areas between 70 deg. south and 90 deg. south, and 70 deg. north and 90 deg. north as 1 : .174.

Readings are taken at each of the 81 spaces by a thermopile and galvanometer. The readings for each nine spaces between each 20 deg. latitude are totalled up and multiplied by its factor, as above stated. These are totalled for the 81 spaces and divided by the reading taken in the centre area; the result being called the "factor for radiometer value."

For example: Total readings. 200

Centre " " " " " 7

Factor for radiometer value 28.5

The energy radiated on the centre square has been ascertained by the radiometer. Suppose it is 29 calories, then the total energy radiated as heat = $29 \times 28.5 = 826.5$ calories.

Gas consumption per hour = 20 cubic feet.

Net calorific value of gas = 141 calories.

Therefore total calories produced per hour = 2820.

Therefore percentage of energy radiated as heat = $\frac{826.5 \times 100}{2820} = 29.3$ per cent.

(c) A given volume of gas gives out the same amount of heat, no matter how it is burned.

A bunsen flame obtains a certain portion of its air for combustion primarily by the holes provided near the gas-nipple for the purpose.

This may be increased at will, and as the total amount of air required for complete combustion is practically a constant, it follows that if the primary supply of air is varied, so will be the secondary.

Starting with a slightly luminous flame in an ordinary bunsen, it will be observed that the flame is long and unsteady. The primary air supply being increased the flame shortens and becomes firmer till, with high aëration, a short, firm, and fierce flame is obtained.

The gas consumption is constant. The explanation of the variable condition of the flame is that, owing to excess primary air, the flame has not to travel so far to obtain the necessary amount of oxygen for complete combustion.

7. A 10 H.P. gas-engine requires overhauling. Describe in detail the operation of taking off, repairing, and replacing the valve box, gas, air and exhaust valves, piston, and connecting rod. Why should a suction-gas engine have an auxiliary supply of town gas?

First unscrew the nuts holding the valve-box in position, and lift it off. Then take out the cotter-pins from the ends of the valve spindles; thus releasing the nuts and washers and allowing the springs to be taken off. Then the valve spindles can be withdrawn through the inside, and the valve-box cleared of all carbonized gas, dust, and corrosion. Fix the valve-box in such a position that when the valve spindles are in they point downwards. Put in one spindle, first powdering the seat with finely-ground emery. Then a brace with a screwdriver bit is put into the top of the valve spindle and rotated with a little pressure, to grind the valve into its seating. The grinding must be continued until every part of the valve and seating is bright, showing that the valve touches its seating all round. This process is repeated with the other two valves. When the spindles are in their respective positions, the springs, washers, nuts, and cotters, can be replaced.

Now unscrew the locknuts on the crank end of the connecting rod, and take off the sheave. If the piston is on the inner dead-centre, rotate the fly-wheel half-a-revolution in order to release the connecting rod. The connecting rod and piston are withdrawn together. The piston rings can then be sprung off, and the piston end, piston, rings, and cylinder cleaned. If any of the rings have become worn and slack fitting, or have lost their resilience, they should be replaced by new ones. In putting on the rings,

care must be taken to see that all the openings where the rings are split are not in the same straight line, but alternately round the piston. The piston is then put into the cylinder, and the fast sheave of the connecting rod pushed on to the crank-pin. The loose sheave is placed over the bolts in the fast one, and the locknuts screwed up. The valve box can then be replaced, putting in new asbestos packing to make a tight joint, and the nuts screwed up.

It is desirable to have an auxiliary supply of coal gas to start the engine, and also in readiness for any breakdown in the suction plant, or for shortage of fuel.

8. The drawings are (fig. 9) a front elevation, (fig. 10) a plan, and (fig. 11) an enlarged section of the parapet which surmounts a railway bridge. Show by sketches in plan and section how you would carry an 8-inch main from point C in the highway to point D and support it to the wall on side E of parapet. State, with reasons, what class of main you would employ, how expansion and contraction would be provided for, what specials would be necessary, and what tools and other materials would be required to complete the work.

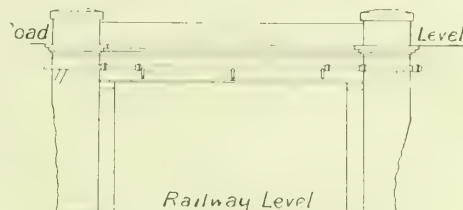


Fig. 9.



Fig. 10.

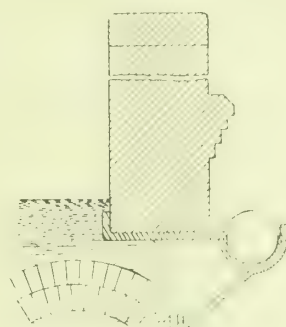


Fig. 11.

Steel, such as Mannesmann weldless, is the best type of main to be adopted. The necessity of selecting a class of main which is not too heavy is obvious, as it has to be suspended on brackets attached to the brickwork of the bridge. Being lighter, such mains are more easily placed into position than cast iron. Steel mains are not as susceptible to changes of atmospherical conditions as cast iron. As the main is constructed partly of bends, and is less than 40 feet span, any special provision for expansion or contraction is unnecessary.

The specials required would be:

Two 8-inch double S bends,

Four 8-inch $\frac{1}{4}$ bends. Also suitable short pieces.

The tools and materials required are: Three brackets, as shown in figs. 9 and 10. The end of the main may be let into the buttress walls; or if the walls are not quite high enough, built up to suit. Alternatively, special brackets of flat steel may be used, and secured to the brickwork with rag or Lewis bolts. It will be preferable to make the joints with lead wool. Other materials required are: Lead, yarn, yarning iron, setts, tools for excavating, chisels, hammers, set-screws, and scaffolding, with

suitable arrangement for suspending from top of parapet wall.

- 9 (A). Give diagram showing the candle power at different angles below the horizontal of (a) any inverted burner, and (b) any upturned burner, each working at ordinary (say, 2 inches) pressure, and consuming not more than 4 cubic feet of gas per hour. A simple sketch in sectional elevation of each burner must also be given.
- 9 (B). State generally how you would carry out lighting installations for any two of the following, having regard to the effect of artificial light on the eyesight: (a) Dining-room, (b) brass finisher's workshop, (c) draper's shop window. What type of burners and globes or shades (if any) would you adopt in each case, and why?

Dining-Room.—In a dining-room, light is chiefly required for (1) Illuminating the table during meals; and (2), sewing or reading at other times. In the first case, the occupants sit round the table [usually in the centre of the room]; and in the second case, they most frequently sit facing the fire-range. It is not possible with exposed light sources to illuminate for both conditions satisfactorily, and even with shaded sources some compromise is necessary. This is best effected by fixing at about the centre of the room a movable pendant, so shaded as to prevent the light sources from being in the range of vision of any occupants of the table. The movable pendant may be advantageously supplemented with two brackets or else figures fixed above the mantelpiece. The latter, however, should be extinguished when the people are sitting round the fire.

Inverted burners of approved type should be employed, and should be fitted with suitable adjusters. The number of units will depend upon the size of the room.

A very soothing effect is obtained with silk shades formed of white interior and green exterior. For ordinary use, it is undesirable to use shades, which obscure a large portion of the light. Most satisfactory results are obtained from white satin-finished globes. If, however, more toning down is required, green etched globes would be preferable.

Brass Finisher's Workshop.—For a large establishment, an installation of high-pressure gas would best meet the requirements. A Keith rotary compressor may be used and inverted burners; a row of these being fixed down the centre of the shop. For the special use of the workmen, some smaller units fixed on movable brackets and flexible tube may be utilized. The lights should be fixed in close proximity to the point required by the workmen, but kept clear of the machines; so that the mantles will not suffer through vibration.

As an alternative scheme, and not quite as expensive in first cost as a high-pressure installation, a row of (say) 4-light inverted lamps may be fixed down the centre of the shop. These should be fitted with clear bowls. Inverted burners with green enamel shades should be fixed on movable brackets near the machines for the use of the workmen.

Anti-vibrators may be used in each case if vibration is considerable.

Draper's Shop Window.—This may be carried out either by exterior or interior lighting, or a combination of the two. If the lighting can be completely done from outside, it is to be preferred. There is no risk of fire, and no dazzling light units to attract the attention of prospective customers. It must never be forgotten that shop lighting is solely a method of attracting attention to the displayed goods.

The number of outside lamps would depend upon the length and the nature of the window. Each lamp, generally speaking, should have globes clear on the window side and obscured on the street side. The height of the globes must be such as to accord with the bye-laws of the local authority.

Where outside lighting is not adaptable, the display window should, if possible, be encased, and a number of lights placed above the case-ment with suitable reflectors for downward illumination. Either vertical or inverted burners can be excellently adapted to this end.

Where the window is wide from front to back, it may be necessary to fix one or two light units in the window; but the dressing should be so arranged as to conceal these from the eyes of the people outside. The best examples of shop lighting are those in which, no matter whether the window is small or large, no light source is visible to the looker-on.

- 10 (A). What quantity by volume of carbonic acid, and what weight of water is produced by the combustion of 1000 cubic feet of average coal gas? What volume per hour of carbonic acid, and what weight per hour of water, is given off by the respiration of an adult under normal conditions; and how many British thermal units of heat does he give out? In what ways, respectively, do the products of coal gas, and the respiration of human beings affect the atmosphere of rooms?

1000 cubic feet of coal gas produce on combustion 600 cubic feet of carbon dioxide and 42·1 lbs. of water.

An average adult gives off 0·8 cubic foot of carbon dioxide per hour.

An average adult gives off 0·1 lb. of water per hour.

An average adult gives off 440 B.Th.U. per hour.

The products of combustion from a gas-flame materially increase the temperature of the air of a room, seeing that each cubic foot of gas will yield from 500 to 600 B.Th.U., and each unit will heat 1 lb. of air 4° Fahr.

Each cubic foot of gas burned yields 295 grains of water, which will prevent the heat having a drying effect on the air.

For every cubic foot of gas burned, about 5½ cubic feet of air are used, or approximately 4·345 cubic feet of nitrogen and 1·155 cubic feet of oxygen; the resultant products being carbon dioxide, water, and nitrogen. The gas, therefore, extracts a certain quantity of oxygen for combustion; but the heat generated induces a constant change of atmosphere in the room through ventilators and other openings.

The products of respiration also impart heat, moisture, and carbon dioxide to the atmosphere. The heat produced from a person per hour is equal to about 0·625 cubic foot of gas burned; further, each person (adult) will require about 1 cubic foot of oxygen, or the oxygen contained in 4·8 cubic feet of air. Organic matter is also exhaled in small quantities from the lungs and pores; and this has a very deleterious effect upon the hygienic state of air.

- 10 (B). Compare the relative fire risks of (a) town gas, (b) petrol air gas, (c) acetylene, (d) oil-lamps, and (e) electricity. State what you know of the general effect of each upon insurance rates.

(a) Fires are chiefly due to leaky joints, corroded pipes, or burners placed too near ceilings, partitions, curtains or similar easily-ignited objects. The characteristic smell of coal gas renders leakage easily traceable. Where any

adjacent objects are ignited by burners, it is attributable to careless workmanship.

(b) The risks attendant upon petrol-air gas depend chiefly upon the construction of the generator and the percentage of petrol vapour in the mixture. A 2 per cent. mixture of vapour with 98 per cent. of air, if ignited in a confined space, will produce a sharp explosion. The greater the specific gravity of petrol, the lower percentage required to give the maximum explosive mixture. The proportions given are in the neighbourhood of those adopted in many air-gas systems. The fire risks depend chiefly on the nature of the constructional safeguards against lights coming into contact with the vaporized air in any enclosing vessels forming part of the plant. Elaborate means, therefore, are taken in the construction of burners by the use of gauzes, fine tubes, shot, &c., to avoid flashing-back. If an air-gas plant is designed to work with a greater mixture than 6 per cent. of petrol vapour, the risks of explosion are slight, providing adequate means are taken to keep up the percentage of vapour when an increased demand is made on the plant.

(c) The safety or otherwise of acetylene is, like petrol air, determined by the immunity or otherwise of the plant from explosion. In the early days, accidents were numerous; but the generators which have survived are much safer now than most of the earlier types. There is little risk of explosion, providing excessive pressure is avoided in the generator and in the supply pipes, and providing also that there is no leakage from fittings. Explosion and subsequent fire may ensue if burners are lighted before the pipes are emptied of air. The same precautions in placing burners, &c., are necessary as with coal gas.

(d) Although more stringent regulations are in force now as to the flash-point of the oils used in lamps, accidents continue numerous. The portability of an oil-lamp, and consequent frequent neglect to ensure its being placed in a safe position, is the most fruitful source of fires. Lamps are knocked over, and fire as well as explosions, frequently ensue. The heat of the lamp may vaporize the oil, and explosion ensue through the wick fitting tightly.

(e) The dangers of fire ensuing from electrical installations is now more generally recognized than formerly, with the consequence that stringent rules governing the work done are enforced by the Insurance companies. The well-known Phoenix Fire Office rules owe their origin to the numerous fires which have from time to time ensued through bad workmanship. The chief source of fires is the fusing of wires, owing to overloading or short-circuiting; electrical fusion or fire from escaping current being the result. Another danger source has now to be added—viz., that of filament lamps bursting, and the heated products of fusion setting fire to inflammable materials. As distinguished from gas, there is no indication of an escape of electricity until fire actually ensues. In the former case, the pungent odour usually leads to location of leakage, and fires bear a small relation to escapes.

Insurance companies class the fire risks in the following order: (1), electricity; (2), town gas; (3), acetylene; (4), petrol; (5), oil. Such companies consider oil to be far the most hazardous. Although electricity is still considered slightly safer than gas, it is a singular fact that gas-works insurance is usually 2s. per cent., and electricity works 3s. per cent.

Insurance companies insist upon acetylene and petrol-air gas plants being fixed in a separate building from that they are intended to illuminate.

The premium for workmen's accident insurance in electricity works is about 2s. 6d. per cent. more than for gas-works.

Mond Ammonia-Recovery Plant.

The Power-Gas Corporation, Limited, have recently secured an order for a large Mond ammonia-recovery plant for the Birchenwood Colliery Company, Limited, of Kidsgrove, near Stoke-on-Trent. It is to produce gas for boiler firing and power from a mixture of bituminous slack, washery refuse, and belt pickings. It is equivalent to 32,000 H.P. in size, will gasify 320 tons of the fuel per 24 hours, and will comprise 13 special Mond producers, fitted with arrangements for the mechanical removal of the ash, of which about 40 per cent. will be contained in the fuel to be gasified. The whole plant is to be erected complete and started to work in nine months, and when finished will be one of the largest producer-gas units in the world. The installation should be of particular interest to colliery companies, since it opens up the possibility of using materials which are at present of no value,

and are frequently a source of trouble owing to the offensive odours given off. It also possesses the advantage that the revenue from the sale of the sulphate of ammonia produced will in a short time repay the initial cost, after which the installation will be a source of profit. Mond-gas producers are already at work in several other collieries, successfully gasifying waste shale as well as many varieties of caking coal which have previously been found unsuitable for gas production.

The marriage was solemnized last Tuesday of Mr. Laurence W. Simpson Roston and Miss Kathleen Mary Dingwall, eldest daughter of Sir Arthur Dingwall, of Shipley House, Carshalton. Mr. Roston is the eldest son of the late Mr. Simpson Roston and Mrs. Roston, of Riverside, Beddington, Surrey.

PARLIAMENTARY MUNICIPAL TRADING RETURN.

THE final stage is now reached in the publication of the return with reference to municipal trading in the United Kingdom which, as readers already well know, has been prepared at the instance of Mr. L. G. Chiozza Money, who, during the last Parliament, was the member for North Paddington. This return, owing to the tremendous amount of ground covered by it, had to be divided into a series of volumes, the issue of which has been taking place one by one at more or less regular intervals. It is over a twelve-month since Part I. was published; and a fortnight since the sixth (and last) volume made its appearance—three-and-a-half years after the return was moved for in the House. Parts I. and VI. were noticed in the "JOURNAL" for June 22, 1909; Part II., on Sept. 21; and Part III., on Dec. 28. Part IV. was similarly dealt with in our issue of March 29; and now we have before us Part V.—which, as indicated, is the sixth to be published, owing to one of the parts having appeared out of its numerical order. The expense entailed in the preparation of these volumes must have been enormous; and exactly what object they are intended to serve, is somewhat difficult to understand. By the time of their issue, too, the information contained in them had become hopelessly out of date. But possibly the instigator of the return would argue that this was of secondary importance, as the collected information for one year would suit his purpose as well as that for another. At any rate, in view of the labour and money bestowed upon them, we must hope that the complete figures, now they are at disposal—even though they may be so utterly out of date—will prove of some real utility, in spite of the fact that we ourselves do happen to be unable to see how any usefulness they may possess can be sufficient to justify their preparation.

Before dealing with the figures in the present volume, it may be well once more to briefly explain that the object of the return was to set forth certain trading statistics for the London County Council, the Corporation of the City of London, the Council of each Metropolitan Borough, the Corporations of the Municipal Boroughs of Liverpool, Manchester, Birmingham, Leeds, Sheffield, Bristol, Bradford, West Ham, Newcastle-upon-Tyne, Kingston-upon-Hull, Nottingham, Salford, Leicester, Portsmouth, Bolton, Cardiff, Sunderland, Oldham, Croydon, Blackburn, Brighton, Derby, Preston, Norwich, Birkenhead, Gateshead, Plymouth, Halifax, Southampton, South Shields, Burnley, East Ham, Huddersfield, Swansea, Wolverhampton, Stockport, Middlesbrough, Stockton, and Blackpool, and the Edinburgh, Glasgow, Dundee, and Aberdeen Corporations. It was to indicate the nature and extent and, for each of the last four years for which figures were available, the financial results of reproductive municipal undertakings, including for each undertaking separately "a short description thereof, date and terms of original acquisition or establishment or subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of relief or burden to rates, number and salaries of the chief paid officials, number of work-people, rate of wages paid in chief classes of labour, and prices charged for products or services supplied or rendered." In a memorandum attached to the return, it is pointed out that the municipal boroughs in England and Wales mentioned above are all those which at the date of the Census of 1901 had a population of upwards of 90,000—with the addition of two (Stockton-on-Tees and Blackpool) which have a smaller population. When noticing Part I., some particulars were given with regard to the form in which the information was asked for and has been supplied in the return.

The municipal boroughs included in the volume now under notice are: Bristol, Newcastle-upon-Tyne, Kingston-upon-Hull, Portsmouth, Cardiff, Sunderland, Gateshead, Plymouth, Southampton, South Shields, Swansea, Middlesbrough, and Stockton-on-Tees. With regard to these thirteen boroughs, the number of reproductive undertakings which fall to be included are respectively: Bristol six, Newcastle-upon-Tyne six, Kingston-upon-Hull nine, Portsmouth six, Cardiff five, Sunderland six, Gateshead three, Plymouth six, Southampton six, South Shields five, Swansea six, Middlesbrough seven, and Stockton-on-Tees six. In only three cases is gas supply included—those of Kingston-upon-Hull, Middlesbrough, and Stockton-on-Tees, but water figures in seven instances—Kingston-upon-Hull, Cardiff, Plymouth, Southampton, Swansea, Middlesbrough, and Stockton-on-Tees. With regard to Stockton-on-Tees water supply, it may be pointed out that up to March 31, 1906, the Town Council had borrowed £1,155,004 for the purposes of the undertaking carried on by the Tees Valley Water Board. The Council have not furnished in connection with the present return, particulars relating to their share in this undertaking. In twelve of the boroughs the electricity supply is a municipal one—the single exception being Gateshead. But in the case of Newcastle-on-Tyne, the statement needs some qualification. The Council do not, in fact, carry on an electric supply undertaking. They are, however, liable for the loan charges in respect of money raised for the purposes of such an undertaking (subsequently sold to a company) by an authority now superseded by the Council. In nine of the places there are tramways owned (though not in all cases worked) by the Council. In twelve instances markets appear; and in the same number of cases there are municipal baths. Seven of the boroughs have

working-class dwellings; while among the more varied undertakings, one notices the following: Bristol, municipal lodging-house and docks; Newcastle-upon-Tyne, quay; Kingston-upon-Hull, harbour and dock and telephones; Portsmouth, harbour, quay, and wharf, and telephone exchange; Sunderland, ferries; Gateshead, quay and cemeteries; South Shields, quays; Swansea, telephones; Middlesbrough, ferry and wharf and cemeteries; and Stockton-on-Tees, quay.

During the four years referred to in the return—1902-3, 1903-4, 1904-5, and 1905-6—the Bristol rates received about £7000 from the markets. Newcastle-upon-Tyne has in the same way benefited from a like source to the extent of £21,000; and a sum of £300 has also been received from working-class dwellings. At Kingston-upon-Hull, the water-works contributed some £23,000, the tramways over £60,000, and the markets £1500. In a similar manner, Portsmouth benefited to the extent of £3500 from the electricity undertaking, £3500 from the tramways, and £17,500 from the harbour, quay, and wharf. At Cardiff, the electricity undertaking has handed over to the rates £6000, and the tramways £650. The Sunderland tramways undertaking contributed £12,500; and the Plymouth water-works £17,500, electricity supply £900, markets £3000, and baths £400. The Southampton water-works have handed over £1370 (all in the year 1902-3), the tramways £10,000, and the markets £1000. The South Shields electricity undertaking has handed over £1100, the tramways £700, the baths £3300, and the quay £1000. The Swansea rates benefited from profits on the markets to the extent of £9000; while Middlesbrough from this source received £1000, and from the ferry and wharf £6000. At Stockton-on-Tees profits from the gas-works have in the years referred to been handed over in relief of the rates to the extent of nearly £25,000; the markets having also contributed some £2000.

In these few figures, we have endeavoured to set out what appears to be the only point that can, without a great deal of trouble, be extracted from the 200 odd pages of tables, &c., of which the present volume is composed. The number of different undertakings carried on by various councils affords an indication of the extent to which municipal trading has grown; and as for the amounts given in relief of the rates—well, the enthusiastic champions of municipalization in every possible direction must be left to make what arguments they can out of them. This factor cannot, in any event, of itself decide the wisdom or otherwise of the policy of such trading; for the circumstances of each individual case need careful consideration. But even if one were inclined to justify municipal trading by the benefit which the rates receive from it, the figures in the volume before us would not be very helpful to this end. During the four years referred to in the return, it will be seen that, out of the 77 undertakings carried on by the thirteen boroughs, only 28 handed over sums in relief of the rates. The second largest contribution appears to the credit of one of the gas-works represented—Stockton-on-Tees. It will, of course, be admitted that many of the undertakings are not such as would in any case be carried on primarily, or even mainly, for purposes of profit; and perhaps in some other instances the method has been adopted of giving the whole of the benefits of municipal service to the particular customers of each separate undertaking.

A GERMAN TEXT-BOOK ON PRODUCER GAS.*

THE text-book before us is a new volume of the well-known series of chemical-technical manuals published by A. Hartleben, of Vienna and Leipzig. It essays to treat of the manufacture of producer gas, including all descriptions of power gas which are made in producers or generators, as distinct from gases made by carbonization processes. It also deals with the use of these gases for power and other purposes.

The treatment of the subject is divided into three parts, of which the first refers to producer gas itself. The first section of this part of the work is on the theory of heat, and gives the usual thermal and other constants of which a knowledge is essential to the proper comprehension of the theory of the process of gasification in producers and generators. The second section treats of this theory, and affords as good an explanation of it as we have yet seen compressed into comparatively small compass. There is here a printer's error; the name of Mr. Bone's collaborateur in his investigation on the "Direct Union of Carbon and Hydrogen" being given as Jesdan, instead of Jerdan. Later in the section, anthracite is spoken of along with ordinary coal and wood as yielding products of distillation on heating. It is accordingly distinguished from coke and charcoal as a generator fuel. But in practice anthracite as used in this country and America in producers or water-gas generators is more nearly allied to the latter fuels than to coal or wood. The third section refers to producer gas, which is here used as a comprehensive term for producer gas proper, semi-water gas, and water gas. Reference is made to the distinction between producers, according to whether they work with a positive or a negative pressure at the grate. The fourth section describes the chief characteristics of the fuels used in the manufacture of producer gas and water gas, including wood and

* "Das Generatorgas seine Erzeugung und Verwendung." Von Dr. Carl Kietzbl. Mit 151 Abbildungen. Vienna and Leipzig: A. Hartleben; 1910,

peat, which have of recent years come into the foreground for the production of power gas, and of a number of other products the manufacture of which may be regarded as the prime object of the processes carried out in the producer. Ammonia and other so-called bye-products are in reality the staple products of many of the so-called gas-producing processes which are carried out with peat, slack coal, or other poor fuels. This contention has frequently been put forward in our columns in the past; and some recent industrial developments show that it is being justified by the actual procedure. The gas produced is in some cases regarded as of so little value that a large proportion of it is blown away, while the plant is worked at a regular load for the sake of the continuous production of ammonia and other so-called bye-products. Brown coal and lignite naturally receive fairly full treatment in a text-book which is intended primarily for Austrian and German readers. For the same reason, also, English coals are less fully dealt with than German and Austrian. Anthracite, being, so far as Europe is concerned, obtainable only from South Wales, comes into consideration as a possible fuel for producers on the Continent only at sea ports, as elsewhere the freight charges would be prohibitive. The fifth section is on the analysis of solid fuels and the gas produced from them. All the ordinary forms of analytical apparatus are described; but the treatment given is not critical, and the reader will find it difficult to judge which methods the author has, from his own experience, found to be the preferable ones.

The second part of the book deals with producers and generators, the underlying principles of the construction of which are first referred to, together with the most suitable types of fans, blowers, air-lock feeding devices, tar-extractors, and other auxiliary apparatus of the generating plant. Then follow descriptions of different types of producers, commencing with those which work with natural draught, and following on to those in which the air is supplied at a positive pressure, and the suction producer. All the ordinary forms of these different types of producing plant are described and illustrated. Two special sections are devoted to the production of gas from bituminous fuel—one referring to producers which are adapted for the recovery of ammonia and other bye-products, and the other to producers in which the bye-products are ignored. The chief examples of the former type are, of course, the Mond and the Duff producers. The question of the fixation of atmospheric nitrogen by producer processes is next discussed. Then follows a section on water-gas generators, of which the Dellwik-Fleischer and the Strache types receive the fullest notice. The carburetted water-gas plants which are used in gas-works in this country are scarcely noticed; and the distinctive Kramer and Aarts type of water-gas generator is passed by with a comment that it essentially depends on the same principles as the other types, and presents no advantage over them. The last section of this part of the work treats of the working and control of the producers and generators. Speaking generally, the author has referred more or less fully to all existing types of gas-producer and simple water-gas generator of any note; and as a compendium of what is common technical knowledge in regard to them, this part of his work may be considered as a useful contribution to technology. His acquaintance with what has been done in connection with the production of power gas seems to extend to all countries and to quite recent times; but it does not appear that the information conveyed has been gleaned at first hand in most cases.

The third, and last, part of the manual deals with the use of producer gas and water gas. The first section refers to the employment of producer gas as a fuel; but there is no special description of the producer furnaces which are in general use on gas-works for heating retorts, though a brief allusion is made to the fact that producer gas is so used. The second section (which, by mistake, is numbered as the third) describes gas-engines, their working and general types, but is naturally too brief to be really of practical value to the user of such engines. The third, and final, section of this part is a short one referring to the use of producer gas as a raw material in certain chemical industries.

The book, which comprises 350 pages, closes with an all too brief index. As a compact and carefully compiled *résumé* of the present industrial position of the manufacture and use of producer-made power gas, we can confidently commend this little book to those readers of the "JOURNAL" who have sufficient knowledge of the German language to be able to peruse it.

Mr. W. Boyd Dawkins, a former Professor of Geology at the Manchester University, and well known in connection with water questions, has had the ordinary degree of Doctor of Science conferred upon him by the governing body of the University.

In a paragraph in a recent number of "Nature," reference was made to a "gas-calculator" designed by Dr. R. C. Farmer, a copy of which was sent to them by Messrs. Baird and Tatlock, Limited. The diagram consists of four vertical lines—the two on the left being graduated in temperatures for wet and dry gas respectively, and the line on the right graduated in pressures (millimetres). A celluloid strip bearing a black ruled line is laid across the observed pressure and temperature of the gas, and the corrected volume of 1 c.c. of gas is read off directly on the middle line. It is claimed to give the volume with an accuracy of 1 part in 5000 parts; and our contemporary has found it extremely rapid and convenient in use.

THE MUNICH CARBONIZING CHAMBERS.

An account was given by Herr H. Rauch, the Works Superintendent of the Municipal Gas-Works at Munich, to members of the Association of Gas and Water Engineers of Austria-Hungary at this year's meeting, held at Innsbruck on May 26 to 29 last, of the results of extended experience with the type of inclined carbonizing chamber which has become identified by name with the Munich Gas-Works. Herr Rauch's communication is published in a recent issue of the official organ of the Association—the "Zeitschrift des Vereines der Gas und Wasser Fachmänner in Oesterreich-Ungarn," from which the following abstract of his remarks has been prepared.

After preliminary trials on a small scale, the first bench of five settings of Munich carbonizing chambers was erected at the Kirchstein Gas-Works in Munich according to the plans and designs of Herr Ries, the Manager of the Munich gas undertaking, and was brought into action on Oct. 3, 1906. The five settings have been in continuous work, with short interruptions, up to the present time, and are still in a satisfactory condition. The side walls and roofs of the chambers are quite smooth and absolutely sound. The bottoms have required no repair in the four years, and offer no more obstacle to-day to the discharge of the coke than they did when they were first brought into use. The fourth setting, on which changes had been made as a result of the early experiences gained, has remained in action since June, 1907, with the exception of one interval of four weeks, during which it was equipped with arrangements for the admission of steam, but in which no repairs were carried out. The doors of the chambers are faced so that the joints throughout are iron to iron; and they have proved absolutely sound without the use of luting material. The only repair necessary has been the renewal of the fire protecting-screens on the discharging doors. The doors themselves have required no renewal or repairs.

As a result of the favourable experiences gained with these settings at the Kirchstein works, Herr Ries brought into action, in the spring of 1909, six settings having a productive capacity of 6000 cubic metres (212,000 cubic feet) per diem per unit, and in the winter 1909-10 six more similar settings, at the new gas-works on the Dachauerstrasse. At this works there are used nothing but the large chamber carbonizers. The experiences gained with these settings so far have been entirely satisfactory; and the author extended an invitation to those attending the meeting at Innsbruck to proceed to Munich to view the chambers in action. This invitation, it appears from a postscript, was accepted by Herr Anzböck, the Chief Inspector of the Imperial Continental Gas Association's works at Vienna, and Herr Arnold, the Superintendent of the Gaudenzdorf works at Vienna. That the fullest investigation is invited in regard to the working of these settings is, the author remarks, shown by the fact that 500 visitors from all parts of the world have inspected the settings at Kirchstein gas-works, and about 300 those at Dachauerstrasse works.

The author then proceeds to refer to the working results obtained with the settings. The figures throughout refer to carbonization without the use of steam, except where otherwise is specially indicated. Results obtained with the settings in the spring of 1907 were published by Professor Bunte,* and have been commented on by many authors subsequently; but the report of later investigations made by Dr. Drehschmidt, Chemist of the Berlin municipal gas undertaking, has been passed over by them.† Professor Bunte's figures compared favourably with earlier results obtained with retorts, but were considerably inferior to those secured when the settings were first brought into use. The settings were shifting apart in the direction of the axis of the chambers, for lack of proper transverse ties; and consequently there was considerable unsoundness. This was not surprising, having regard to the novelty of the construction. The cross-ties were then strengthened; and a few improvements were made in the heating arrangements. In July and August, 1907, the settings, in a sound condition, were subjected to fresh trials; and on the average of twenty days' working afforded a yield of 13,348 cubic feet of gas per ton of Saar coal, which corresponds with the make of gas originally obtained with the settings.

In the spring of 1908, these figures were confirmed by exhaustive investigations carried out by Dr. Drehschmidt, which were reported in detail at the time (*vide supra*). The chief results of the carbonization of a mixture of English and Silesian coal as found by Dr. Drehschmidt, were as follows: First trial, 12,175 cubic feet (uncorrected) per ton of coal; second trial, 12,340 cubic feet (calorific power 572 B.Th.U. gross per cubic foot); third trial, 12,566 cubic feet (554 B.Th.U.); fourth trial, 13,901 cubic feet (517 B.Th.U.). It will be observed that these figures show a gradual increase in make of gas, with a simultaneous diminution in calorific power, until, as the standard calorific power of 5000 calories per cubic metre (522½ B.Th.U. gross per cubic foot) is approached, the make amounts to upwards of 13,900 cubic feet per ton of coal. This variation of yield and calorific power was secured solely by manipulating the heat of the settings. The average temperature, as measured at the burners and at the nozzles of the furnace, ranged from 2246° Fahr. with the make of

* See "JOURNAL," Vol. XCIX., p. 501. † *Ibid.*, Vol. CIII., p. 704.

12,175 cubic feet per ton, to 2340° Fahr. with the make of 13,901 cubic feet per ton; while the temperature of the chambers varied from 1807° to 1954° Fahr. respectively. When steam was admitted to the chambers, a make of gas of 14,568 cubic feet (uncorrected) per ton was secured; the gross calorific power of the gas being 510 B.Th.U. per cubic foot. Other figures obtained by Dr. Drehschmidt in his investigations show an average make of 13,148 cubic feet (uncorrected) per ton of coal; the gross calorific power of the gas averaging 553 B.Th.U. per cubic foot. A trial with Saar coal also gave the high make of 13,689 cubic feet per ton; the gas having a gross calorific power of 576 B.Th.U. per cubic foot. The calorific values were determined by means of a Junkers recording calorimeter.

The first bench of settings of large chambers at the Dachauerstrasse works gave in May, 1909, equally favourable results. A mixture of Saar and Karwiner coal afforded on the average a make of 13,320 cubic feet per ton. Exhaustive investigations have recently been made on the second bench of these settings. A four-days' run with Saar coal gave an average make per ton of 12,649 cubic feet; the gross calorific power of the gas being 602 B.Th.U. per cubic foot, and its specific gravity 0.459. Dr. Drehschmidt's investigations clearly showed that it was perfectly feasible to reduce this high calorific power by increasing the heats of the settings, and at the same time to obtain an increased make of gas. Up to the present, steam has not been used to lower the calorific value of the gas, except in a few experiments which showed that it was quite possible to work with the admission of steam in the chambers. The admission of steam is ordinarily carried out towards the end of the period of distillation—i.e., at a time when the calorific power of the gas being evolved is at its lowest. The introduction of steam consequently reduces it still further, and at the same time increases the specific gravity of the gas through admixture of water gas. There is, therefore, a risk that when only one gasholder is used, the gas of higher specific gravity from the end of the charge will remain in the lower part of the gasholder and pass without admixture into the distributing system. The gas made towards the end of the distillation in the carbonizing chambers is, though slightly poorer in calorific power, of lower specific gravity—viz., considerably under 0.4—and consequently, when it enters the gasholder, it immediately ascends and mixes with the gas already there. This explanation has been proved to be correct by exhaustive investigations at the Kirchstein works at Munich.

It has been alleged that the gas from carbonizing chambers is subject to very great fluctuations in calorific power, especially if the charges are not distributed uniformly over the 24 hours. The experiences at Munich, however, show that there is no need on this account not to avail oneself of the great advantage of doing away with night work. The author gives a diagram showing, for the four-days' run at the Dachauerstrasse works just referred to, the curves for the calorific power of the gas made and for the make of gas. The curves show great regularity, and only very moderate fluctuations from the mean value. The settings were charged in three groups—in the morning, mid-day, and evening. From 7 o'clock in the evening till 7 o'clock in the morning, no charging took place. In regular working they would be charged only in two groups—in the morning and in the afternoon. It is evident that no inconvenience arises from want of uniformity in the quality of the gas, from the fact that at the time of the author's address about 85 per cent. of the gas supplied in Munich was made in the carbonizing chambers, and only the small residue in retorts. Of the total consumption, two-thirds was then made at the Dachauerstrasse works, exclusively with chamber settings; and at this works there is only one gasholder. The remaining one-third of the total consumption was made at the Kirchstein gas-works—as to two-fifths in retorts, and as to three-fifths in five chamber settings, which were charged only in the morning between 7 and 10.30 o'clock. Notwithstanding this concentration of the charging of the fifteen chambers in the 3½ hours, no disadvantage is experienced in the gas supply from Kirchstein works.

Professor Bunte's investigations on the Munich chambers showed a consumption of coke as fuel in the furnaces of the setting equal to 15.3 per cent. of the weight of coal carbonized. This figure applied to the Kirchstein settings when the flue gases left the settings at the abnormally high temperature of 977° Fahr. It is evident the regenerative arrangements were not sufficient, and the same comparatively high consumption of fuel was shown in Dr. Drehschmidt's trials. At the Dachauerstrasse gas-works, however, later investigations have shown a consumption of 13.5 per cent. of fuel in the furnaces. This fuel contained 12 per cent. of ash and 20 per cent. of water; but the latter has been deducted in arriving at the 13.5 per cent. quoted for the fuel consumption. The coke used was inferior, and contained 20 to 30 per cent. of breeze. The 13.5 per cent. of fuel must be regarded as satisfactory from the point of view of economy of heat; but it may be pointed out that many gas men are inclined to attach too high an importance to a low fuel consumption, and to disregard its relation to a high make of gas. For instance, an increase in the make of gas of 3 per cent. might fairly be accompanied by an increase in the fuel consumption of about 3 per cent.

As to labour, the twelve settings of 6000 cubic metres (212,000 cubic feet) capacity per diem at the Dachauerstrasse works are charged by four men, of whom two are on the charging and two on the discharging side. Consequently, the make of gas is about 636,000 cubic feet per man per shift. Five minutes are required for discharging and recharging one chamber; but the works'

reports show that on the average the time spent per setting of three chambers is twenty minutes. Consequently, twelve settings can be charged in four hours. So that with an eight-hour shift there are still four hours available for cleaning and maintenance work. The work on the discharging side of the settings could readily be carried out by one man if necessary. The heating of the chambers naturally requires some care at first; but after four years' experience, it is left entirely in the hands of the mechanics or foremen.

The regulation of the heats is effected merely by reducing the secondary and primary air supplies during the twenty-four hours, in correspondence with the reduced supply of heat required as the distillation advances. During the night it is in charge of the night watchman, who alters it at fixed intervals according to instructions. No greater heating of the central chamber takes place, as has been surmised in some quarters would be the case. In the latest settings at the Dachauerstrasse works, heating of the roofs of the chambers is completely avoided by providing the settings with inclined firing and four rows of burners; and in this case the central chamber works at a few degrees lower temperature than the side ones. The introduction of inclined firing at the Dachauerstrasse works, combined with the adoption of full charges for the chambers, has given very favourable results.

At the Kirchstein works, there were on the average two to three stoppages of the ascension-pipes in twenty-fours. But such stoppages no longer occur with the new settings at the Dachauerstrasse works, while with them the tar is thinner and more oily, of a brownish colour, and contains less than 10 per cent. of fixed carbon. The yield of ammonia, which Dr. Drehschmidt found varied with the Kirchstein settings between 0.228 and 0.286 per cent. of the weight of coal carbonized, has been considerably improved in the new settings. Two naphthalene washers were provided on the new works; and one of them was brought into use when the works were started. But as, after a few months' working, no perceptible amount of naphthalene was found in the washing oil, it was put out of action. The small amount of scurf formed in the chambers cannot be attributed to the scurf being burned off during the time the chambers are open, because there only five minutes are occupied discharging and recharging each of them. The smallness of the formation of scurf is doubtless attributable to the short length of time during which the gas is exposed to the hot walls of the chamber.

The chief objection raised to the Munich chambers has been their high cost of installation. This is due to their extremely solid and massive construction. Professor Strache has remarked that large chambers can only be employed in the gas industry if they can be kept absolutely sound. Gas consumers must not be supplied with a mixture of coal gas and flue gases. Hence the coke ovens used for the production of metallurgical coke cannot be forthwith adopted in the gas industry. The requisite soundness can only be attained by solid construction such as has been arranged for with the Munich chambers. It has been said the chambers at Dresden give a gas of 0.58 sp.gr., which indicates an admixture of 22 per cent. of flue gases. This is a correct deduction. But it must be pointed out that the Dresden chambers are not on the Munich system. The proportion of carbonic acid in the gas from the chamber settings at Munich varied, according to Dr. Drehschmidt's investigations, between 0.9 and 4.8 per cent. on the 24 hours, and averaged about 2.4 per cent. The proportion of nitrogen in the gas remained below 2 per cent. These figures, taken in conjunction with the average specific gravity of the gas, which ranged between 0.40 and 0.46, show that the chambers were absolutely sound both in regard to the walls between them and the heating flues, and in regard to the doors of the chambers. It is, however, quite true that the first settings were of too massive construction in certain parts, and that the price was consequently needlessly high. It would have been absurd in the first instance to have endangered the adoption of a right principle by economy in material of construction. The settings are now, on the strength of the experiences already gained, being made of lighter construction; and the fire-brick material used is considerably economized. The charging no longer takes place from the top of the settings; and consequently the retort-house at the Dachauerstrasse works is some 16 feet too high for the new bench of settings.

An off-set to the high cost of installation is afforded by the low cost of repairs. Experience extending over nearly four years at the Kirchstein works shows that the annual repairs average about 2½ per cent. of the cost of installation. The repairs needed have been almost limited to the periodical renewal of the two middle walls, which can be done without disturbing the side walls or the roofs of the settings. The roof is propped up by a beam, and a new wall was introduced beneath it. Single slabs have also been introduced quite satisfactorily into the chamber walls. The side walls and buttresses, roofs of settings, bottoms of chambers, and the burners, are, after four years' use, in excellent working order, without having undergone any repair.

The author concluded his address with a reference to the advantages from the "ethical-social" standpoint of the displacement of manual labour by mechanical working on a large scale. Some points from the discussion which followed the reading of the paper will be dealt with subsequently in the "JOURNAL."

Among the subscribers to the Hospital Saturday Fund are the Gaslight and Coke Company, for £532; the South Metropolitan Gas Company, for £211; and the Metropolitan Water Board, for £128.

GASHOLDER TANKS WITH BULGING SIDES.

By F. S. CRIPPS, Assoc.M.Inst.C.E.

The letter from M. Bonnet in the "JOURNAL" for the 19th inst., in reply to my queries, forms a valuable supplement to his most interesting paper read before the Société Technique.

I venture to produce the salient points in the letter, at the same time converting the French into English measures, as they will then appeal more forcibly to English readers.

The letter states that the curve shown, and for which the stresses were determined in the paper, is not the actual curve adopted for the Simmering tank. The example given has a curved side, which, when subject to water pressure, induces: (1) A vertical downward thrust on each post of 152 tons (the posts being 9 ft. 3½ in. apart, and the vertical pressure being nearly 53½ tons for every 3 ft. 3⅜ in. of circumference). (2) A horizontal outward radial force at the top, on every metre (3 ft. 3⅜ in.) of circumference, equal to 29½ tons.

Treating of the latter force first, we find that, the outward radial pressure causes a circumferential tension in the horizontal ring-girder of no less than 959½ tons.

This girder is of wrought iron, and the allowable safe stress was taken at 6·33 tons per square inch in tension, requiring therefore 151½ square inches effective sectional area. Or, if we take the strength of the joints at 75 per cent. of the solid section, then the actual section required would be about 202 square inches. This would be a heavy girder.

M. Bonnet states that the horizontal wrought-iron girder used for the Simmering tank was made much lighter than this, because the curve did not correspond with that of the example described in his paper. As a matter of fact, the girder was 5 feet wide, and constructed of four angle irons, 4 in. by 7⅝ in. by ⅞ in., with a web plate 0·7 inch thick. This would give a sectional area of 67·3 square inches, or, allowing for rivet holes, &c., at junctions, say, an effective section of 51 square inches, which, at 6·33 tons per square inch, corresponds with a stress of not more than 323 tons, or roughly only one-third of that required by the example given in the paper. Now, 323 tons circumferential stress would correspond with a radial pressure of barely 10 tons per metre of circumference, instead of 29½ tons.

From this we conclude that the tangent to the upper part of the curve must, in the actual structure at Simmering, approach more nearly the vertical than in the example given in the paper, by this means reducing the outward thrust at the top. M. Bonnet states this to be the case.

It is obvious that, the more nearly the tangent to the curve at the top approaches the vertical, the less is the outward radial thrust on the horizontal ring-girder.

It may be asked, then, What is to hinder us from altering the curve so that the tangent becomes quite vertical; as by doing so, it would appear that the horizontal girder might be abolished altogether? From a purely theoretical point of view, it might be so; but there are many practical reasons against such a course, which we need not discuss.

Now, as to the vertical force acting on the posts: The actual shape of the curve adopted at Simmering has not been given; and therefore the actual vertical force acting on the top of the posts is not ready to hand.

But recurring to the example in the paper, we find it works out at 152 tons on each post, of which there are 72 round the tank. A vertical load of 152 tons on the top of each is considerable, as they are over 40 feet high. Each post would therefore probably require from 40 to 50 square inches sectional area, according to design. These, together with the bracing attaching them to the sides of the tank, would form a heavy item.

Then, we must not neglect to notice the cross strains on the plating, caused by the posts (to which all vertical stress has to be transmitted) being 9 ft. 3½ in. apart. Between each pair of posts, the distributed vertical force acting on the plated sides at the top is 152 tons; and all this has to be transmitted through the plating to the posts, causing racking or cross strains, which necessitate making the plates thicker to allow for it. The ring-girder at the top should be strong enough in a vertical direction to carry and transmit the tangent downward pull of the sheeting or plating to the posts. If the posts are too far apart, it is easy to see that the tank would tend to buckle between them, unless the horizontal ring-girder is very strong in a vertical direction.

On the other hand, a multitude of vertical posts (braced to the sides of the tank, for the reasons given in the paper) would be expensive.

One other point may be mentioned. Unlike all other tanks, the plates are not quite rectangular, but require to be curved on the edges so as to suit the bulged form of the tank. This makes expensive work.

It is not always wise to save material and increase the labour on the work in consequence. It is often advantageous to use more material to simplify a structure, and at the same time save labour on it.

If I may be permitted to refer once more to the tank I patented in 1901, I would draw attention to the simplicity of its construction. All plates are rectangular; and these, as well as all girders, &c., are free from complicated curves. The weight of the structure, however, would, I think, be greater than that of M. Bonnet's most ingenious device.

AUSTRIAN INVESTIGATIONS ON GAS-FIRES.

The last number to hand of the "Zeitschrift des Vereines der Gas und Wasser Fachmänner in Oesterreich-Ungarn" contains a report by Dr. Fritz Kropf on investigations of gas-fires which have been carried out at the Experimental Works of the Austro-Hungarian Association of Gas and Water Engineers at the Technical College at Vienna, under the guidance of Professor Strache. Four stoves of different makes were investigated—two being of Austrian manufacture, one Swiss, and one, which was without a flue, French.

The investigations dealt with the efficiency, radiation, effect on the air of the room, and the completeness of combustion. The room in which they were carried out was of 4697 cubic feet capacity. The stoves were connected with the chimney by means of a galvanized iron flue pipe, 3½ inches in diameter, which was carried vertically to a height of 5 ft. 8 in., and then horizontally for a length of 3 ft. 7 in. as far as the chimney. A damper was inserted in the flue-pipe 4 ft. 9 in. above the stove, so as to keep the draught on the stove as far as possible independent of any fluctuations in the chimney draught. The gas pressure was kept constant by means of a mercury governor. The proportion of carbonic acid in the flue gases was determined by a Strache's "Autolysator." While the trial was in progress, gas was simultaneously collected in a holder; and the calorific value and composition were afterwards determined. The volume of air required for the consumption of one volume of gas and the volume of carbonic acid produced by its combustion were determined by exploding a sample of the gas with excess of air. The quantity of air passed through the stoves was then easily determined from the proportion of carbonic acid in the flue gases. Details of the determinations on the three stoves provided with flues are shown in the table, p. 265.

The relative proportion of moisture in the air of the room fell in four hours by about 4 per cent. The proportion of carbonic acid in the air after five or six hours' use of the stove was 25 to 35 volumes per 10,000 more than at the start. If the flue was closed by means of a damper, the stoves continued to burn in all cases without any perceptible lengthening or smoking of the flames. Even when the flue was cut off, no carbonic oxide could be traced in the exit gases. Generally speaking, the efficiency increased as the gas pressure decreased. Two methods were used for measuring the heat radiated from the reflector. They were, briefly: (1) The stove was placed in a sheet-metal casing which had in front of the reflector an opening as large as the latter, which could be closed by a slide. The air passed in through sufficiently large openings in the bottom; and the top of the casing led to a wide tube from which the heated air escaped. The effect of the reflector was then easily determined from the quantity and temperature of the escaping air when the slide was open and when it was shut. With stove No. 1, the reflector accounted for 5·4 per cent. of the heat given out by the stove, disregarding heat from the flue-pipe; with No. 2, a water-flow calorimeter of the size of the opening for the reflector was placed in front of the latter. The side facing the stove was blackened, and the other side was bright. The water passing through the calorimeter was so regulated that its temperature was as much above the reading of a thermometer placed at the back of the calorimeter as that of the inflowing water was below it. The reflector radiation determination in this way on stove No. 2 amounted to 7·2 per cent.

Compared with the results of the investigation of English gas-fires [the author refers to the first series of researches at Leeds University reported on by Mr. E. W. Smith at the meeting of the Institution of Gas Engineers in June, 1909, the results of which have only during the last few months been reproduced in the German and Austrian gas journals], the stoves examined at Vienna are said by the author to show a considerably higher efficiency. This is attributed to the fact that the English stoves are so constructed that the highest possible proportion of the heat is emitted in the form of radiant energy, and that consequently much heat passes into the chimney unutilized. The object aimed at by the English Committee on Gas Fires was, the author says, to reduce the loss of heat by way of the chimney to 10-15 per cent.; and this object is, he states, entirely fulfilled by the fires examined at the Vienna laboratory. It was considered whether the efficiency could not be further increased by utilizing the gross calorific power of the gas by completely condensing the aqueous vapour from the products, instead of utilizing merely the net calorific power. This could be effected by using the smallest possible excess of air for the combustion of the gas and cooling the exit gases as much as possible. The condensed water could be thrown away daily, or allowed to pass direct into a drain. But the exit gases, thus freed from the greater part of their accompanying moisture, must be re-warmed to some extent in order to give the necessary draught, and must be mixed with more air in order to avoid further condensation. Precautions must be taken to avoid the sulphur acids in the condensed water destroying parts of the stove with which they come in contact. Such a construction, in addition to increasing the efficiency, would present the further advantage that there would be no destructive condensation in the flue-pipes, and the much smaller quantities of sulphur acids in the dry exit gases would have a less rapid destructive

Number of Stove	1.		2.		3.		
Consumption, cubic feet per hour	51	25	66	19	34	22	7
Gas pressure, tenths of an inch	12	12	12	12	8	8	8
Temperature of exit gases, degrees Fahrenheit							
Back of the stove	411	307	334	252	244	217	145
Before the damper	277	221	202	198	212	176	127
On leaving the room	205	169	234	144	165	140	108
Carbon dioxide, per cent., by volume—							
Back of the stove	4.5	3.3	3.9	2.7	3.8	3.1	1.8
After the damper	4.2	3.0	3.6	2.4	3.2	2.9	1.8
Carbon dioxide in the flue before the damper, volume per volume of gas consumed	0.564	0.564	0.530	0.532	0.534	0.574	0.574
Nitrogen and air in the flue before the damper, ditto	11.976	16.436	13.06	19.10	13.536	17.936	31.326
Aqueous vapour, ditto, ditto	1.009	1.009	1.105	1.137	1.217	1.109	1.109
Nitrogen and air after the damper, ditto	13.00	17.60	14.20	21.86	16.17	18.55	31.326
Efficiency of the stove alone, per cent.	82.6	84.0	85.1	82.9	90.2	89.0	90.5
Do. of the stove and flue up to the damper, per cent.	89.4	89.7	89.0	88.1	92.0	92.0	95.0
Do. of the stove and flue up to the exit from the room, per cent.	92.3	92.3	92.4	92.8	93.8	94.4	96.7
Temperature of the escaping air, degrees Fahrenheit . . . . .	..	..	..	185	212	216	194

action upon the metal pipes which are mostly used. Flue-pipes which have perished, or become blocked by carbonate of zinc, would then no longer be found.

The foregoing is the substance of Herr Kropf's report, which is obviously incomplete, in that it gives no particulars of the types of gas-fire investigated. But, reading between the lines, it may be assumed that they were all of the copper reflector type with luminous flames, which are the most generally used in Austria and many other Continental countries; and it is probable that they were provided with regenerative passages. A stove of this general type, but evidently without regenerative arrangements, was investigated by the English Committee this year; and the results obtained may be compared with those reported from the Vienna laboratory. The stove referred to is No. 11 in Table I. of the Appendix to the English Committee's report. ["JOURNAL," Vol. CX., p. 774.] The percentage of heat passing up the flue and the temperatures of the air of the room and of the flue gases were not, however, determined for this stove by the English Committee.

INCREASED WATER STORAGE FOR LONDON.

Progress of the Chingford Reservoir.

In the "JOURNAL" for April 14, 1908, we recorded the commencement by the Metropolitan Water Board of a large storage reservoir at Chingford, for the construction of which powers had been obtained by the East London Water Company in 1900. The original estimated cost of the reservoir, a pumping-station equipped with machinery for raising 200 million gallons per day, and other works, was £550,000. The contract was let to Messrs. Charles Wall, Limited, for £340,770. The works were designed by, and are being carried out under the supervision of, Mr. W. B. Bryan, M.Inst.C.E., formerly the Company's Engineer, and now the Chief Engineer of the Board. Since the Contractors commenced operations, they have vigorously prosecuted them. They have had as many as 1200 men employed; while the plant comprises twelve locomotives, 15½ miles of track, and a large quantity of plant. The works, which will be completed in two years, were inspected last Saturday afternoon by the Chairman (Mr. E. B. Barnard, who was Chairman of the Works Committee when they were started) and the members of the Board, who were accompanied by a numerous party of invited guests. When noticing the commencement of the works rather more than two years ago, we gave a general description of them; and the following additional particulars are taken from an illustrated booklet, containing also a short history of the London Water Supply, presented to the visitors on Saturday as a *souvenir* of the occasion.

In order to enable the reservoir to be made, it was necessary to divert the River Lea, the Sewardstone Mill stream, and the Mar dyke, which flowed in very circuitous courses through the site of the reservoir, and to substitute a new channel about three miles in length for the old river course, the length of which was four miles, and the length of the other watercourses about 1½ miles. The new channel most efficiently carried away all last winter's floods, and kept the actual reservoir site free from overflow, and consequently prevented any delay in the execution of the works by reason of floods. No damage whatever has accrued to the river training walls, of which between six and seven miles form the banks of the new channels.

In constructing a reservoir, the most difficult work is the excavation below the bottom of the valley, to enable a perfectly water-tight wall of puddle clay to be joined to an impervious stratum. The puddle trench is about 4¼ miles in length; and the maximum depth is 33 feet. The total number of runners driven in for timbering was 58,072. Enormous quantities of water were met with; but the Contractors grappled with this difficulty in a most efficient manner by installing a system of pumping by electricity. Two power stations were erected; the larger containing three gas-engines, two gas-suction plants, two 90-kilowatt and one 60-kilowatt generators, and four oil-engines. The smaller generating station contained a 40-H.P. gas-engine and generator. Electrical energy is supplied not only to centrifugal pumps, but to digging-machines, pug-mills, and also for lighting purposes.

In order to make the main bank, about 3 million tons of earth are required; and 1½ million tons have already been excavated and placed in position. The amount of clay obtained within or near the site of the new reservoir, made into puddle and put in position, is about 210,000 tons, leaving about 90,000 tons still to be placed. The reservoir, when completed, will be capable of containing 3000 million gallons; and the water area will be about 416 acres. The intake channel from the river and the site of the proposed pumping-station are at the Enfield Lock end of the reservoir, where two reinforced concrete footway bridges have been built to carry the diverted public footpath. At the southern end of the reservoir, the public road has been diverted, a new three-arched bridge of reinforced concrete erected, and a new road 40 feet wide constructed as far as the boundary of the county of Middlesex. Several other reinforced concrete bridges have been built. An overflow from the River Lea Navigation has been made, and the towing-path is carried over it, and supported by fifteen arches.

After the reservoir is completed, the stored water will be conveyed by a channel some two miles in length to join the already existing channels near the Chingford pumping-station; thence for 1½ miles into the chain of reservoirs, twelve in number, extending as far south as the High Bridge on the Lea Navigation in the borough of Hackney and Copper Mill Lane, Walthamstow. The stored water finally passes through a canal 1¼ miles in length to the filter-beds at Lea Bridge, where, after filtration, it is distributed throughout the Board's eastern district to a population of nearly 1,600,000.

The members of the Board and their guests left Liverpool Street Station by the 1.46 p.m. train, in which compartments had been reserved, for Ponder's End, which was reached shortly after two. The party made their way along the Lea Valley Road to the south-west extremity of the reservoir, where they were received by the Chairman (Mr. Barnard) and Vice-Chairman (Mr. G. S. Elliott) of the Board. Trains were waiting to convey them along the west side of the reservoir to a point near the intake on the River Lea diversion. At this part of the reservoir the embankment has been made to about its full height. Some time was spent here; and Mr. Bryan took the opportunity of furnishing a few particulars in regard to the works. The visitors were then conveyed to another part of the site, when most of them left the trains, and walked along the eastern bank of the reservoir to the south-eastern corner, where the Contractors' offices are situated. Near this place has been constructed the three-arched bridge, in reinforced concrete, over the Lea diversion, in connection with the new road which forms part of the scheme. Here the numerous company partook of light refreshments served in marquees on the ground. The band of the Board's Employees' Association was in attendance, and played selections of music during the afternoon. As there was a little time to spare before the train left Ponder's End for London, some of the visitors were driven to the outlet works of the new reservoir, which are near the Chingford Wells pumping-station, where Mr. Bryan explained how the water will be conveyed to the extensive group of reservoirs (constructed by the East London Water Company) lying to the south. This brought to a close an inspection which was full of interest; and, in the course of it, opportunity was taken from time to time for informally congratulating the Board, their Chief Engineer, and the Contractors, on the progress which has been made with this important addition to the water storage of the Metropolis.

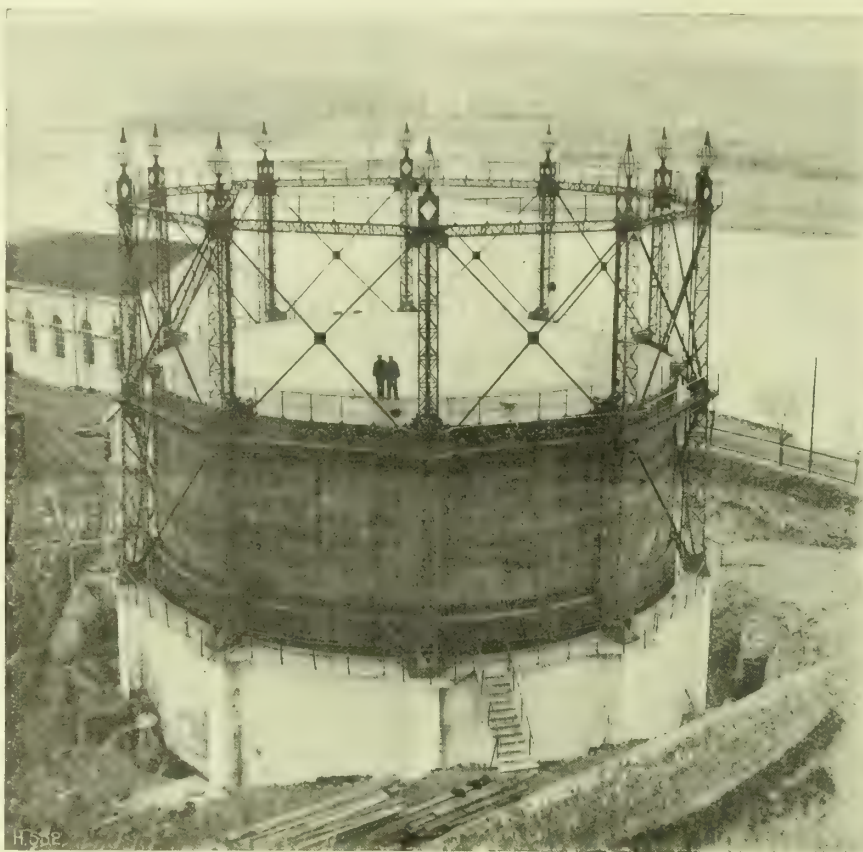
Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. Henry Rayner) that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 13s. 4d. per cent. per annum, while carrying forward to the next account £542,370 3s. 10d. (which includes a balance of £32,746 13s. 1d. taken over from the late West Ham Gas Company on Jan. 1 last). The dividend is the same as for the June half of last year; but the carry-forward is £132,477 more. Excluding the West Ham balance, the amount is £99,731 more.

A REINFORCED CONCRETE GASHOLDER TANK.

The current number of "Concrete and Constructional Engineering" contains some particulars, with illustrations, of a reinforced concrete gasholder tank erected at the San Sebastian Gas-Works, under the supervision of M. Wenceslas Aguirre-bengoa. As this is the first tank built with the new material in Spain, special interest attaches to it; and in presenting the following details of the work, we acknowledge our indebtedness to our contemporary for the use of the block which accompanies them.

Owing to the great increase in the consumption of gas, it was necessary to increase the storage capacity of the works; and it was decided to erect a holder of 212,000 cubic feet capacity, with a tank on the Hennebique system. The tank is 78 ft. 9 in. diameter and 25 ft. 8 in. high. The wall is divided into ten sections by the same number of T-shaped buttresses to support the iron stanchions of the tank. The width of the circular bars of iron is 2 ft. 8 in., and they are 8 inches thick. In designing the tank, the calculations were made in the same way as for a circular reservoir, under the assumption that it was divided into zones 20 inches high; the buttresses only being arranged to receive the metal stanchions. The work was carried out in two-and-a-half months. The concrete was well rammed to prevent porosity and to lessen the danger of filtration. When the centring was removed and the interior and exterior of the tank were rendered with portland cement and gravel in the proportion of 1 to 2, a test was under-



taken for resistance and impermeability, by filling the tank with water. The test proved most successful, and during the time it lasted no cracks or displacement whatever were noticed. The general appearance of the tank is pleasing.

GERMAN ASSOCIATION PHOTOMETRIC REPORT.

Tests of Safety Lamps.

In our account of the proceedings at the annual meeting of the German Association at Königsberg last month, it was mentioned that the report of the Photometric Committee had not been printed along with the reports of the other Technical Committees of the Association; and it was stated that it referred mainly to investigations on safety lamps for use on gas-works. The report (signed by Dr. W. Leybold, of Hamburg, as Chairman of the Committee), has now been published in the "Journal für Gasbeleuchtung," and the following is a summary of its contents.

One of the rules for the prevention of accidents in gas-works in Germany is to the effect that where spaces such as apparatus and purifying-houses, gasholder-houses, and vaults under gasholders, have to be entered in urgent cases with a light, the latter must be furnished only by electric safety lamps or safety lamps complying with prescribed conditions and kept in proper order and tested from time to time. On all large gas-works, electric lamps have lately come into extensive use. Some of them have fixed small incandescent lamps, while others have a lamp attached to a flexible wire by means of which they can be conveniently directed to the spot where the light is required. On works where electric current is available, the lamps are re-charged on the spot; but in other cases charged accumulators are used to replace the exhausted ones. An electric safety lamp answers well, and is unobjectionable; but it is essential that it should be switched on in the open before the room is entered.

In most cases, however, the safety lamp which was devised by Davy in 1816 for use in mines is employed. Davy discovered that the flame did not ignite firedamp through gauze containing over 400 meshes to the square inch, provided the gauze did not become red-hot. The original safety lamps were constructed of such gauze; but since little light could pass through it, the portion round the flame through which the light should pass was afterwards constructed of glass, the air circulation being maintained through wire gauze. Probably the Imperial Continental Gas Association, who supplied gas in Berlin and Hanover in 1826, introduced the safety lamp into gas-works in Germany. At the Hamburg Gas-Works, a safety lamp exists which is still in perfectly usable condition, and probably dates from the time when the town was first lighted by an English Company in 1845. Lately, however, a whole series of safety lamps of different types have been constructed, though they all depend on the same principle. Many thousands of these lamps are in use in coal mines; and the mining authorities prescribe certain points which must be

observed in regard to them. These points are, briefly, that each lamp must be so arranged that a completely tight joint shall be always maintained between the different parts of it; the glass used must be well annealed, and its ends cut exactly at right angles to its axis; the wire gauze must contain at least 144 openings of uniform size to the square centimetre (936 to the square inch); the wire of which the gauze is composed must be between 0.3 and 0.4 mm. (about 0.012 and 0.016 inch) in thickness; and any way in for the air must be protected by wire gauze of the above description. These prescriptions have been adopted in the rules for the prevention of accidents on gas-works, and therefore apply to the lamps in general use.

Safety lamps are not much required on gas-works; and consequently each works possesses only a few. But they have to be kept in proper condition, so that they may be ready to use at any time. At a recent inspection of works, some lamps were found which did not comply with the above-named prescriptions, though they were sold as safety lamps. Neither the inlet nor outlet was fully protected by wire gauze. The lamps fired a mixture of gas and air. There is a great difference between the use of lamps in mines and on gas-works. The lamps for mines must be locked so that they cannot be lighted by a match in the mine. Some of them are provided inside with friction appliances, so that they may be re-lighted on the spot; and in these cases benzoline is used as the fuel. The lamps can only be opened at the issuing office. Benzoline lamps, however, have the disadvantage that the fuel volatilizes, and they have to be filled shortly before they are required. As safety lamps when wanted on a gas-works are generally needed suddenly, benzoline lamps are on this account objectionable; and the oil-lamps, which are always ready for lighting, appear preferable. The oil, however, thickens in course of time; and it is necessary to light the lamps once a month so as to ascertain if they are in usable condition or whether the oil requires renewal.

Another difference between mines and gas-works is that the proportion of firedamp or methane in mines is small, and the maximum explosive force is attained with 9½ per cent. of methane. As a rule, high percentage mixtures do not occur in mines. In gas-works, on the other hand, an escape of gas—for instance, in the purifying-house or in the basements where the connections and valves are assembled—is frequently such that the mixture of gas and air approaches pure coal gas, and then a whole series of explosive mixtures occur as it becomes diluted. The mixtures containing much gas and little air burn on ignition without explosion; but they are almost as dangerous, on account of the risk of fire, as explosive mixtures. Safety lamps for use on gas-works must therefore be so designed that they ignite neither explosive nor combustible mixtures nor pure gas. A simple method of testing lamps is to blow gas on to them, while alight, from flexible tubing. Ignition should not take place in any case; but the lamps

should quietly go out for want of oxygen. As a practical test, which may be applied anywhere, this method is good enough. For testing a large series of lamps, however, special apparatus is desirable, such as is used in the experimental laboratories of collieries. This, however, is on a large scale; and a smaller testing apparatus has been designed in which the lamps burn in a jacket of coal gas or air gas. An apparatus of this kind which is made by a Zwickau firm proved unsuitable for the Committee's investigations, because of the varied dimensions of the lamps they had to test.

A special testing apparatus was therefore devised for the investigations, in which lamps of different sizes could be readily examined. This apparatus consisted of a sheet-metal cylinder, 26 inches high, with a lid having in its centre an easily opening flap-valve. A ring bunsen burner was provided in the lower part of the casing, 8.6 inches in diameter, and having 18 holes. A metal plate, 6.8 inches in diameter, for receiving the lamps was supported on brackets above the burner-ring. The flame of the lamp could be readily observed through a sighting-hole, with thick glass, in the side of the cylinder. When the gas had been passing through the bunsen ring for four or five minutes, the proportion contained in the mixture inside the cylinder was determined by means of a Strache's "Gasoscope." The proportions of gas in the mixture varied within certain limits with the gas passed through the burner. For instance, with a rate of flow of gas to the burner of 3.5 to 4.2 cubic feet per hour, the proportion of gas in the cylinder was $17\frac{1}{2}$ to $22\frac{1}{2}$ per cent. When the rate of flow was increased to 7 cubic feet per hour, the proportion of gas was 29 per cent. Further increase in the supply of gas, however, did not appreciably increase the proportion in the mixture in the cylinder.

Sixteen specimens of safety lamps submitted by various firms have been tested in this apparatus by the Committee. Of these, only three were seriously defective. One of the three was a large oil-lamp with a flat wick, part of the air supply to which was drawn through a tube passing through the oil-reservoir, and the mouth of which was protected with wire gauze. The flame of this lamp was extinguished in four minutes when gas passed into the experimental apparatus at the rate of 3.5 cubic feet per hour; but when the rate was increased to 4.2 cubic feet, the gas burned alongside the oil-flame as it entered through the tube which passed through the oil-reservoir. The result was that the glass of the lamp broke. The gas-flame continued to burn in the lamp after the oil-flame had been extinguished. The tube had probably been taken through the oil-reservoir by the designer of the lamp with the object of cooling the oil. The second lamp which was defective was a candle lamp with two glass cylinders, and with the air supplied through the bottom of the lamp and from the top through the intermediate space between the two cylinders. Both air-inlets were protected with wire gauze. The flame was extinguished when gas was passed into the testing apparatus at the rate of 3.5 cubic feet per hour; but when the rate was increased to 4.2 cubic feet, the gas burned within the lamp, melted the candle, and broke the glass cylinders. The wire gauze guarding the lamp was too coarse—viz., 8 meshes to the centimetre (20 to the inch). The third lamp which failed was a benzoline lamp which was found in a small gas-works. The air was admitted at the side through unprotected holes, $1\frac{1}{2}$ mm. (0.06 inch) in diameter, and also at the top through a short wire crown. The exit holes were outside the protecting wire crown. The lamp fired in the testing apparatus. Of the other lamps tested, six are described as ordinary miners' lamps, two as large miners' lamps, three as large oil-lamps with flat wicks, one as a large candle-lamp, and one was an old safety lamp from the Hamburg Gas-Works of a date about 1845. All the lamps, except the last and those referred to as defective, were constructed by firms who make a speciality of these lamps.

Having regard to the danger attending the use of an unreliable safety lamp, the Committee recommend that all safety lamps should at least be tested by the simple method of blowing gas on to them. The investigations are being continued in the direction of ascertaining the light given by the lamps. The Committee suggest that it would be useful if the different constructions adopted for portable safety lamps for use on gas-works were exhaustively investigated; and they recommend that the Instructional and Experimental Works of the Association at Karlsruhe should be entrusted with this investigation. The works would then be in a position to say which types of safety lamps should be permitted on gas-works.

DEPRECIATION, CAPITAL REDEMPTION, AND RENEWAL AND EXTENSION FUNDS.

By F. KORDT, of the Düsseldorf Corporation Gas-Works.

[Abstract-Translation of a Paper read before the Meeting of the German Association at Königsberg.]

A very important factor in calculating the prime cost of gas or in determining the surplus shown in the balance-sheet are the allowances for depreciation and redemption for various purposes. In private industrial undertakings, these allowances are settled by the manager and the board of control according to the requirements of the case; but in municipal concerns the financial con-

dition of the town is apt to be taken into consideration, and the works may be stinted in consequence. Municipal works, however, ought not to be differently treated in this respect to private works.

Often the opinion is expressed in municipal administrations that it is unnecessary to write-off so much because the works have been kept in good order. But we all know that it is not merely the ultimate wearing out which settles the amount to be written off. What gas engineer has not had to demolish settings, retort-houses, apparatus, gasholders, &c., before they were in reality worn out, in order to erect larger installations in their stead? Frequently, also, older plant is destroyed before its time, so that newer and improved plant, embodying advances made, may be introduced. Ample depreciation allowances are even more necessary with municipal than with privately-owned industrial undertakings. If too little has been written off, and the works become antiquated and no longer able to meet competition, if they are owned by a company the shares may (if need be) be called in, and fresh shares issued, in order to provide the money required for modernizing the works. But if the works belong to a corporation, this plan cannot be followed. New work has to bear, not only its own interest and depreciation charges, but also any amounts left outstanding in respect of old work.

There are different ways of providing for the redemption of the value of an installation in municipal undertakings: (1) By paying off a proportion for amortization of the capital employed, and amassing a renewal or extension fund; and (2) by writing off from the book value of the installation. Both methods attain the object, provided the allowances are high enough. Ordinarily for the redemption of the capital expended, a fixed percentage is allowed for interest and redemption, so that the interest saved is applied to increase the redemption allowance. Thus the redemption of capital expended by a rate of interest of 4 per cent. is effected in 41 years by an allowance of 5 per cent. for interest and redemption, or in 28 years if 6 per cent., or in 21.6 years if 7 per cent. is allowed. The allowance of 5 per cent., therefore, means writing-off at the rate of about $2\frac{1}{2}$ per cent.; that of 6 per cent., at the rate of about 3.5 per cent.; and that of 7 per cent. is almost equal to 5 per cent. on the capital expended. If, in addition, renewal and extension funds are accumulated, it is evident that sufficient provision can thus be made for depreciation of the work. But usually money passes sparingly into the renewal and extension funds—especially when the municipal chest is not well filled. The renewal fund then is applied for necessary extensions, or *vice versa*.

It is therefore more correct to write-off on the separate values, and to cover the redemption of the capital on the installation, as well as ordinary extensions, by the amount so written off for depreciation. This is the commercial practice. It matters not precisely what is done with the sum written off, so long as it is applied in the interest of the works. For instance, if the capital outlay on a works is £50,000, and in consequence of diminution of value £5000 is written off, this sum may be applied to the redemption of capital or for renewals or extensions. The financial state of the works is the same in either case. Depreciation may, however, be written off on the book value instead of on the capital outlay, though the latter at first glance appears to be the simpler. On looking still farther, however, it will be seen to be troublesome in respect of the detail involved. There are additions to be made to the different accounts every year. The value of apparatus, such as meters, installed in one year has to be completely written off a year before that of similar apparatus installed a year later. The procedure becomes even more complex when some plant or building is discarded before its value has been completely written off at the ordinary rate of allowance for depreciation. If further changes are made, it becomes still more troublesome to trace out the year when the capital outlay should be extinguished. On the other hand, if depreciation is written off on the book value, the values in the books fall off gradually until only a trifling residual sum remains. If, however, plant is discarded before the normal time, its residual value must be written off specially. The author gives a table for rates of depreciation, from 2 to 20 per cent. and for one to sixty years, to facilitate the determination of the book value of plant at any year for every 100 marks (£5) of capital expended on it. He then gives examples of the manner of using the table in cases where plant is scrapped before its value has been almost completely written off.

The next question is the important one of the percentage rate of depreciation which should be written off the book values on gas-works in general, in order to avoid a false value being maintained in the balance-sheet. In considering this point, special attention must be given to the revolutionary changes required by the technical advances in the industry. At the Düsseldorf Gas-Works, the latest rates of depreciation adopted are: On buildings, 3 per cent. of the book value; on gasholders, 6 per cent.; on retort-settings and apparatus, 10 per cent.; on railway and tramway plant, 6 per cent.; on mains, 4 per cent.; and on meters, $12\frac{1}{2}$ per cent. According to the books for last year the sum written off averages 6.6 per cent. of the total book value. At this rate, the value of the plant, &c., after 33 years have elapsed will still amount to 10.6 per cent. of the original cost. The author would retain the above-named rates, except that he would write off buildings at 5 per cent., instead of 3 per cent., of the book value, and apparatus at only $7\frac{1}{2}$ per cent., instead of 10 per cent. At these rates a residual value of 10 per cent. would be reached for buildings in 44 years, for holders and railway plant in 37 years,

for retort-settings in 22 years, for apparatus in 29 years, for mains in 56 years, and for meters in 17 years.

Such depreciation allowances are, however, in the author's view, very finely cut; and hence it has been the practice at Düsseldorf to augment them by writing off special sums in addition. The foregoing allowances must anyhow be taken as the lowest that are permissible. The special sum that was written off at Düsseldorf last year was equivalent to 4.6 per cent. of the book-value; and adding this to the 6.6 per cent. ordinary depreciation, the total written off was 11.2 per cent. At this rate, a residual value of 10 per cent. of the original cost will be attained in 20 years, which, in the author's view, is a fairer life to assume for gas-works than 33 years, which he regards as too high. Mr. Körting has expressed the opinion that a suitable allowance for depreciation on gas-works is an average of 4 per cent. on the purchase prices. This would bring down the value to the residual 10 per cent. in 22½ years. This 4 per cent. allowance seems to the author quite proper; and the result is much the same as writing off 10 per cent. of the book value according to the table which he has compiled.

In many towns, the system of book-keeping adopted in public offices is followed for the municipal industrial undertakings. In that case, the sums written off should be placed to an extension and sinking fund account; and the residue, after amortization charges have been met, should be applied solely to extensions. The sums written off must not find their way into the municipal chest, to be utilized for general municipal requirements or to cover other obligations. They must be applied solely in the interests of the gas-works, or remain untouched. Then when gas-works plant becomes out of date and has to be written off, the amount is to a large extent already in hand.

The author arrives at the conclusion that with small gas-works, having relatively few receipts and expenses, it is best to write off depreciation on the initial outlay, so that the amounts to be written off will be uniform and not too high at first. With large works, on the other hand, having relatively big receipts and expenses always, and numerous additions and extensions to buildings and plant, it is better to write off on the book value, as is done in almost all industrial works. The figures instanced must not be regarded as of universal applicability. The sums to be written off must be determined separately for each particular case. Consideration must be given to the generally increasing value of land, as well as to the increasing cost of materials and construction in, *e.g.*, gasholders and mains laid in a firm sandy soil. For instance, water-mains laid in Düsseldorf in the seventies, and since replaced by mains of larger size, have remained so well preserved that they have been utilized again by the gas undertaking. The sums to be written off depend on the circumstances of each instance. It will not, however, be contested that in all cases the depreciation allowances must be based on expert judgment, and not be settled according to the financial exigencies of the municipal exchequer for the time being.

CONTROLLING THE WATER SUPPLY TO GENERATOR FURNACES.

By M. CAMILLE ROCHE.

[From a Paper read before the Société Technique du Gaz.]

The basis of the adjustment of the supply to a generator furnace is one described by the author in a previous communication—made to the Congress of 1908.* It is the use of a small aperture in a thin plate. In the former paper, the device described was an aperture in a thin tin plate (part of the drum of a meter) fixed between two flanges; the whole being provided with a cock and attached to a vessel with a constant water-level. The plate thus arranged is not very accessible, owing to the thickness of the clamping flange. Any particles of dirt or cinder carried along by the liquid are liable to choke the aperture, and the plate has then to be withdrawn by unscrewing one of the flanges—a somewhat lengthy business.

The author has therefore devised a modified method, according to which the pierced plate is instantly accessible in case of obstruction. A cup, or nipple, is obtained—of bronze for plain water, or of anti-friction metal for ammoniacal liquor. To one end of this is soldered the piece of metal cut from the drum of a meter. The fine hole has now to be pierced in the cup that is thus formed. In the event of the aperture ever being choked by suspended matter in the water, all that is necessary is to pass a finger under the cup to start the flow again. Naturally care should be given to the clearness of the water, in order to ensure a constant passage. Also throughout a works it is well to preserve a constant level of water above the apertures. On all pieces of apparatus the same apertures will then provide the same supply.

Passing now to consider the adjustment of the steam admitted to the generator furnace, one constant-level vessel will serve for two furnaces each having two vaporizers. It should have four delivery apertures and four funnels, by which to receive the liquid in four lots. The apparatus is placed somewhere handy, on a level with the eyes—say, on the wall opposite the front of the furnace. The supply is controlled to give from 600 to 700 grammes of water for every kilogramme of coke consumed in the generator. This is the best proportion—the clinker remaining

as cinders, the grating of the furnace not suffering, and the inlet of the primary air being reduced. The water which enters into the upper funnel is led by a pipe close to the hearth. A second funnel is placed there, protected from dust by a removable cap, by means of which it can be seen from below whether the water is being delivered normally. From this funnel the water is conducted by the syphon to the vaporizer, where it is evaporated, and passes on to mix with the primary air. The best working is obtained when the water is not all vaporized, but when a few drops reach the hearth of the furnace from time to time along with the steam. Under these conditions, the cinders are slightly moistened, and the furnace bars are better protected. Ordinary boilers supplied in this way for two years past have shown no sign of getting out of order.

The cooling of ascension-pipes, by the use of water within them, as described by the author in 1908, has given excellent results so far as the tar is concerned. There have been no obstructions; and after being eighteen months in use, the pipes thus cooled did not require cleaning when the furnaces were taken down. But the water mixed with the gas has caused a certain amount of trouble. When plain water is used, it reaches the cisterns and causes dilution; while if the pipes are watered with ammoniacal liquor, an appreciable loss of ammonia takes place. These drawbacks have been obviated by cooling the outsides of the pipes; and the controlling of the water according to this system was conducted as follows: In place of the delivery apertures previously used inside the pipes, others, giving about double the quantity of water, were employed. In order to distribute the water around the pipes, a band of hemp fibre, about 25 mm. in width, was wound spirally down the length of each pipe. This material, owing to its porous nature, prevents the water from splashing, and does not char under ordinary conditions. It is difficult to prevent it doing so when drawing the retort, and then it is better to remove the hemp or use a more ample supply of water from a larger aperture. A single tarred strand can be employed in place of the band; but it does not distribute the water so well. At the bottom of the pipe is placed a flange. A spout conducts the water into a gutter, whence it flows along a very gentle inclination towards the furnace. The flange is of cast iron; the two halves of each semi-section being placed edge to edge, and locked together by a flat ring; the whole being made tight with cement.

The cooling arrangement above described has so far proved a most satisfactory solution of the previous difficulties—to such a degree, in fact, that it is difficult to understand why it is installed in so small a number of works. Its outstanding merits are that the ascension-pipes are kept clean, manual labour is saved, and loss of gas and stoppage of the retorts are obviated. Moreover, the tar in the hydraulic main remains fluid, and passes easily to the outlet; while the gas produced maintains an even temperature and illuminating power.

CAULKING GAS-MAINS BY MACHINE.

The number of "Progressive Age" for July 1, contained an illustrated article showing how the Consolidated Gas Company of New York have solved the problem of caulking gas-mains quickly and well by means of a compressed-air machine, which has been in use on a 48-inch main. The method of caulking by hand was slow and of doubtful uniformity, especially at the bottom of the pipe, where, owing to the awkward position of the workman, the result was poor at the best. Hand work required two-and-a-half hours to yarn the joint, and seven hours to caulk with lead wool, or one joint completed per day of ten hours with two men working on the joint. Tarred rope to the extent of 2½ inches was rammed in for the yarning; and on top of this 2½ inches of lead wool. About 160 lbs. of lead wool were used for each joint by this method. With the compressed-air machine, the same proportions of yarn and lead wool were used at first. Observation soon disclosed the fact that under the air-hammer 187 lbs. of lead wool were being forced into the space that was hitherto occupied by 160 lbs. The quantity of lead wool caulking was then cut down to 2¼ inches; and the amount of lead wool used per joint is now about 160 lbs. The yarning process is done by hand, as no tools have yet been perfected for it. Two men are employed for a joint—one on either side of the main; and the calking-iron is alternated between them.

The labour-saving possibilities of such a machine as that described are readily seen when the results of the limited trial on this work show that two joints are completely yarned and caulked by two men in a ten-hour day, against one joint in the same time with the same number of men working by hand. Further, the pressure of the caulking-iron is uniform, and ensures a perfect joint, using the same amount of lead wool pressed into a smaller space. The air-compressor is driven by a 15-H.P. gas-engine; the whole being mounted on a truck, and moved about by a team of horses. The gas-engine consumes about a gallon of gasoline per hour. The pressure maintained averages 60 lbs. per square inch.

Mr. Charles Crowther-Smith, of Anglesea House, Shirley, Southampton, for many years Secretary of the Southampton Gas Company, whose death was announced in the "JOURNAL" for the 21st ult., left estate valued at £15,982 gross, with net personality £10,845. His will contains a number of bequests to some local hospitals and other benevolent institutions.

* See "JOURNAL," Vol. CIII., p. 335.

REGISTER OF PATENTS.

Retorts for the Production of Gas and Gas Coke.

BOWING, J., of Wandsworth, S.W.

No. 12,583; May 27, 1909. No. 11,491; May 9, 1910.

These inventions relate to improvements in retorts for the heating of which gaseous fuel is made use of, and to retorts provided with tall vertical walls with a relatively narrow distilling chamber.

The patentee proposes to construct a rectangular chamber of fire-clay or other suitable material (such as fire-brick) of any convenient dimensions in respect of height and length; the length being measured fore and aft. Its breadth is determined by considerations to be hereafter referred to. The side faces of the chamber are so constructed and finished that when a number of chambers are arranged side by side the side faces form the cheeks of a series of flues by which the retorts are heated. These flues are intended to serve the purpose of supplementary combustion chambers in which the burning of the heating gases can be completed, and they are so designed as to secure the fullest possible contact of the incandescent gases with the cheeks. With this object, the flue space is preferably divided up into vertical channels by ribs formed of the material of the flue walls, or of other suitable refractory material; and the side walls are placed at a distance of (approximately) an inch from one another. The object of thus using a very narrow flue is "to obtain the smallest breadth of flue that will allow the free combustion of the burning gases to take place, so that the heat may be generated as close as possible to the walls, because that part of the flame which is in actual contact with the walls of the flue is much the most effective part of the flame." It is, therefore, desirable to minimize the distance separating the sides of the retorts from one another. This distance, which determines the breadth of the flue, must, however, itself be determined with reference to the smoothness or roughness of the finish of the faces of the retorts. The inventor has found that using ordinary fire-clay carefully finished and with retorts up to 8 feet high, a breadth of about an inch gives the best results. In this way, he secures that a very large proportion of the heat shall be taken up by the wall. His latest experience in the working of such flues has led him to the same result as that reached in connection with his earlier work upon the destructive distillation of coal, and embodied in patent No. 24,687 of 1906.

Continuing the specification of his later patent, the inventor remarks: "I may use for the purpose of supplying the gaseous fuel to the flues a series of burners fitted upon a tube in the ordinary way in which such burners are arranged for the supply of gas-fires; and in that case I employ a combustible mixture in which the proportion of air is rather less than what is required for the complete burning of the gas, and is so adjusted as to minimize the risk of firing-back into the supply pipe. The air necessary to complete the combustion is supplied externally to the nozzle and within the flue. The bunsen tube, with its nozzles, is arranged in a tunnel placed at the foot of the flue; and by means of suitable doors a properly adjusted air supply is admitted to the tunnel and enters through it to the flue. These tunnels are placed under the middle of the bottom walls of the retort-chambers; the two flues in the two sides of each retort being led round to the tunnel. Thus each tunnel serves two flues; and each flue is served by two tunnels, except the two endmost flues of the series, which are, of course, in communication with only one tunnel each."

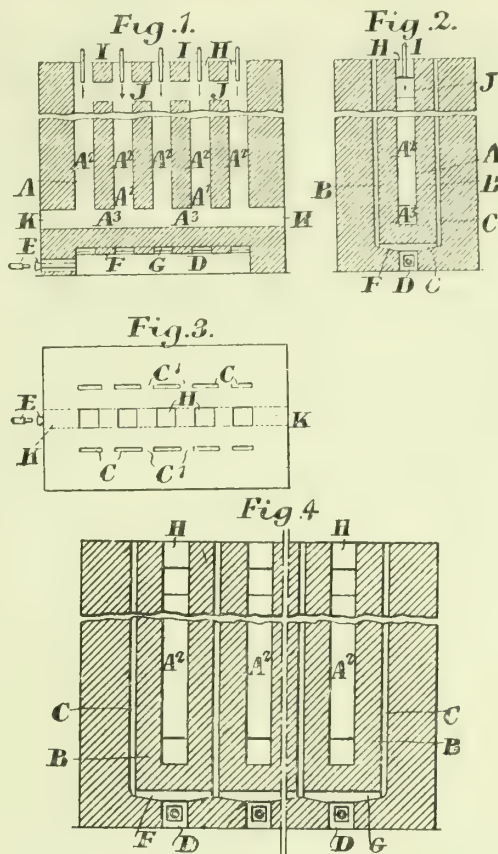
In the course of his recent experimental work, he says he discovered that with gas supplied at a pressure of about 6 inches of water, it is possible with great advantage to modify this form of burner; and he now prefers to construct his gas-burner in the following way: The tunnels above referred to, instead of containing the gas-pipes fitted with nozzles for the supply of the combustible mixture of gas and air, are left quite empty, and closed at one end with a fire-clay door, through which an opening of suitable dimensions is made for the introduction of the gas and air supplied for the purpose of maintaining combustion. The nozzle through which the gas and air for maintaining the flame are supplied is placed outside this door and directed towards the centre of the opening. In this way, a gas-jet is projected through the opening in the door; and it sucks in with it a supply of air sufficient for the purpose of completing the combustion. A metal or fire-clay cone is placed in front of the nozzle for the purpose of dividing up the air supply, so that the gas-jet introduced through the cone may contain such an excess of gas as to be incapable of ignition, whereas air will enter through the annular space surrounding the cone in the opening of the door. In this way, a strong jet of gas is forced into the tunnel and ignited only after its admission to the tunnel—the distribution of gas and air in the throat of the tunnel being such as to prevent the flame from travelling back to the gas-nozzle. For communicating with the flues, each tunnel is provided with a number of ports along the upper angles in which its side walls meet the top of the tunnel. The areas of these ports are so arranged that the flame travels to the farther end of the tunnel and fills the flue through its entire length with incandescent gas.

The retort-chamber having been brought to the working temperature, is filled with carbonaceous material prepared and disposed in such a manner as to permit steam to flow through the entire mass; and it is then closed against the admission of air. Water or steam is introduced through a suitable conduit into the retort; and, the necessary temperature—say, for instance, from 600° to 800° C.—being maintained by continuous firing in the flues, water gas comes off. Under these conditions, the operation becomes a continuous one, since it is possible to arrange hoppers for feeding in the coke at the top of the retort, and suitable ashpits for discharging the ash and clinker from the bottom or side.

Fig. 1 is a longitudinal section of a single retort adapted to the production of water gas. Fig. 2 is a transverse vertical section of fig. 1. Fig. 3 is a plan of the retort shown in section in figs. 1 and 2. Fig. 4 is a section illustrating the arrangement of a battery of retorts.

A is a rectangular chamber, of fire-clay or other material, divided

by a series of walls A¹ so as to form a series of retorts A² of small dimensions communicating with one another at the bottom by openings A³. The chamber is surrounded by walls B, the space between which and the outer surface of the walls of the chamber A forms the flue C, which is preferably divided up into vertical channels by ribs C¹. D is a tunnel formed below the rectangular chamber A into the mouth of which the bunsen tube or burner E is introduced; so that the flame is projected into the tunnel and passes up through the flues around the walls in the manner described.



Bowing's Retorts for the Production of Gas and Coke.

The bottom of the rectangular chamber A is supported above the tunnel upon a series of bridge-pieces F having spaces G between them which form ports through which the flames pass from the tunnel into the flues C. When a battery of chambers is employed, each chamber is provided with an independent tunnel and burner as in fig. 4.

H are openings formed in the roof of the chamber A through which the charge is introduced; and I are pipes in these openings for the introduction of water. If steam is to be used, a single pipe I only is necessary; the steam distributing itself to the various parts through a passage J formed above the walls A¹.

The gases generated escape through the passages K, which also serve for the discharge of the ash and clinker from the chamber.

Decomposing Hydrocarbons.

LESSING, R., of Southampton House, High Holborn, W.C.

No. 15,071; June 28, 1909.

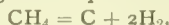
In his specification the patentee says: "It has been proposed to decompose hydrocarbons in a gaseous or vaporized state, and more particularly the products of the destructive distillation of coal into the elements—namely, carbon and hydrogen—by passing it through heated gas-retorts or coke-ovens charged with a contact material, such as broken brick, coke, iron, or the like. When working according to this proposal, the carbon obtained, however, is not of sufficient purity to be of marketable value—being mixed or in close contact with the above-mentioned materials." The object of the present invention is to obtain, besides hydrogen of a purity sufficient for commercial purposes, carbon in a pure state and without admixtures, so that a marketable product is obtained. With this object in view, the invention consists in passing the gas or gases through retorts, chambers, coke-ovens, or the like, which are either empty or partially or completely charged with carbon, such as is obtained according to his invention; no packing material of a character foreign to the carbon obtained in the retorts being employed, so that pure carbon is obtained within the retort, chamber, or oven.

The hydrogen gas produced is especially intended for the charging of aerial craft requiring gas of low density.

The invention may be carried into effect in various ways, of which the following is given as an example: He produces coal gas in an ordinary gas-making plant and leads it through a suitable inlet into one end of a gas retort or chamber, which may be of the horizontal, inclined, or vertical type—the retort or chamber being filled with carbon obtained according to this invention. The retort or chamber is heated to a temperature of (say) 1000° to 1300° C.; and care is taken to adjust the rate of flow of the gas in such a manner that complete decomposition of the hydrocarbons contained in it into hydrogen and carbon is obtained. The rate of flow depends on the heating surface available, the temperature of the gas admitted, and its composition; gas containing a large percentage of methane, for instance, requiring a lower

rate of flow than gas containing less methane. The hydrogen is taken off through the outlet or ascension pipe usually provided on gas-retorts by suitable means—for instance, an exhauster—and conveyed into a holder or to its place of consumption after having been cooled and scrubbed.

It has to be borne in mind, the inventor points out, that the volume of the hydrogen produced is considerably larger than that of the gas admitted compared under equal conditions of pressure and temperature. For instance, methane, which is a chief constituent of ordinary coal gas, decomposes according to the equation



One volume of methane yields two volumes of hydrogen. Consequently, for the rate of flow of the gas entering the retort, which has been chosen with regard to the requirements of the decomposition, the velocity of the hydrogen leaving it has to be adjusted accordingly. He prefers to maintain positive pressure within the retort, so as to avoid contamination of the gas by diffusion of the flue gases into the retort. The carbon produced by the decomposition is deposited upon the carbon charge and the walls of the retort or chamber. From time to time, it is wholly or partially removed as soon as it shows signs of obstruction to the required flow of gas, and is then replaced by a fresh charge of carbon of suitable shape and size.

When carrying out the process without any special contact-material, the patentee has found that he can obtain the carbon in the form of fine powder instead of the denser product which is deposited on the walls and carbon charge.

Instead of using the crude and hot gases as obtained directly from a coal-gas plant, he may employ gas previously passed through condensing and purifying plant, or gas from a district main. He prefers to do this if a higher purity of the hydrogen produced is required.

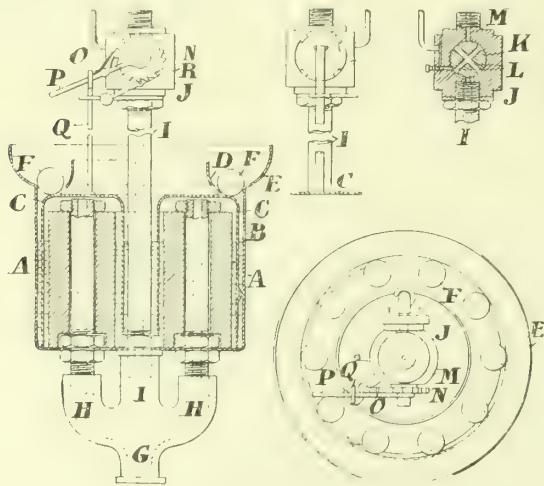
In many cases, especially when using coal gas, it is, he says, advisable to pre-heat it before entering the decomposition retort or chamber. This may be effected by imparting to it the sensible heat contained in the hydrogen issuing from the retort, or by any other suitable means; and this may be carried far enough to obtain a preliminary partial decomposition of hydrocarbons which should go far enough to attack the heavy hydrocarbons—yielding a carbon of lower density, but which would leave the more stable hydrocarbons (notably methane) essentially unaltered. Upon subsequently yielding to the influence of the higher temperature in the decomposing vessel proper, the hydrocarbons left undecomposed during the preheating yield carbon of different character from that obtained under the conditions already specified.

Gas Controllers or Regulators.

BLAKE, E. W., of South Croydon.

No. 14,973; June 26, 1909.

This gas controller or regulator is chiefly designed for use in connection with street-lamps, although also applicable for other purposes. In such controllers or regulators as hitherto made, the gas-valve is opened so as to turn on the supply to the burner by raising the pressure of the gas in the main to a certain predetermined point; the valve being closed so as to extinguish the gas by again raising the pressure of the gas in the main to the same pressure as that required for turning on the valve. A device has also been proposed in which it is possible to extinguish the gas without raising the pressure of the gas in the main to the high point required for turning on the gas; but this device is open to objections in practice, chiefly owing to the fact that it does not operate the gas-valve directly.



Blake's Gas-Lamp Lighting Regulator.

The device shown comprises an annular container A, partly filled with mercury, as indicated at B, and into which there dips an annular bell C. The upper part of the bell is provided with the inclined neck D, and the upper part of the casing with an expanded channel E. F represents a series of balls placed around the neck of the bell and forming the load before referred to. G is the gas supply pipe, having three branches, two of which H pass up through the wall of the annular casing, while the third I extends through the centre of the annular bell C and projects beyond the upper end of it, which is fitted with the cock J. This cock is provided with a plug K formed with the gas-passages L, designed to place the gas supply pipe I in communication with the supply passage M in the cock casing. The cock is also provided with a passage connecting the pipe I with a passage communicating with a bypass burner. The plug K of the cock has fitted to it outside the casing the ratchet wheel N, with which engages the pawl O pivoted upon the arm P, which is itself pivoted axially with the cock plug. The arm engages with an eye or stirrup upon the upper end of a rod Q, the lower end of

which is attached to the upper part of the annular gas-bell C. R is a detent, which prevents the backward movement of the ratchet wheel N. There are stops on a disc carried by the plug K and serving, when the plug is rotated, to support the bell C in a raised position by being interposed in the path of a catch carried by the bell.

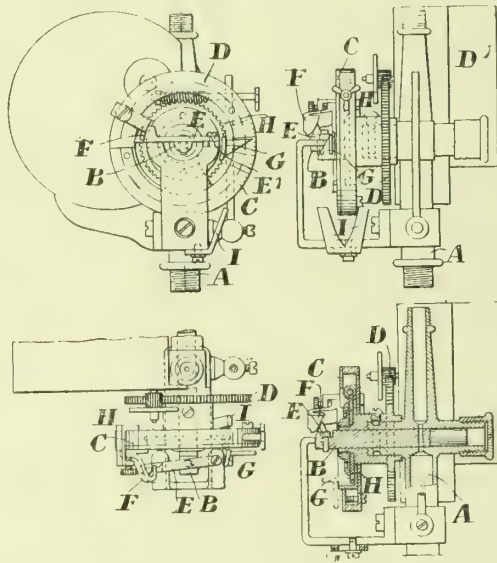
With this construction, when the pressure in the main has reached the predetermined point, the bell C is caused to rise, and as it rises the balls F slide by gravity down the neck and rest upon the channel E—thus relieving the bell of their weight. The upward movement of the bell actuates the pivoted pawl O, which turns the gas-valve so as to open it and permit gas to pass through the supply pipe I to the burner. On the fall of pressure in the main, the bell C drops, but is prevented from descending to the bottom of its stroke by contact of the catch with one of the stops carried by the cock K, which stop has been brought into the operative position by the movement of the cock when turned by the ascending bell. The bell is retained in this position until the pressure in the main is raised sufficiently to lift it from the supporting stop. This further upward movement again turns the gas-cock so as to extinguish the gas, and at the same time moves the supporting stop out of the path of the bell, which is therefore free to descend. As it nears the lower end of its stroke, the balls F again roll on to the inclined neck D, and thus reinstate the load, which prevents the bell from rising until the pressure in the main again reaches the predetermined higher point.

Automatically Establishing and Cutting Off the Supply of Gas.

HANSFORD, J., of New Barnet, and WRIGHT, J. F., of Witton, near Birmingham.

No. 15,086; June 28, 1909.

This apparatus (so arranged that the supply of gas will be automatically cut off and again established at predetermined times) is of the kind wherein the valve controlling the supply is operated by means of driven tappets, one or both of which is automatically adjustable so that the times at which the supply is cut off or established may be automatically varied according to the time of year.



Hansford and Wright's Automatic Lighting and Extinguishing Apparatus.

The supply duct A is opened and closed by a cylindrical plug cock B, on the projecting end of which the timing disc C and driving wheel D (operated by clockwork) are mounted to rotate, and which is shifted axially to open and close the supply duct by a lever E fulcrumed on the frame and coupled with the plug cock as by a pin and slot connection, and actuated by engagement with the timing tappets F, G, which are arranged to shift the lever alternately in opposite directions.

One of the tappets F (usually the one which cuts off the supply) is mounted so as to be manually adjustable on the timing disc by means of a screw-clamp; while the other tappet G is mounted to rotate with a worm wheel H, freely mounted co-axially with the timing disc but carried round with the latter by engagement with a worm which is journaled upon the timing disc. The worm shaft carries a star wheel, which is arranged to encounter a normally fixed tappet I once in each revolution of the timing disc—thereby causing the tappet G to be shifted circumferentially on the timing disc a definite amount. The tappet is so arranged that it can be set to turn the worm in either direction—for example, by mounting it adjustably on the frame so that it may be set to engage the star-wheel on either side—whereby the tappet may be automatically advanced day by day during half the year and retracted during the other half.

The tappet F may (alternatively) be adapted to be adjusted automatically in the same manner as that described with reference to the tappet G. The timing disc may be driven by a motor actuated by the gas supply; and in this case it is necessary that the rate of flow of gas should be constant. An automatic pressure governor would have to be interposed between the supply pipe and the gas-motor, which would usually also be the gas-meter.

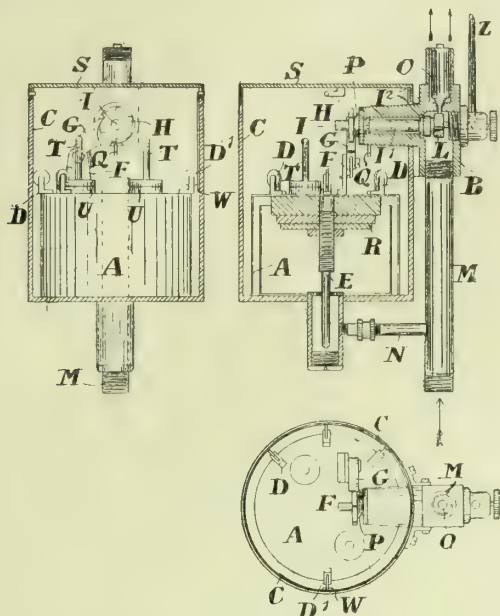
Pressure Controllers for Operating Gas Lighting Systems.

SPARKS, E., of Tufnell Park, N.

No. 22,805; Oct. 6, 1909.

This device for controlling gas-lighting systems by variation of the pressure in the mains, consists in inserting a lift-valve or plug-valve

in the direct path of an upright gas-way from main to burner; the gas-way being arranged parallel with the operating cylinder of the pressure controller.



Sparks' Pressure Controller for Gas Lighting Systems.

The controller utilizes a piston A, which is raised by the increased pressure of gas, which causes gas to alternately pass through the cock B or to be cut off. The piston is mounted in a cylinder C, and is preferably guided by rollers mounted on the piston and a central guide E. The piston carries at the top a bracket F, in which is mounted a spring-pressed pawl G, adapted to engage a ratchet wheel H mounted on a spindle I projecting into the cylinder C above the piston at right angles to the axis of the cylinder. The spindle passes through the cock and is provided with a cam-wheel L or ratchet-wheel arranged in the gas-pipe M. Gas passes from this pipe to under the piston through a branch pipe N.

The wheel with a number of cams L corresponding in number with half the number of teeth on the ratchet wheel H, is situated in the part of the cock-casing which is in line with the gas-pipe, and a cylindrical plug, with a conical point O, seated in the casing, is adapted to be lifted by the cams or ratchet teeth L provided for this purpose on the spindle I.

When the piston is lifted by an increased pressure of gas, the operating pawl G rotates the ratchet-wheel H one tooth; and this causes the spindle I to turn, and the conical plug valve O is raised from its seat, or, if raised, is allowed to return to its seat. In the first case, gas will be allowed to pass along the pipe M direct to the burner; and in the second case, the passage of gas will be cut off.

In order to avoid side-thrust and to steady the piston in its movements, the guide-rollers are arranged in such a way that three of the rollers D bear against the inside of the cylinder C on the same side as the pawl G and bracket F, and a single roller travels in a groove or slot W in the wall of the cylinder on the opposite side to the three-guide rollers.

The cock B, to which the upper and lower portions of the gas-pipe M are connected, passes through the cylinder C; the pipe being also preferably parallel with the axis of the piston and cylinder. In order to prevent leakage past the gas-cock, the spindle of it within the socket portion of the casing is made with a narrowed part, and there is interposed a coiled spring or spring washer P between the ratchet-wheel H and the outer extremity of the socket portion B—this spring serving to hold the shoulder of the spindle against a corresponding shoulder in the bearing for the spindle within the socket.

The piston is weighted by removable weights R, and it is provided with a mercury bath or seal into which it dips. A bye-pass pipe Z is shown. The top of the piston is also shown provided with studs or stems T upstanding from it; and upon these stems weights U may be fitted to secure a fine adjustment of the weight of the piston without having to alter the weights R on the underside of the piston.

Igniting and Extinguishing Gas-Burners.

FORTI, V., of Paris.

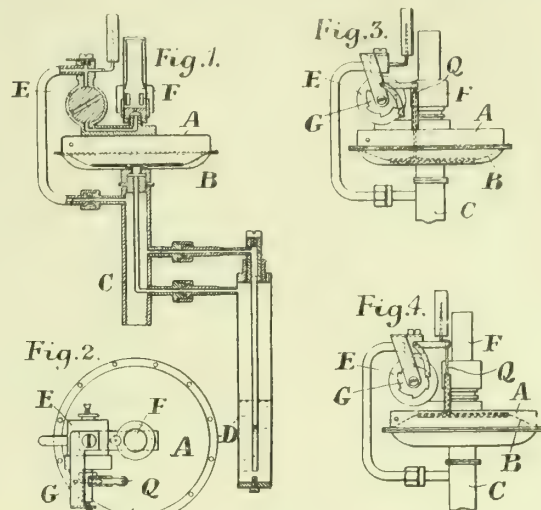
No. 26,349; Nov. 13, 1909. Date claimed under International Convention, Nov. 14, 1908.

This invention relates to apparatus for automatically igniting and extinguishing gas-burners by producing an instantaneous excess of pressure in the main from which the system of pipes is supplied, or, if necessary, at the gas-works itself.

Fig. 1 is a vertical section through the mechanism applied to the burner; fig. 2 is a plan; fig. 3 is a side elevation of the parts in normal position; and fig. 4 shows the parts in position when there is an excess of pressure on the gas.

The mechanism comprises a chamber A in two parts bolted together and holding between them a flexible membrane B, fixed to a metallic disc of suitable weight. The chamber A is mounted on a vertical pipe C, attached at its lower end to the gas-supply pipe. From the pipe a branch terminates in a tube, open at its lower end and connected by its enlarged upper end with a closed cylinder D. The upper part of the cylinder is connected with a tube which opens into the chamber A beneath the membrane B. From the upper part of the pipe C springs a branch, which conveys the gas to the casing of the cock E. The

plug of the cock has a bore at right angles to its axis; and its casing is connected with the bunsen burner F of the gas-lamp. There is also a small pipe terminating in a pilot-jet, which is constantly alight. The plug of the cock carries outside its casing a ratchet wheel G, with which engages a pawl, pivoted at its upper end to a bracket carried by a rod Q fixed on the disc of the membrane. The cylinder D contains a quantity (suitable for the gas pressure) of liquid—preferably glycerine.



Forti's Lamp Lighter and Extinguisher.

The parts of the apparatus being in position shown in figs. 1, 2, and 3, when the gas-lamp is out of use and the cock E is consequently closed, if pressure is produced in the pipes which terminate in the apparatus, the excess pressure overcomes that of the column of liquid in the cylinder D, and gas bubbles through the liquid and passes into the chamber A. The membrane B is thus lifted (fig. 4), and the rod Q is suddenly raised, so that a pawl (provided for the purpose) turns the ratchet G, and through it the cock E. The latter is thus brought into the position in which gas is supplied to the burner, and is ignited by the pilot-jet. A perforation in the chamber A above the membrane allows passage of air, so that free-movement of the membrane is not impeded. When the momentary excess pressure ceases, the glycerine in D rises again, and balances the normal pressure of the gas supply. The gas in the chamber A now escapes through the orifice in the cylinder D, so that the membrane falls again and the pawl descends ready to engage the next tooth of the ratchet G—the burner remaining alight. To extinguish the gas, another momentary excess pressure is produced, whereupon the membrane B is again lifted, and the plug of the cock turns into a position in which the cock is closed.

All the burners connected with the system of pipes are affected by each excess pressure put upon the gas, whether it is intended that the burners shall be extinguished at midnight or burnt throughout the night. A variation of the construction of the several cocks E provides the differentiation between burners on the system. The ratchet wheel G has always six teeth; and each excess pressure determines the rotation of the plug of the cock through 60 degrees—that is to say, the ratchet wheel turns through the angle comprised between two teeth.

Removing Tar from Coke-Oven Gas, Retort Gas, &c.

FABRY, R., of Sheffield,

No. 29,930; Dec. 22, 1909.

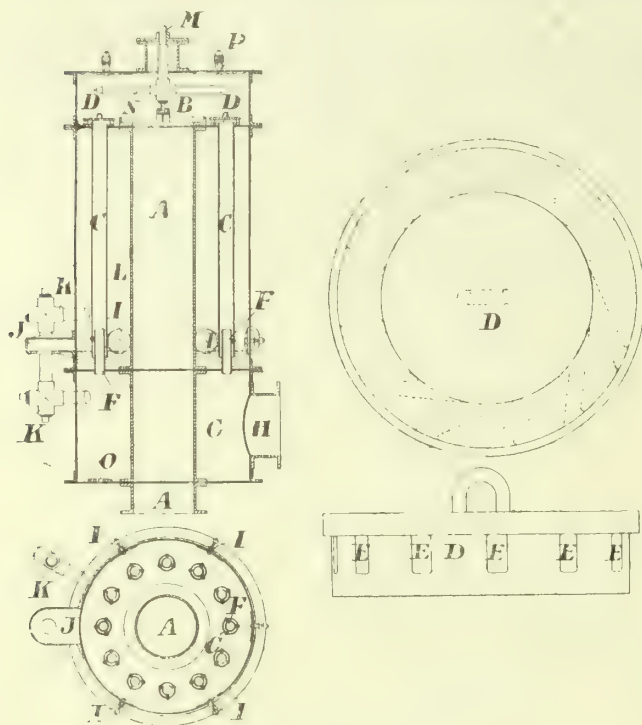
In this apparatus (see p. 272) centrifugal force is employed to free gas under treatment from the tar it contains; and it is characterized by the use of empty vertical tubes of small diameter—say, 5 inches or less—in which the gas is made to travel at high speed with a rotary or spiral motion.

The working of the tar-separator may be described as follows: The gases containing the tar in the form of finely-divided particles enter the separator by the vertical central pipe A, through which they reach the chamber B. From this chamber they penetrate into a series of empty vertical tubes C, each of which is covered by a cast-iron hood D. The hoods are each provided with twelve tangential conduits E, which constitute the only passage through which the gas can reach the tubes C. The total area of the conduits is such that a difference of 3 to 4 inches water pressure is required between the gas pressures at the inlet and at the outlet of the tar-separator in order to pass the quantity of gas for the treatment of which it has been designed. This difference of pressure is sufficient to impart to the gases the speed "necessary to obtain complete separation of the last traces of tar."

From the separating tubes C the gases pass through the smaller tubes F into the chamber G; and from there, through the connection H, to the other apparatus for different treatment. The separated tar flows down the sides of the tubes C into the tar-bath at the bottom of the chamber L, the height of which tar-bath is determined by the position of the tar outlet J.

A pipe connection K is provided between the chambers G and L, for the purpose of keeping the gas pressure equal in both chambers and so prevent any disturbance of the tar-bath in the bottom of the chamber L. Inspection holes I are provided so that the chamber L may be cleaned from time to time of solid matter accumulated therein.

When separating tar from hot gases, it is necessary to avoid the formation of any pitch in the apparatus. On the other hand, when separating tar from cold gases solid deposits of naphthalene are also liable to interfere with the good working of the tar-separator. For the purpose of preventing both these occurrences, a continuous flow of tar is admitted through the pipe M, and uniformly distributed by the rotating device N on top of the hoods D. The tar so admitted will



Fabry's Tar-Separator.

continuously flush the hoods and their conduits E, and maintains the latter free from pitch or naphthalene. This tar is also separated from the gas in exactly the same way as the tar originally contained in the gas; and all the tar eventually finds its way out of the separator through the outlet J.

An additional tar outlet O is provided at the bottom of the chamber G, so as to drain this chamber of any tar, water, or other liquid which may condense in the chamber or return to it from the gas-conduits.

In practice, such a tar-separator is built to deal with the maximum output of gas; but when the maximum is not to be treated, it becomes necessary to reduce the output of the separator accordingly, so that the gas may still pass into the separating tubes with the requisite speed. For the purpose of reducing or augmenting the output, manholes P are provided in its upper cover by means of which a suitable number of hoods D may be removed and replaced by a similar number of plain lids—thus putting the tubes so covered out of action and leaving the remaining tubes to work under the proper conditions of speed and pressure.

Generating Gas from Peat.

ASTOR, J. J., of New York.

No. 15,736; July 6, 1909, Date claimed under International Convention, May 10, 1909.

This invention relates to the manufacture of producer gas from peat. The main essential feature of it involves the disintegrating action on the peat caused by the expansion of the gas occluded in the peat or held within its pores and interstices. The patentee proposes to utilize the gas, or a portion of it, manufactured from the peat to operate an engine, and to utilize the exhaust gas from the engine for creating the alternate compression and rarefaction of the air and gas in the peat-chamber without coming into contact with the peat. To aid in the disrupting and disintegrating of the peat (to facilitate the production of the gas), he preferably mounts the engine within the base or beneath the producer, and supports the grate or floor of the peat-chamber on the engine-base, so that the jar and vibration of the engine will be communicated to the peat.

Production of Gas and Ammonia from Peat.

LYMN, A. H., of Bromley, Kent.

No. 17,074; July 22, 1909.

In ammonia recovery gas-producer plants, the patentee points out, it is found that when the fuel, like peat, contains a large percentage of moisture, the yield of ammonia and the quality of the gas are poor; and the object of his invention is to increase the yield of ammonia and simultaneously to improve the quality of the gas from peat containing a large percentage of water.

For this purpose, he passes into a gas-producer (of any usual form or construction) a mixture of air and steam in a highly superheated condition. He is aware that it has previously been proposed to utilize the sensible heat of the gases leaving the gas-producer to superheat the air and steam entering the gas-producer; but when using peat containing much moisture, it is found that the temperature of the gas leaving the producer is not high enough to superheat sufficiently the air and steam entering the gas-producer. He accordingly utilizes a portion of the gas generated in the producer—preferably after it has been treated for the recovery of ammonia and other bye-products—to superheat the air and steam. For this purpose, he burns some of the gas and applies the heat of combustion to superheat the mixture of air and steam on their way to the producer. The transmission of the heat of combustion to the mixture of air and steam may be effected by the usual means.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Vertical Retorts for Small Works.

SIR,—At the recent meeting of the European Gas Company, Mr. H. E. Jones is reported by you to have said (in answer to a shareholder) that vertical retorts were only suitable for very large works; that such a unit as a vertical retort would be in most of their works absolutely too clumsy; and that the Directors would like to have a little more knowledge of their success in different positions, &c.

It seems perfectly clear from this that Mr. Jones had not in his mind at the time he made this statement the Dessau system of vertical retorts; or, if he had, he cannot know how extensively they are being used in moderate-sized works. May I, therefore, be permitted to point out that this system of vertical retorts has emerged successfully from the experimental stage, and has now become an established mode of carbonizing. There are over 5000 retorts of this system in operation in various parts of the globe—comprising about fifty different towns and cities, varying in population from 20,000 upwards. Among these may be mentioned such places (small in comparison with the majority of the stations of the European Gas Company) as Aschaffenburg, Friburg, Jena, Berne, Brandenburg, and Nancy.

May I further add that many of these retorts have been in operation for four or five years, and that repeat orders have in several instances been received. They are, in fact, giving complete satisfaction as regards gas production, saving in labour, and durability. If Mr. Jones would like to make a personal inspection of this system at any time, I am quite sure the Dessau Company of Berlin would be very pleased to obtain for him facilities for doing so, either at Berlin, Dusseldorf, Cologne, Mariendorf, Duisburg, Magdeburg, Warsaw, Barcelona, Zurich, or elsewhere. If he prefers to stay at home, there is Sunderland, where I am sure Mr. Jones would be a welcome visitor.

C. HOLMES HUNT, Secretary.

Vertical Gas-Retort Syndicate, Limited.

17, Victoria Street, S.W., July 21, 1910.

Automatic Gas-Lighters.

SIR,—On p. 199 in your last issue (Register of Patents), there appeared an abstract of the specification of an invention under the name of E. W. Blake, which purports to be an improved construction of the "Robson" automatic lighter; and the object of the invention is stated to be to provide apparatus which is to a certain extent self-regulating, so that the turning off of the gas at extinguishing time may be performed at a lower pressure than is required for turning on the gas at lighting time. Another object is stated to be to prevent unintentional variations of pressure in the main from operating the apparatus during lighting periods.

Had Mr. Blake taken the trouble to make himself acquainted with my invention, he might have spared himself the time spent on devising his so-called "improved construction" of my apparatus. Suffice it for me to say that I should at any time be pleased to show my apparatus performing successfully the two objects of his invention—moreover, without the aid of liquid seals, bells, or fancy valves; and I would also show him feats in automatic lighting which, I venture to think, are not "dreamt of in his philosophy."

GEO. ROBSON.

39, Victoria Street, S.W., July 23, 1910.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Middleton Corporation Bill.

Bill presented and read the first time: Wemyss and District Water Order Confirmation Bill.

Bills reported, without amendment: Montrose Water, &c., Order Confirmation Bill, Water Supplies (Protection) Bill.

Bills reported, with amendments: Bradford Corporation Bill, Fylde Water Board Bill, Middlesbrough Corporation Bill, Water Provisional Order Bill.

Bills read the third time and passed: Clydebank and District Water Order Confirmation Bill, Little Hulton Urban District Council Bill, Mountain Ash Water Bill, Paisley Gas Order Confirmation Bill, Shirebrook and District Gas Bill.

The Water Provisional Order Bill referred to above is to confirm an Order made by the Board of Trade in regard to the Sutton District Water Company, and it had been under the consideration of a Select Committee presided over by Lord Clinton. The object is to extend the area of the Company's supply so as to include the parish of Kingswood. The Bill had been opposed by the Kingswood Water Company, and a clause had been inserted requiring the Sutton Company, if requested, to acquire such of the mains of the Kingswood Company as might be used by them in carrying out their scheme. The Bill was considered by a Committee of the whole House on Thursday; and the report of the amendments was to be presented yesterday.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, and read the first time: Paisley Gas Order Confirmation Bill.

Bill presented: Falkirk Corporation Gas Order Confirmation Bill. Bills read a second time and committed: Abertillery and District

Water Board Bill [Lords], Gas Orders Confirmation Bills Nos. 1, 2, and 3 [Lords].

Bill read a second time: Paisley Gas Order Confirmation Bill [Lords].

Lords Bills reported: Gas Companies Standard Burner (No. 1) Bill, Gas Companies Standard Burner (No. 2) Bill, Gas Companies Standard Burner (No. 3) Bill, Gas Orders Confirmation Bill No. 2.

Bills read the third time and passed: Cambridge Water Bill [Lords], Clydebank and District Water Order Confirmation Bill [Lords], Gas Orders Confirmation Bill No. 2 [Lords], Havant Gas Bill [Lords], Middleton Corporation Bill.

The Gas Companies (Standard Burner) Bills came up for consideration yesterday; but they were all successively objected to, and were formally ordered to be put down for to-day.

GAS COMPANIES (STANDARD BURNER) BILLS.

Consideration of Clauses.

House of Commons Committee.—Monday, July 18.

(Before Sir HENRY KIMBER, Chairman, Mr. BALDWIN, and Mr. F. W. S. M'LAREN.)

The Committee having given their decision on the above Bills (see ante, p. 213), met this morning for the consideration of clauses.

Mr. RAM, on behalf of the opponents, asked the Committee to insert the following clause: "Any gas examiner appointed by the local authority or local authorities concerned may at any reasonable time test, at any prescribed testing-place, the illuminating power and purity of the gas supplied by any of the promoting companies." There was no such power at present; and the opponents considered it a reasonable request to make. Under the Gas-Works Clauses Act, the power to test was limited at present to certain hours, varying slightly according to the different times of the year. But when that Act was passed, there was practically no gas used for power and heating purposes; whereas it was now very great indeed.

Mr. FITZGERALD, on behalf of the promoters, submitted that because they were altering the test-burner there was no reason for altering the General Act of 1871, which regulated the testing of gas throughout the United Kingdom with the exception of London. What was proposed by the clause was done now by that Act—it enabled the gas to be tested at any reasonable time; and it fixed what a reasonable time was.

The CHAIRMAN: That was for illuminating power.

Mr. FITZGERALD agreed. He pointed out, however, that the proposed clause asked to do away with the provisions of the Act of 1871. Again, the words in the clause were "any reasonable time;" but the first point that would arise when a test was made would be, Was it "a reasonable time" or not? With ordinary gas companies, if the gas were tested on a Sunday about forenoon, it would almost certainly be found to be below the illuminating power, because there was no consumption and no circulation of gas in the neighbourhood. It was after considering these matters that, in 1871, Parliament fixed the hours when testing should take place. The only large case where these provisions had been changed was under the Special Act relating to the London Gas Companies. In that case, there was an entirely different code of provisions; and the companies were protected against the gas being tested unfairly. But the London provisions could not be applied all over the country. This proposal meant an alteration of the general Statute, which, if altered at all, should be altered by another General Statute.

Mr. RAM replied that they did not desire to insert in the Bills anything unfair. The conditions of these 43 gas companies were being altered. The Committee had heard in the evidence of the largely increased use of gas for power and heating. This had nothing to do with its actual use for light; but they were only asking for a test to be taken of the illuminating power and purity, because, given the illuminating power what it ought to be, the heating power would be approximate to what it should be.

The CHAIRMAN said that, supposing the Committee were, on behalf of Parliament, *de novo* settling the terms of the Gas-Works Clauses Act, or considering an amendment, it would not perhaps be an unreasonable thing to moot that there should be no limited hours for the gas examiners to do their work; but this was not the exact position at present. The Gas-Works Clauses Act of 1871 was general legislation. It was quite true that the present Bills, although promoted by the 43 companies, were a step, with regard to the burner, in general legislation; and to this extent it was perhaps an amendment of previous Acts. But the reason for this alteration or this differentiation between the 43 companies and the scores of other companies who had not got it, was put on the ground that the advance in science in gas illumination had shown the necessity and importance in the future of looking to the testing with regard to power and heat. The matter was daily becoming more important. But the Committee did not think that this was the time, or that it was for them, as a Parliamentary Committee sitting upon these particular Bills, to make this alteration; and they did not see their way to insert the clause.

Mr. RAM then proposed the following clause:

The promoting companies (each of whom is in this section called "the company") shall at any time within the period of twelve calendar months after the passing of this Act, if and when required by any consumer of the gas supplied by the company, supply and fix, free of charge to such consumer, a sufficient number of burners suitable in all respects for the consumption of the gas to be thereafter supplied by the company in the place of any burners (not being incandescent burners) used by such consumer at the passing of this Act. Notice of the provisions of this section shall be given on each demand note of the company sent out during the said period. The company shall, if required by any person who shall be supplied with gas by means of a prepayment meter, supply and fix free of charge in connection with such meter one incandescent burner with mantle and chimney in such position as such person may desire.

Such a provision was not without precedent; and it was particularly necessary with regard to the present case, because the evidence showed,

and it was admitted, that, in consequence of the change in burner, there would be a distinct diminution of light with the flat-flame burners. This clause was inserted in the Alliance and Dublin Gas Act of last year, excepting that in that case the words "flat-flame burners" were used; and he was willing to insert these words in this clause. There was precisely the same clause in the Gaslight and Coke Company's Act of last year, with the exception that in London there was not the enactment with regard to prepayment meters. A provision of a similar nature was inserted in the Sheffield Order by the Board of Trade, at the instance of the Sheffield Corporation.

The CHAIRMAN: It is not in the Model Clauses, is it?

Mr. RAM replied that it was not. There were, however, several precedents other than those he had referred to.

Mr. FITZGERALD: Where this clause has been inserted, there has always been a reduction of candle power.

The CHAIRMAN asked whether the clause had been put in by agreement.

Mr. FRERE (the Parliamentary Agent for the petitioners) said that in the Sheffield case it was inserted against the will of the Company.

Mr. HONORATUS LLOYD pointed out that the clause was inserted by the Board of Trade and not by Parliament.

The CHAIRMAN remarked that the fact that the clause had been inserted did not cover the whole case, because, even supposing it was imposed upon them, it would have been upon the consideration of the whole of the particular circumstances, which the Committee had not got before them. In the consideration of these Bills, the Committee had had evidence from a medical gentleman from Liverpool with regard to the use of incandescent burners by the poorer classes; and by this clause the Committee were being asked to compensate differentially a portion of the poor as against another portion of the poor who were able, at all events, to afford incandescent burners.

Mr. RAM said he was proposing to deal only with the poor consumer who would be adversely affected by the charge. There were poor consumers who were using incandescent burners; but that was no reason why assistance should not be given to those who needed it. The very fact that this had been done by consent showed how absolutely reasonable it was; and in the cases where the clause had been inserted, the companies considered it a right and fair thing that justice should be done to poor people who were using an inadequate flat-flame burner. It had been proved that in many cases in Liverpool nothing but a flat-flame burner could be used; and it was with regard to these persons, who would be put to the expense of changing the burners at their own cost, that he asked for the clause.

Mr. HONORATUS LLOYD replied that there was no opposition with regard to the majority of the companies in the three Bills; and yet the clause was to be applied to them all. In asking for the clause, the opponents assumed that the poor people all used flat-flame burners, whereas the majority of them used incandescent burners. As to the precedent in the Alliance and Dublin Gas Bill, there were a number of questions discussed. The Company offered to accept the clause; and it was then inserted by agreement. In the case of the Gaslight and Coke Company, it was part of their own proposal that they should give the clause. They were reducing the illuminating power. As to Sheffield, the Company were seeking to reduce the candle power and alter the burner to the No. 2 argand; but the discussion on the matter was to the effect that they were asking to alter one of the cardinal points of the bargain—the actual candle power. It was under these circumstances that the earlier part of the clause that was now being asked for was inserted without discussion. There was not one of the cases where the only question was the change of burner; and, as a matter of fact, there was no such provision in the Model Bill. The clause itself was contradictory in asking for flat-flame burners for poor customers while it was common knowledge that most of the poor consumers had prepayment meters, and in that case they were asking for the incandescent burner.

The CHAIRMAN said this was, in fact, a form of compensation to some consumers and not to all. The Committee had decided against differentiation in passing the preamble of the Bill; and it was differentiation for a burner which was admitted to be defective. If the clause were allowed, it would be inserted against a large number of companies against whom there was no opposition and against whom it was not claimed; and it would be a variation of the general law.

Mr. RAM remarked that he would be content to limit the clause to the companies against whom there was opposition.

The Committee decided that the clause could not be inserted.

Mr. TALBOT then proposed a clause with regard to the provision of a testing-place by the Liverpool Company.

Mr. FITZGERALD agreed to accept this without discussion.

Mr. RAM asked the Committee to insert the following clause:

The Exeter Gaslight and Coke Company and the Southampton Gaslight and Coke Company shall, within three months after the passing of this Act, provide and maintain at the Municipal Offices of the Mayor, Aldermen, and Citizens of the City of Exeter, and the Mayor, Aldermen, and Burgesses of the Borough of Southampton (in this section called "the corporation"), or such other place as may be agreed with the corporation, a testing-place (which testing-place shall be a prescribed testing-place for the purposes of the Gas-Works Clauses Act, 1871), and all such apparatus as may be necessary for testing the illuminating power and purity of the gas supplied by them, and the corporation shall provide a suitable room for the purpose.

The Committee had heard, Counsel said, of the variation which took place as to the quality of the gas; and it was necessary, in regard to these two Corporations, that there should be testing-places on their premises.

Mr. FITZGERALD contended that the testing-place was invariably fixed by the Special Act; and in each of these cases, a suitable testing-place had been fixed, and the gas had been tested there for years without complaint. Under these circumstances, there was no reason whatever why Exeter and Southampton should be selected out of the 43 companies because of the improved form of the burner.

Mr. RAM said that, in the great majority of the companies in the Bills, they had already got what was being asked for in the clause; so that there was no question of selection.

The Committee decided not to allow the clause.

Mr. TALBOT, on behalf of the Bournemouth Corporation, asked the

Committee to repeal the proviso to section 19 of the Bournemouth Gas and Water Act, 1896, which required the Corporation to give the Company two hours' previous notice before conducting the tests. He said that, with such a notice, the Company had the opportunity of enriching the gas so as to enable them to pass the test; and the purpose of testing was defeated.

The CHAIRMAN: That is a suggestion of possible foul play?

Mr. TALBOT: I do not think it is foul play.

The CHAIRMAN: Unfair play?

Mr. TALBOT said that if the Company thought the gas was going to be tested in two hours' time, they would naturally give instructions to their officers for the gas to be properly kept up. The provision was obviously capable of this being done. He did not know what other object was served by two hours' notice. It might be said that this had nothing to do with the burner; but whenever a gas company came to Parliament for statutory powers for any purpose, that was always the opportunity of the local authority to ask for a re-adjustment of the statutory provisions. And the objection to the promotion of a Bill in this form by so many companies tended to deprive each individual corporation or local authority of the power of doing that which it undoubtedly would do if there was a separate Bill promoted by each company.

The CHAIRMAN remarked that Mr. Honoratus Lloyd need not reply. In many Acts notice had been required; and he did not see that a case was made out against the Bournemouth Company, or that they should have taken from them that which they had enjoyed the last 14 years, without doing wrong.

Later in the day, the clauses were finally adjusted; and the Bills were ordered to be reported to the House.

WARRINGTON CORPORATION AND STAND-BY CHARGES.

Clauses Granted in the Bill.

The Local Legislation Committee of the House of Commons have had before them the Bill promoted by the Warrington Corporation, which deals, among other things, with the gas and electricity undertakings. When the clauses were being considered,

Mr. WEDDERBURN, who appeared for the promoters, explained that the object of clause 17 was to enable a reduction of price in various outside districts. The comment of the Local Government Board was "An application was made to the Board last session for a Provisional Order to effect, among other things, the alteration in the Act of 1877 proposed by this clause. The Board were prepared to entertain the proposal so far as it related to the repeal of the minimum additional charges for the supply of gas outside the borough. The application was, however, withdrawn in consequence of the Board's decision on other matters. The promoters had met the Local Government Board on this point.

The clause was then passed. Clause 18, with regard to bye-laws as to gas-fittings, &c., clause 19, as to the laying of telegraphic and telephonic apparatus, and clause 22, as to the construction and placing of pipes, &c., between mains and meters, were withdrawn. Clause 20, saving as to penalties, and clause 21, power to lay gas-pipes in streets not dedicated to public use, were passed without discussion. Clause 23, gas consumers to give notice to the Corporation before removing, and clause 24, notice to discontinue supply of gas, were also passed. Some discussion arose upon clauses 25 and 26, however.

Clause 25 provides:

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of gas from an installation other than that of the Corporation, the Corporation shall be entitled to receive from him, as a standing charge in addition to the price of the gas actually supplied to him, a fixed sum to be determined by them, not exceeding £5 per annum: Provided always that, in determining such fixed sum, the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises, and provided also that the Corporation shall not be entitled to any such standing charge as aforesaid in respect of any premises for which the whole supply of gas is afforded by them through a meter having a nominal capacity of less than ten lights.

Clause 26 provides:

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of electricity, either from the Corporation or from an installation other than that of the Corporation, the Corporation shall be entitled to charge and receive from him in respect of the supply of gas so laid on such minimum sum as shall be fixed by them not exceeding 25s. for any one quarter of a year, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a lower sum. Provided always that in fixing the amount of such minimum charge the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises: Provided, also, that, in respect of any premises for which the whole supply of gas afforded by the Corporation is taken through a meter having a nominal capacity of less than ten lights, and the supply of electricity is taken from the Corporation, no such minimum charge shall be made; and provided, also, that, in respect of any premises for which the whole supply of gas afforded by the Corporation is taken through such a meter as aforesaid, and the supply of electricity is obtained from an installation other than that of the Corporation, the amount of the minimum charge shall not exceed 5s. for any one quarter of a year.

On these clauses, the Home Office made the following report: "The Secretary of State observes that these two clauses follow provisions which were allowed last year to Heywood. But these provisions were adapted to somewhat special circumstances; and the Secretary of State suggests, for the consideration of the Committee, that if any provisions to the effect proposed were allowed to Warrington, it would be better, in the absence of any special reason to the contrary, that the two clauses should be combined and re-drafted on the lines of the provision allowed to Mountain Ash last year, and in the Rhondda Urban District Council Bill of the present session. That provision is based on the form which was settled by the Police and Sanitary Committees in regard to the supply of electricity in cases where the consumer has a separate supply, and which is now part of the general law;

and its requirements appear to the Secretary of State to be more suitable for adoption generally than the special provisions in the Heywood Act."

The Local Government Board reported: "These are exceptional provisions in regard to the supply of gas; but clauses on the subject were allowed by the Local Legislation Committee, on evidence. The Committee, however, will no doubt require to be satisfied that the clauses might properly be allowed in the circumstances of this borough."

Mr. J. L. Whittle, the Town Clerk of Warrington, said the object of the clauses was to make a manufacturer who had the Corporation pipes laid on to his premises, and at the same time had an acetylene installation of his own, pay a minimum charge. They had many cases of people who provided themselves with a separate supply, and still wished to retain the use of the Corporation pipes in case of a breakdown. The manufacturers of Warrington had considered the clauses, and agreed they were reasonable. There was no objection at all.

Mr. WEDDERBURN called attention to the clause given in the case of Mountain Ash, which provided that: "Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Council a supply, or continuance of a supply, of gas for premises having a separate supply—that is to say, a supply from an installation other than that of the Council—unless he shall previously have agreed to pay the Council such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises, and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889." Counsel contended that the objection to this clause was that it applied only to gas, and it might involve the Corporation in many arbitrations. On this ground, Warrington preferred the Heywood clause.

The CHAIRMAN (Sir Francis Layland-Barratt) said that, under that clause, they might be able to make a very big charge on certain manufacturers. It was not limited in Mountain Ash. His opinion was that Warrington stood in the same position as Heywood; and therefore the clauses would stand.

Mr. BAKER (the Parliamentary Agent for the Bill) said that, in clause 25, the amount was fixed not exceeding £5 per annum; whereas in clause 26, it was a fixed sum not exceeding 25s. for any one quarter of the year. He asked whether it would be better to make them similar. If it was £5 per annum, and the tenant left towards the end of the year, they might possibly lose the £5; and under the other clause, they would get the previous three quarters of the year.

The CHAIRMAN said it was a mere drafting amendment; and they should have the £5 altered to 25s. per quarter.

Clauses 25 and 26 were then added to the Bill, as also were clause 27, which gives power to require the use of anti-fluctuators for gas-engines, and clause 28, which deals with the period of error in defective meters.

Bland Light Syndicate, Limited.

The Chairman (Mr. C. W. Bland), in submitting at the meeting the accounts for the twelve months ending April 30 last, congratulated the shareholders on the results of the year's trading. The business, he remarked, showed a steady increase all round. An interim dividend at the rate of 10 per cent. per annum for the six months ending Oct. 31, 1909, was paid in January; and the Directors recommended a further distribution at the rate of 20 per cent. per annum—making a dividend of 15 per cent. for the year. It appeared from the accounts that the distribution of this dividend still enabled the Directors to carry forward a sum equal to a substantial dividend on the Company's issued capital. The whole of the amounts brought forward on account of the preliminary expenses, advertising, and goodwill had been written off out of the profits. The continuous expansion of the Company's business was being maintained; and the further increase anticipated in last year's report had been fully realized. Meanwhile, the returns for this year to date showed considerable improvement over the corresponding period of last year.

Electric Lighting Scheme for Dundalk.

Mr. A. W. Trotter, the Electrical Adviser to the Board of Trade, has held an inquiry at Dundalk into objections which had been raised to a proposed scheme of electric lighting. In the course of the proceedings, Mr. Matheson, K.C., who appeared for the Dundalk Gas Company, pointed out that the scheme as originally propounded provided for 11 miles of overhead wires. Now it was proposed to have 9 miles of overhead wires and underground wires through the main thoroughfares. The gas-pipes, which were laid through practically all the streets of the town, owing to the nature of the soil, suffered considerably from corrosion. It was proposed to lay the electric cables direct in the soil with a warning board above them. Under these circumstances, if the electricity escaped it would be likely to set up electrolysis such as had occurred in Belfast recently (*ante*, p. 122). The result would be disastrous to the Gas Company, and would be of considerable danger to the public. The crossing of the streets with the overhead wires would also be dangerous. Evidence in support of this statement was given by Mr. George Airth, the Gas Manager, and Mr. Porte, Demonstrator of Physics to the Royal College of Science in Ireland. On behalf of a number of ratepayers, Mr. Donaldson also contended that the scheme as put forward would be unsightly and dangerous; but the Council urged that they had adopted the specifications of the Board of Trade, and that similar schemes were in operation elsewhere.

Tottenham and Edmonton Gas Company.—After carrying £1000 to the insurance fund, the amount to the credit of net revenue account for the past six months is £39,320. The Directors recommend full statutory dividends of 7 per cent. per annum on the "A" stock and 5½ per cent. on the "B" stock, carrying forward £23,154. A year ago the dividends were at the rate of 6½ and 5½ per cent. respectively; and the amount carried forward was £18,592.

LEGAL INTELLIGENCE.

ACTIONS BY DEBENTURE-HOLDERS IN GAS COMPANIES.

Last Tuesday, Mr. Justice Joyce had before him, in the Chancery Division of the High Court of Justice, actions by debenture-holders in two gas companies.

Bucks and Oxon District Gas and Coke Company, Limited.

An action brought by Mr. Eveleigh against this Company came before his Lordship on a motion for judgment upon agreed minutes. For the plaintiff, who sued on behalf of himself and the several other holders of debentures, Mr. Ward Coldridge asked for the usual declaration of charge, an inquiry as to what the property charged by the debentures consisted of and in whom it was vested, an account of the trust estate, and an inquiry as to what other incumbrances there were on the property. His Lordship made an order in the agreed terms.

Cobham Gas Company.

An action brought by Mr. Fitter against this Company came before his Lordship on a motion for judgment in default of defence. The plaintiff was represented by Mr. Wright. The Company was incorporated in 1899, and had issued certain debentures, of which the plaintiff held several. Lately a Receiver was appointed of the assets of the Company, except the uncalled capital. There was no appearance on behalf of the Company; and his Lordship made the usual order in a debenture-holders' action.

North Sussex Gas and Water Company.

Last Friday, before Mr. Justice Swinfen Eady, Mr. Patrick Hastings, instructed by Mr. Matthew J. Jarvis, of Finsbury Square, moved, on behalf of Miss Lomax, suing on behalf of herself and all other debenture-holders in the above-named Company, for the appointment of a Receiver. He said the Company had not put in any defence. It was a statutory concern, incorporated in 1905, and by section 11 the non-payment of interest was specifically made a ground for an application for a Receiver. The plaintiff was the holder of debentures to the amount of £1000, on which six months' interest was due and unpaid. It also appeared that judgment had been obtained and execution levied on the premises of the Company. His Lordship appointed Mr. Alfred W. Lunt, of Heathfield, Sussex, as Receiver, on giving security.

National Air Gas Company, Limited.

Last Friday the debenture-holders' action of Crewdson against the above-named Company was again mentioned to Mr. Justice Parker. Mr. Romer, K.C., reminded his Lordship that a Receiver and Manager had been appointed with the view of protecting the assets. The Company were now willing that the appointment should be continued over the Long Vacation. His Lordship ordered the motion to stand over until the second motion day in Michaelmas term; the Receiver and Manager to be continued, and to give security forthwith.

West Ham Corporation Finances.

In the Chancery Division of the High Court, on Monday of last week, judgment was reserved by Mr. Justice Neville in an action brought by the Attorney-General at the instance of large ratepayers of West Ham who questioned the legality of an overdraft of £150,000 obtained by the West Ham Corporation from the London and County Banking Company, Limited, for their electrical undertaking. It was alleged by the Attorney-General that the Corporation had exhausted their borrowing powers for electricity purposes, and had, in utter disregard of the limitations and restrictions of their Statute, obtained illegal advances on overdraft, resulting in reckless extravagance, and considerably enhancing the liability of the ratepayers. An order was also sought for repayment by the bank of interest paid to them in respect of these alleged illegal borrowings; but this part of the case was settled by the bank, without admitting liability, agreeing to repay £7000, with costs.

An Alleged Infringement of Design.

Last Friday, in the Chancery Division of the High Court, before Mr. Justice Parker, the plaintiffs in the action of William Cross and Sons v. Sydenham and M'Oustra, Limited, moved for interim relief in respect of an alleged infringement of their registered design for gas boiling-stoves. Mr. Sebastian, who represented them, however, stated that the parties had come to terms. The plaintiffs, he added, were carrying on business at West Bromwich as makers of gas boiling-stoves; and the defendants were at Walsall. Mr. Gray, on behalf of the defendants, consented to treat the motion as the trial of the action, to give a perpetual undertaking not to infringe the plaintiffs' registered design, to deliver up all stoves made in accordance with the design, and to pay £40 as agreed damages and costs. His Lordship made an order in these terms.

Control of Outside Lamps and Signs.—At the meeting of the London County Council last Tuesday, the Building Acts Committee reported that they had had under consideration the question of the control of lamps, signs, and other structures projecting from the fronts, or erected in advance, of buildings; and they recommended that legislation should be promoted next session with a view to provision being made for the regulation and control of such lamps, &c., not being architectural decorations within the meaning of section 73 of the London Building Act, 1894.

MISCELLANEOUS NEWS.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In a preceding issue of the "JOURNAL," the report of the Chief Inspector under the Alkali Works Act, 1906, for the past year was dealt with. To-day we give some extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard. He says that, with one exception, there was no reason to complain of the way in which the manufacture of sulphate of ammonia was conducted during the past year. At the works referred to, considerable negligence was displayed, and the matter was the subject of much correspondence with the Chief Inspector. On the assurance of more care being taken in future to prevent the escape of noxious gases into the atmosphere, no steps were taken to recover any penalty for infraction of the Act. The number of works using the continuous system of distillation is 33, and six use the intermittent system; the proportion of total liquor distilled by the two methods being 99.1 and 0.9 per cent. respectively. Products equivalent to 3021 tons of sulphate of ammonia were made during the year. There are a few places in the district where tar is distilled; but the majority of the works are those in which roofing felt is manufactured, and in these provision is made for dealing with the vapours. In the case of the other class, the sulphuretted hydrogen evolved at certain stages of the distillation is either burnt or absorbed in oxide of iron.

In the North of England district, which is under the supervision of Mr. E. Morley Fletcher, the number of works registered is 153, and the number of processes inspected last year was 201. All the works in the district were visited, and 546 tests were made of the gases evolved during the various processes. An increased quantity of sulphate of ammonia was made, owing to the extension of coke-ovens with recovery of bye-products; but no new works were registered. The total quantity of liquor distilled was equivalent to 46,687 tons of sulphate, and 99.8 per cent. was made by the continuous process. Mr. Fletcher says that when oxide of iron is used for arresting the sulphuretted hydrogen in the effluent gases, this in the form of a heap, instead of enclosed in a brick purifier, is becoming fairly general. The former method he considers preferable, certainly in the case of small works, as there the supervision is not always so good as in the larger ones, and escapes of sulphuretted hydrogen up the sides of the brick wall and through cracks in the brickwork itself are frequently left unnoticed, whereas any escape from the heap is quickly seen and remedied.

Reporting upon the district comprising Cheshire, North Wales, and part of Lancashire, Mr. E. G. Ballard states that 22 processes for the manufacture of sulphate and muriate of ammonia were under inspection during the past year. With one exception, he had no reason to complain of the way in which they were carried on; but at the works referred to, there was evident neglect on the part of the foreman in charge. Representations were made by the Chief Inspector, and no further infractions afterwards occurred. The various plants were kept in a good state of repair, and the manufacturers did all they could to meet the requirements of the Act. At all the works in the district the ammonia stills are on the continuous principle of distillation; the number of such stills being 22. The methods by which the sulphuretted hydrogen evolved in the process of manufacture is dealt with at the various works in the district are as follows: By the Claus process, 2; by absorption in oxide of iron, 18; by special process, 1. The proportion of sulphuretted hydrogen treated by the above processes, in terms of sulphate of ammonia made and per cent. of total liquor distilled, is as follows: By the Claus process, 7.5; by absorption in oxide of iron, 51.5; precipitated by metallic salts, 41.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, the number of works dealing with gas liquor and sulphate and muriate of ammonia was increased by one last year; and all the plant was properly worked and maintained. This remark applies also to tar-works, of which there are six in the district.

The district of North and East Lancashire, which includes part of Yorkshire, is under the supervision of Mr. J. W. Young, B.Sc. To the gas liquor and other works 226 visits were paid last year. The proportion of liquor distilled by the continuous process was 90.8 per cent., and to liquor ammonia 7.3 per cent. Regarding the mode of destruction of the foul gas evolved, 34.4 per cent. of the total manufacture was in connection with sulphuric acid plants, 23.9 per cent. with Claus plants, 39.6 per cent. with oxide of iron purifiers, and 2.1 per cent. with other methods. Mr. Young says the first was entirely satisfactory, and some of the Claus plants worked very well; but at others better supervision is needed, both to avoid nuisance and to improve the quality of sulphur obtained. There were occasions when it was necessary to recommend an immediate change of oxide purifiers, owing to incipient foulness. Moreover, in some cases the walls of the boxes were not impervious to leakage of gas; but in all of the works advice was promptly taken. In a few instances box purifiers were abandoned for the heap system, with ultimate satisfaction; and Mr. Young says it is to be hoped this example will be more generally followed, as there still remain in this district purifiers with walls dangerously high. At three important works serious representations had to be made, because, although with more than one purifier in use, the parties disregarded the Chief Inspector's warning to provide hydraulic change-valves. Two promptly made the necessary alteration; but at the other, considerable pressure had to be exercised before the object was attained. At one works, much trouble had been given before it was possible to secure even a moderate amount of reform. The Inspector found "an ignorant attendant, a leaking saturator, a most inadequate purifier, and no condenser to cool the hot foul gases." The three latter have been cured; but as to the former, it is stated that "there is room for doubt."

At one works the purifiers were, on one visit, being used as a receptacle for lumber; thus obstructing the performance of their proper functions and the inspection of their condition.

In this district there are 25 tar-distilling works, most of which were found in good order and well conducted, though Mr. Young says more care is required to keep the receiver at the worm-end closed. At two of the works, the stills were found operating without any provision for leading away the foul gas from the receiver. The cause for complaint was at once removed at the former works; but at the latter there was so much unnecessary delay in carrying out the requirements of the Act that a crisis was only narrowly averted. At one works where there is a range of five stills, the foul gases from the receivers were formerly draughted together to one fire for destruction. Now each still separately destroys its own gas at its own fire. The change gives greater safety, and there is less likelihood of nuisance.

The total number of processes under inspection in sulphate of ammonia and gas-liquor works in the East Midland district, which is under the supervision of Mr. R. D. Littlefield, is 56, of which 49 are sulphate and muriate of ammonia works and the rest liquor works. Two additional sulphate works were registered during the year; bringing up the number to 48, of which 46 use the continuous and two the intermittent process. The proportion of liquor distilled by the former process last year amounted to 99.5 per cent. of the total. The sulphuretted hydrogen evolved is dealt with mostly by oxide purification and combustion.

In the South Midland and Norfolk district, which is under the supervision of Mr. Edward Jackson, there are 104 works where ammonium sulphate, chloride, or carbonate is manufactured or gas liquor concentrated; the number of such processes under inspection amounting to 114. In the year 1884, when the South Midland district was formed, out of a total of 112 registered works only 23 manufactured sulphate of ammonia. Four new works were registered last year for sulphate of ammonia manufacture. At two of them, which are plants at ordinary gas-works—continuous stills with the usual hand-fishing saturators were put down, with water-cooled iron pipe condensers. In the first case, a brick-walled oxide of iron purifier was attached; the bricks being laid in cement, as usual and necessary. At the other works, two oxide of iron heaps, with hydraulic change-valves, were arranged. The fourth new sulphate works registered were in connection with a power-gas plant of large dimensions, and was of the usual kind. There are now in the district five plants of the Mond or Duff type, where sulphate of ammonia is manufactured; also 19 where it is produced in connection with patent coke-ovens. At two works where retorts were used (so-called coal-carbonizing works), patent coke-ovens were substituted for them—in one case entirely, and in the other partially. There are only two of these carbonizing plants now in operation in the district; whereas at one time there were six. The remainder of the gas liquor distilled is from ordinary gas-works. There was again a considerable increase in the quantity of ammoniacal liquor produced in the district from other sources than the gas-works, such as coke-ovens, producer-gas plant, iron-works, and coal-carbonizing works. This is shown by the following figures, giving the proportion of liquor produced on a sulphate of ammonia basis:—

	1908. Per Cent.	1909. Per Cent.
From gas-works	61.2	54.9
„ coke-ovens	27.9	34.0
„ producer-gas plant	4.0	6.9
„ iron-works	2.9	2.8
„ coal-carbonizing works	4.0	1.4

It will be seen that 45 per cent. of the ammoniacal liquor now produced in the district is from sources other than ordinary gas-works. Five years ago (1904), this figure was only 7.9 per cent. of the total. Out of a 9.9 per cent. increase in the amount of sulphate of ammonia produced during 1909 over the year 1908, coke-ovens are responsible for 9.4 per cent. of it—i.e., 95 per cent. of the increased production of sulphate last year was due to coke-ovens. The number of works using the continuous method of distillation in this district last year was 98; and the proportion of liquor distilled was 99.9 per cent.

Associated with Dr. Alfred C. Fryer in the supervision of the South and South-West of England District is Dr. Bailey; and all the works were visited and reported upon during the year by one or the other of these gentlemen. The number of visits paid was 836, and of tests made 713. There were 95 works registered for the manufacture of sulphate and muriate of ammonia. Dr. Fryer records that an interesting experiment is being carried out at a small gas-works in the South of England. The method is based on bubbling the gas through sulphuric acid, and then evaporating down with a steam-coil to obtain the sulphate of ammonia. Should this plan be found to work successfully and economically, he says a boon will be conferred upon those smaller works where considerable difficulty is experienced in the disposal of the ammoniacal liquor. They are not allowed to run it into the streams, and they are frequently situated at long distances from manufacturers who might otherwise buy it from them. Early in the year, two men were “gassed” at one works; and the circumstances pointed to the possibility that the men suffered from the effects of hydrocyanic acid. Suggested improvements have been made with the view of obviating any possible repetition of such an occurrence. The disposal of sulphuretted hydrogen by combustion and subsequent neutralization of the acid products is in use at three works. The number of works using continuous distillation plants is 72; the proportion of liquor treated by this method being 95.2 per cent. Oxide of iron purification was in use in 86 works last year.

Mr. F. Napier Sutton makes some interesting observations in his report on the district comprising the eastern and south-eastern counties, in which there are 11 alkali works and 171 scheduled and registered works. The distillation of gas liquor, either for concentration or the manufacture of ammoniacal compounds, is carried on at 89 works; and 94 manufacturing operations are under supervision. The products manufactured consist chiefly of sulphate; but they include carbonate and nitrate of ammonia, and liquid (concentrated and refined) and anhydrous ammonia. The gas-works in the district produced 80.3 per cent. of the products; and the balance came from the works of private firms. The total quantity of ammonia compounds made in the district

last year showed a small reduction on the previous year's total. The number of works using continuous distillation plants was 82; and the proportion of liquor treated was 98.9 per cent.

The direct utilization of the sulphuretted hydrogen in the saturator gases for sulphuric acid manufacture is carried on at three works; the proportion of gas thus utilized being 55.5 per cent. of the whole. Mr. Sutton points out that great care is necessary to free the saturator gases from naphthalene and other oily hydrocarbons and ammonia before passing to the burners, if nitre consumption is to be kept down. Special attention in this direction was given at two of the works in his district. The Claus sulphur-recovery process has been adopted at works where hitherto, on account of their very isolated position and other peculiar conditions, the foul gases had been burnt in a special furnace. The process is now in use at ten works, and 23.8 per cent. of the gas is thus dealt with. Special difficulties exist at one works in dealing with the waste gases leaving the depositing chambers, as the latter have insufficient area and cannot be extended. The fine undeposited sulphur carried forward repeatedly blocked the terminal limestone tower and purifier, and as a substitute for these the exit gases are now to be passed to a fire.

Absorption of the foul gases by oxide of iron is used at 60 works, and it accounts for 9.2 per cent. of the gases. The use of oxide-heap purifiers in place of open box purifiers continues to increase in popularity. This method was adopted in August, 1908, in place of the Claus process, at one large works where the annual make of sulphate is 800 to 900 tons, and the daily make from 5 to 6 tons. A careful account has since been kept of the cost of this method of purification; and by the courtesy of the engineer and manager, Mr. Sutton is able to give the cost, which works out at 5.96d. per ton of sulphate made.

Treatment of the saturator gases by combustion and subsequent neutralization of the acid products in limestone scrubbers remains in use at 11 works; and the proportion of gas treated is 10.3 per cent. At two works the saturator gases continue to be passed to the coal-gas purifying plant. The crude method of burning the gases in retort or boiler fires is only now in existence at two works. One is a small establishment producing only 10 tons of sulphate by an intermittent plant; at the other works, bone charcoal liquor is distilled, and the saturator gases contain only traces of sulphuretted hydrogen.

Mr. Sutton directs the attention of manufacturers to the desirability of adopting a continuous lime-feed to the stills; the loss of ammonia by the wasteful method of intermittent liming being considerable. The addition of lime is frequently made at the smaller works by hand pumping at intervals nominally of 15 minutes, but frequently of 20 and 30 minutes; and it results in corresponding intervals of waste of fixed ammonia salts. At most of the large works, continuous lime-feed is now used; and Mr. Sutton says there is no reason why the principle should not be adopted in every case, with advantage to the yield and improvement in the character of the effluent. A little thought and ingenuity will overcome the problem.

This leads to another matter closely connected therewith; and Mr. Sutton proceeds to deal with it. He says that the varying quantity of lime used at different works is remarkable; and on examining the reason for this, it is obvious that it is a question of the character and quality of the lime employed rather than variations in the character of the ammoniacal liquors treated. Considerable excess of lime is necessary (usually 30 to 50 per cent. beyond the theoretical quantity needed) if the ammoniacal liquor is to be thoroughly decomposed. Chalk limes are mostly used in his district, and they differ much in quality, for some are badly burnt and are therefore low in causticity, while others contain a high proportion of silicious matter; or a lime may be poor for both reasons. A limestone lime, such as that obtained from Derbyshire, is very free from silicious or other inert matter, and when well burnt contains from 93 to 95 per cent. of caustic lime (CaO), against 85 to 88 per cent. found in well-burnt chalk lime. The absence of silicious matter in limes is important, not only because the causticity is affected thereby, but because the amount of fine flinty and earthy matter blocks the trays and seals of the stills, and quickly fills up the spent liquor settling-pits, besides injuring the pumps.

Mr. Sutton points out that the necessity of clearing the still trays which have blocked with solid matter and the cost of frequently removing the sludge from the settling-pits has led a few manufacturers to use caustic soda in place of milk of lime for decomposing the fixed ammonia salts. Caustic soda is a soluble alkali, and the sodium compounds formed on decomposition of the salts are likewise soluble; hence the stills may run for years without cleaning, and the effluent contains no solid matter requiring settlement and removal. The initial cost of caustic soda as against lime is much greater (70 to 72 per cent. Na₂O costs £10 5s. per ton), while its combining value is somewhat less. But those who use it appear to think its greater cost is balanced by the advantages mentioned above. This has led to an inquiry into the costs of both materials; and, by the courtesy of various managers of works, permission has been granted to publish the following figures. They are from a limited number of works only, but they have been selected geographically over the district, and include different types of distillation plant.

Class of Alkali Used.	Average Cost Delivered at Works per Ton.	Per Ton of Sulphate of Ammonia Made.	
		Average Consumption.	Average Cost.
	s. d.	Lbs.	s. d.
Cambs, Herts, and Kent chalk lime	19 3	310	2 8½
Surrey greystone chalk lime	16 3	257	1 10½
Buxton limestone lime	18 6	201	1 8
Caustic soda (70 to 72 per cent. Na ₂ O) . . . . .	..	55	6 5½

These figures show that the quantity used and the cost per ton of chalk limes is distinctly greater than with other classes of limes; the most efficient being Buxton lime. At two works, experience was had with both varieties; and the cost and efficiency were markedly in favour of the latter.

Reporting upon the works in his district for the distillation of tar,

Mr. Sutton says no addition to the plant occurred last year at the nineteen works in which this operation is carried on, and the quantity of tar actually distilled was less than a few years ago, before the advent of tar-surfaced roads. The more complete dehydration of tar as a preliminary to distillation is receiving further attention; and at another of the larger works plant has recently been erected for the continuous heating and dehydration of the raw tar by means of the waste fuel gases. Appliances exist at all works for dealing with the permanent gases evolved at the outlet of the condensers, and it is only occasionally that any of them have been found faulty. No complaint occurred last year of nuisance arising from this class of work.

In the district comprising South Wales and Monmouthshire, which is under the supervision of Dr. Bailey, ten of the fifteen processes carried on in registered works for the manufacture of sulphate and muriate of ammonia are for dealing with gas liquor; the others being at coke-ovens having bye-products plant. Dr. Bailey says the plant generally was kept in good repair. In two instances, where oxide of iron heaps are used for dealing with the foul gases, it was necessary to call serious attention to the unsatisfactory nature of this portion of the plant; and in both cases steps were taken to put everything into satisfactory working order. The total amount of ammonium salts, in terms of sulphate of ammonia, produced during the year, shows an increase of less than 1 per cent. over the previous year. The number of works using plants for continuous distillation was 14; and practically the whole of the liquor was treated by this process.

Report to the Secretary for Scotland.

Following the reports of the District Inspectors is Mr. Carpenter's report to the Secretary for Scotland. The details of the work done in this portion of the United Kingdom are, as usual, furnished by Mr. W. S. Curphey, who is now the Chief Inspector. We extract the subjoined particulars.

The number of works in Scotland registered under the Alkali Act during the past year was 169; being an increase of six over the number registered in 1908. Eight works were added to the register, while the registration of two was discontinued. The processes carried on numbered 274, compared with 267 the preceding year. The quantity of salts of ammonia made (expressed as sulphate) was:—

	Tons.
Gas-liquor works	19,974
Iron-works	18,786
Shale-works	57,048
Producer gas, coke, and carbonizing works	16,946
Total	112,753

In the course of inspection, 590 visits were paid, and 405 examinations were made of the gases passing away from the various works. The general average escape of muriatic acid from all the alkali works was 0.089 grain per cubic foot of chimney gases, equivalent to an escape of 2.7 per cent. on the quantity produced. The general average escape from all the sulphuric acid works was equivalent to 1.29 grains of sulphuric anhydride per cubic foot of total escaping gases. In both cases these general average figures are lower than the corresponding results obtained in 1908, and are both well within the limits prescribed by the Act. The means provided to prevent undue escape of noxious gases were maintained in an efficient condition in all the works.

The number of registered works in Scotland in which sulphate, chloride, or hydrate of ammonia was made last year was 102, or four more than in 1908; the number of such processes operated being 107. This increase in number was due to the addition to the register of four gas-works in which the manufacture of sulphate of ammonia was commenced during the year. Mr. Curphey remarks that, of late, with every year has come an increase in the number of gas-works where the liquor produced in the manufacture of illuminating gas is utilized locally for the preparation of sulphate of ammonia. This development, he says, is likely to continue, as there is a tendency among gas managers to adopt the practice in works in which hitherto the residual products have been sold, and also because the increasing production of gas in many works renders the local treatment of the ammoniacal liquor more attractive.

The total quantity of liquor distilled last year was equivalent to 19,974 tons of sulphate of ammonia; and the whole of it was treated by the continuous method. The sulphuretted hydrogen evolved was dealt with by the methods named in the following proportions, expressed in terms of sulphate of ammonia: By the Claus process, 11.65 per cent.; by oxide of iron purifiers, 77.39 per cent.; by combustion, 10.57 per cent.; by metallic salts or other methods, 0.39 per cent. These figures do not include the ammoniacal liquor dealt with in iron-works, shale-works, coke-oven or producer-gas works. No change in the mode of disposing of the waste gases in these classes of works occurred during the past year.

As shown above, the use of the oxide of iron purifier is the most common method of dealing with the waste gases given off in distilling gas liquor; and Mr. Curphey says that these purifiers were generally found in an efficient condition—entirely preventing any escape of sulphuretted hydrogen. Constant attention on the part of the management is, however, requisite to ensure that the purifiers are maintained in proper order, by changing the contents at sufficiently short intervals, and by supplying fresh oxide as that in use becomes fouled through repeated alternate action in the purifiers and revivification outside them. As the population increases, and the use of gas becomes more and more popularized, growth in output from gas-works results. Along with this more work is called for from the sulphate of ammonia plant; consequently entailing a greater demand on the means provided for dealing with the noxious gases. On this account, the means for cooling and purifying the waste gases require to be improved from time to time. During the past year, increased cooling appliances were provided in four works, and enlarged purifiers brought into operation in six.

The vacuum plant for distilling gas liquor continued in active use in three works during the year. The vacuum principle was likewise in operation in several works for the concentration of solutions of sulphate

of ammonia produced when using dilute sulphuric acid. In this connection, Mr. Curphey says the vacuum method presents an advantage over older forms of open evaporators, avoiding, as it does, the formation of large clouds of moisture from the water evaporated.

The production of sulphate of ammonia in Scotland from all sources amounted, as shown by the figures tabulated above, to 112,753 tons—an increase of 7283 tons on the figures for 1908. This was due to a larger production in the several groups of works. In the iron-works, shale-works, and coke-oven works, greater activity in the chief products led to an increased yield of bye-products; while the gradual growth in the demand for illuminating gas is indicated by a greater production of ammoniacal liquor.

In the remarks by Mr. Carpenter which follow Mr. Curphey's report, he refers to the fact just alluded to, and points out that the total of 112,753 tons of sulphate made in Scotland forms nearly one-third of the produce of the United Kingdom.

In continuation of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Carpenter gives the figures, compiled from the statistical returns to the Home Office on Mines and Quarries, for the ten years ended Dec. 31 last. They show that the total quantity of shale mined in the United Kingdom in 1900 was 2,282,221 tons; the amount of sulphate of ammonia recovered being 37,267 tons, or 36.6 lbs. per ton of shale. In 1905, the figures were 2,496,785 tons, 46,344 tons, and 41.6 lbs.; while last year they were 2,967,057 tons, 57,048 tons, and 43.1 lbs.

MANCHESTER CORPORATION SALARIES.

Reductions in the Gas Department—Discontented Officials.

The Special Committee appointed by the Manchester City Council to deal with the salaries and conditions of service of officials have completed their labours, and the report is now in the hands of members of the Council. It is a voluminous document, covering 225 printed pages, with numerous tables; and should the recommendations of the Special Committee be approved by the Council, a considerable saving is to be effected in the wages bill. In each department a minimum and maximum salary for the chief officials has been named; and the Committee consider it desirable that a retiring age should be fixed, to apply to all officials in the service of the Corporation—a suspension of the rule only to be made by consent of the Council by resolution—"provided that (except in the case of an official who, at the commencement of the scheme, should have attained the retiring age, or be of an age less than five years below the retiring age) such suspension should be for one year only." The Committee also consider it desirable that Corporation officials should reside within the boundaries of the City.

It is recommended that all advances of salaries and wages be annually considered by the various Committees; that where the maximum salary or wage fixed for a position is less than that received by the present occupant of such position, such occupant shall continue to hold office at the present salary or wage; and that all future appointments be made from candidates who have passed an open competitive examination—every employee under 21 to pass a medical examination.

Officials in the Gas Department are seriously affected by the Committee's recommendations. For example, in the prepayment meter department all the maximums of the principals are lower than the present salary—in one case £15, and in another £52. There are similar reductions in the meter stores (Whitworth Street West) department, and large reductions in the general stores department. The present salary of the Chief Gas Engineer is £1100; and £1250 is recommended for the present holder of the office, and £1000 as a maximum for future holders. In the case of the Gas Superintendent, the proposed minimum is £450 and maximum £600, the amount now paid to that official. The minimum for the Chief Clerk is put at £200, with £250 as the maximum. The present holder of the office gets £325 a year. The Accountant for the department will in future start at £250; the maximum being £400, a sum now paid to that official. At the various gas-stations, the salaries are to be reduced; and while some forty increases have been suggested on present figures by the Gas Committee, the Special Committee say "No" to about 35 of them. The highest remunerations to be paid are in various instances £50, £60, and nearly £100 below the Gas Committee's present idea of what should be paid. The Minutes Clerk of the Gas Committee, now drawing £250, has £100 suggested as the minimum and £150 the maximum for the position. Clerks in the gas-meter accounts and deposits departments now getting £117 and £104, are to come down to £91 and £65. In several cases the proposed reduction is from £5 to 30s.

On the question of office hours, it is recommended that throughout the service they shall be from 9 o'clock in the morning till 5 in the evening (with an interval of 40 minutes for lunch); and on Saturdays from 9 in the morning until 1 o'clock in the afternoon. Provision is made that, where the exigencies of business require an alteration of the foregoing hours in the case of particular officials, the Employing Committee shall have power to vary the hours; and it is also to be understood that every official is liable to be called upon to commence duty before, and to remain on duty after, office hours, under instructions from the head of the department, whenever necessary. Regarding holidays, the Committee recommend that, so far as public convenience admits, the Bank Holidays, Christmas Day, New Year's Day, Good Friday, the following Saturday; Whit-Wednesday, from noon, and the whole of Whit-Thursdays, Friday, and Saturday be observed as holidays.

There are 19,667 employees of the Corporation; and in all grades the greatest dissatisfaction is expressed at the recommendations of the Committee. The "Guild Journal," the official organ of the municipal officers of Manchester, says: "The fact that expanding business and increasing prosperity may increase salaries in a private firm, does not necessarily apply to a corporation. Corporations stand alone—they are not run for profit. They are run for the good of the ratepayers—some will say these are closely identified. Officialdom should be run on the cheapest possible lines, and the yearly increase of work by the

additions of out-townships and city developments are not to be used in favour of increasing salaries. Careless expenditure in past years is no argument in favour of greater salaries. It rather tends the other way—the way of reduction. . . . Perhaps a first-rate set of councillors may eventually spring up to help the second-rate officials. Time may otherwise bring its compensations."

HALIFAX CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The accounts of the gas undertaking of the Halifax Corporation for the past financial year have been issued; and we have received a copy from the Gas Engineer and Manager (Mr. J. Wilkinson). They show that the sale of 778,059,600 cubic feet of gas produced a revenue of £84,534; but a sum of £299 was paid to the Sowerby Bridge Urban District Council for 2,659,000 cubic feet supplied to Luddenden—bringing down the total to £84,235. The deduction of discounts further reduced this to £79,220. Meter-rents produced £2324; the sale of residual products, £26,255; and other items made up a total of £109,339. The principal items of expenditure in the past year were: Manufacture and purification of gas, £39,777; maintenance of works, £7791; distribution of gas, £4929; and management, &c., £5183—other items making up a total of £67,970, and leaving a gross profit of £41,369 to go to the net revenue account, compared with £38,809 this time last year. After meeting interest and sinking fund charges and paying income-tax, there was left a balance of £14,222, compared with £11,533 before. Adding the amount brought forward, £13,273, a total of £27,495 was produced. Out of this was paid to the borough fund account in aid of the rates for the year 1909-10, £7268; to the district fund account, £3634; and placed to the reserve fund, £3616; making a total of £14,518, and leaving a balance of £12,977. The amount added to the reserve fund brings it (with £788 interest on investments) up to £26,770.

The accounts relating to the working during the past year show that 72,328 tons of coal and 4860 gallons of oil were employed in the manufacture of 839,384,000 cubic feet of gas, of which 775,540,500 cubic feet were sold and 10,566,000 cubic feet used on the works. The leakage amounted to 53,275,500 cubic feet, or 6.33 per cent. The residuals were 32,611 tons of coke made for sale, 4434 tons of tar, and 862 tons of sulphate of ammonia. The cost of gas at the works was 13.95d. per 1000 cubic feet sold; and the expenses of distribution &c. (less meter-rents), came to 5.44d.—making a total of 19.39d. The total receipts for gas worked out to 24.52d. per 1000 cubic feet; showing a difference of 5.13d. The balance of profit was 4.4d.; and the accident insurance fund and the Charlestown brick-works site account for the rest.

PUBLIC LIGHTING OF NEWMARKET.

Gas Company's Tender Accepted.

The Newmarket Urban District Council held an adjourned meeting last Friday to consider the question of the public lighting of the town.

The Clerk (Mr. S. J. Ennion) read a letter from Mr. Frank A. Simpson, the Engineer of the Newmarket Electric Light Company, expressing regret that the time allowed for sending in tenders for the street lighting was so short that it was quite impossible for him to furnish the necessary particulars to his Board to enable them to tender. He said if the terms could be extended, they would be glad to go fully into the matter and submit a tender. He pointed out, however, that to enable his Company to submit a low tender, they would require the period of the contract to be for ten to fifteen years, as otherwise it would not pay them to expend the large amount of capital that would be required. He added that the Gas Company, having their pipes, posts, lanterns, and plant, were now in a much better position to quote for a longer period than his Company. The Clerk also read a tender submitted by Mr. J. H. Troughton, the Engineer, Manager, and Secretary of the Newmarket Gas Company, which contained the following offer: The amount of the expiring contract is £928 for 261 lamps, and after it was settled to extra lamps were taken over. Mr. Troughton offered to light these 271 lamps all the year round—viz., 2288 hours, and the existing winter corner lamps on the present basis of 1923 hours extra—for three years for the sum of £1100, or for five years for the sum of £1075. The present lamps consist of 227 No. 3 Kern burners of 80 to 90 candle power; 10 No. 4 Kern burners of 105 to 120 candle power; 7 No. 4 double burners of 210 to 240 candle power; and 27 self-intensified burners of 300 to 330 candle power. This makes 271 lamps in all, giving nearly 32,000-candle power, of which 9000-candle power is equally distributed in High Street, and the remaining 23,000-candle power over the rest of the district. Any increase in lighting hours to be paid for in proportion, and any additional lamps to be charged in accordance with a scale submitted. All other terms to be as contained in the existing agreement, except that the Company are to be allowed, during the continuance of the contract, to effect improvements in the system of lighting the streets by the adoption of better burners, lanterns, or other apparatus, at their own expense, provided that the lighting efficiency is not reduced. Mr. Troughton added that his Directors ventured to hope that the Council would see their way to again place a contract with the Company, who had spared no expense or trouble in keeping the lamps up to a high state of efficiency during the past five years. They believed they had given satisfaction to the Council and to the ratepayers; and they were proposing to make a considerable sacrifice in order to meet the public desire to have the lamps lighted every night in the year.

In the discussion which followed, the Chairman (Mr. H. Hambling) said the difference between the present hours of lighting (excluding June, July, and 16 days of August) was £99 on the five years' contract; and this was the one which he thought the Council should adopt. He accordingly moved that they accept the Gas Company's tender on this basis. Speaking personally, he would be very sorry to see the

roads ripped up for laying down the electric light plant. Mr. O. E. Griffiths moved, as an amendment, that the tender for three years be accepted. He pointed out that it was only £25 more than the one proposed by the Chairman. Mr. Bonham seconded the amendment; and it was carried. Mr. Griffiths then moved that the next tender for public lighting should be asked for twelve months before it would come into force, so that the Electric Light Company could have an opportunity of tendering; and the motion was carried.

MANCHESTER GAS AND ELECTRICITY DEPARTMENTS.

The Relations of the Departments.

We learn from the "Manchester Guardian" that the affairs of the Gas and Electricity Departments of the Manchester Corporation are at present under the consideration of a Joint Committee. At the last meeting of the City Council, Alderman Gibson (the Chairman of the Gas Committee) stated that the chief officials of the two departments were about to meet, or had met, to consider the relationship between the two bodies, and the basis on which each department should make its contribution in relief of the rates. The Engineer, Superintendent, and Accountant of each department have had several conferences, and have prepared their report. Mr. Gibson said that he wished the two departments to work together as brothers, not as antagonists. It was with the idea of bringing this laudable state of affairs about, and making it permanent, that the officials set to work. It is understood the officials are unanimous in recommending that the outstanding debt of each department shall be the basis on which the amount to be allocated for the purpose of aiding the rates shall be computed. According to this mode of reckoning, the Electricity Department should contribute more than the Gas Department, because its debt is higher; the latter being £1,212,685, while the former is £1,970,112.

THE (NEW) TODDINGTON GAS COMPANY.

A Curious Report.

The "Financial News" on Saturday contained the following article dealing with the last annual report of this Company.

The annual report and statement of accounts of the (New) Toddington and District Gaslight and Coke Company, Limited, is in several respects a rather extraordinary document. The Auditors' report on the accounts is dated May 9, 1910, which shows that the accounts had been completed and audited at that date; but the annual meeting, at which the report and accounts will be presented, will not be held until the 30th inst. There seems to have been quite enough delay in bringing the accounts before the Auditors; but why another two months (nearly three months) should be allowed to lapse before shareholders have an opportunity of discussing them, certainly needs explanation. Then, strangely enough, the printed notice convening the meeting states that the business will be: "(1) To receive the Directors' report and accounts of the Company for the year ending December 31, 1910." Perhaps the person responsible for the drawing-up of the notice (or the printer) was so conscious of the delay that has taken place that he tried to mend matters by anticipating the future. In any case, the error in the date stifles criticism; nothing more pungent or satirical can be imagined.

Another curiosity in this report is the statement that the bankers of the Company are "The London and County Banking Company, Limited, Tunbridge Wells." As the London and County Banking Company, Limited, was amalgamated with the London and Westminster Bank in August last, it may be truthfully stated that there was no London and County Banking Company in this country at the time when the report was drawn up. Two such curious errors as these are not often found in one report. Indeed, more than usual care is expected in the composition of a document of this description; but such care appears to have been lacking in this case. The report itself is quite unsatisfactory. It says:

The Directors still hope to extend the mains to a profitable portion of the district, and are now only awaiting a favourable opportunity to raise the necessary capital. Meanwhile, the present mains have been overhauled and repaired, and the loss of revenue by leakage greatly diminished, which will, no doubt, be shown in subsequent accounts. Great expenses have been incurred this year. All the beds of retorts were worn out and have been replaced by entirely new beds.

According to the accounts, the sales of gas and residuals during the year realized £561, and the expenses were £758—showing a loss of £197 on the year, to which has to be added a loss of £17 made in 1908, which does not look very promising for the raising of further capital.

It may, perhaps, be recalled that the (New) Toddington Gas Company was one of the Eaton group of gas companies which have been so frequently criticized in the columns of the "Financial News;" and on March 10, 1909, there appeared an article warning readers against purchases of the shares and debentures of this particular Company, which were being offered by the Water and Gas Debenture and Share Investment Trust, in a circular signed Sir C. B. Herne Soame, Bart. The warning seems to have been justified.

The report of the James Keith and Blackman Company, Limited, for the financial year to the 31st of March shows that the amount of business done exceeded that of any previous year. After providing for debenture interest and making sufficient allowance for depreciation and reserves against doubtful debts, the audited accounts show a net profit of £5291, which, with the balance brought forward, £2301, makes a total of £7593 standing at the credit of the profit and loss account. The Directors recommend that dividends should be declared at the rate of 5½ per cent. per annum on the preference shares and at the rate of 5 per cent. per annum (free of income-tax) on the ordinary shares; leaving £2389 to be carried forward.

LONDON COUNTY COUNCIL AND GAS TESTING.

Alteration of Conditions of Service of Examiners.

At the Meeting of the London County Council to-day, the Public Control Committee will submit a report giving the result of their consideration of the question of the desirability of altering the conditions of service of the Gas Examiners employed in the Chemical and Gas Testing Department.

According to the report, there are permanently employed in the department nineteen gas examiners, each of whom has charge of one testing-place. There are also a number of relieving gas examiners, appointed by the Council, who are employed, when necessary, at a daily fee. The salary attached to the position of gas examiner is £135 a year, rising by £5 annually to £165 a year; and the examiners do not contribute to the superannuation and provident fund. At present the conditions of appointment do not necessitate the permanent examiners devoting their whole time to the duties of the office, and all or most of them are engaged on other work. The Committee are of opinion that a more efficient control over the work of gas testing would be secured by substituting for the part-time examiners, as they retire, a class of officers whose whole services would be devoted to this work; and they suggest that each examiner should have charge of two testing-places instead of one as at present; that the salary of the new grade should be at the rate of £200 a year, rising by £10 annually to £250 a year; and that the examiners should be subject to the Council's regulations as to the superannuation and provident fund, sick pay, and other conditions of service applicable to such appointments.

It is proposed that examiners at present in charge of testing-places shall hold their appointments undisturbed; but that when a vacancy occurs in their number the other examiners shall be invited to apply for the position, while retaining their present one, at an addition to their present salary equal to the difference (£85) between the maximum of the present, and the maximum of the proposed, scale of salary. In the event of none of the present permanent examiners applying, it is suggested that the relieving gas examiners should be invited to apply for the vacant place, at the salary of £135, rising by £5 to £165, on the understanding that the officer appointed would be required to take the next testing-place falling vacant, at an addition in salary equal to the difference (£65) between the minimum of the present and the minimum of the proposed scale.

With regard to the financial aspect of the question, the Committee consider the gross ultimate saving on the salaries of the permanent staff will amount to £685 per annum; but, taking into account the cost of admitting the whole-time men to the benefits of the superannuation fund, the cost of travelling between stations, and the provision of relieving examiners during sickness or holidays, the actual saving is estimated at about £300 a year.

The Committee submitted recommendations in accordance with their proposals.

PUBLIC LIGHTING OF FINSBURY.

Another Victory for Gas.

At the Meeting of the Finsbury Borough Council last Thursday, the Works Committee presented a further report on the subject of the public lighting of the borough. As already mentioned in the "JOURNAL" (*ante*, p. 145), at the previous meeting the Committee reported that they had had under consideration a letter from the Gaslight and Coke Company with reference to experiments lately carried out by them in certain streets of the borough with inverted burner incandescent gas-lamps; and they recommended that the Company's proposals should be accepted. The consideration of the matter was then deferred. The Committee now stated that they had reconsidered their report in conjunction with one by the Borough Surveyor as to his further conference with the Company on the subject, and the correspondence which had taken place relative to the general question, and had resolved to report to the Council to the effect stated below.

The Committee have further satisfied themselves that the cost of public lighting during the year ended March 31—viz., £7438 11s.—is the minimum expenditure with which any comparison of the advantages of a new lighting scheme can properly be made, having regard to the considerably larger number of burners then and now in use than during earlier years. That such a comparison shows that, notwithstanding the scheme offered by the Gaslight and Coke Company provides for the improved lighting of the borough to the extent of an increased candle power of 100,000, or an improvement of more than 71 per cent. on the present aggregate candle power of 140,000, and will avoid the necessity otherwise for the Council shortly to incur heavy capital expenditure in the renewal of lanterns even with the present system of lighting, its adoption by the Council will effect a further saving to the Council of £525 per annum.

In the event of the scheme being adopted, the Company are prepared to enter into a formal agreement with the Council providing as follows: The agreement to take effect as from Oct. 1, 1910, for a period of ten years, determinable then or thereafter subject to six months' notice on either side, or by the Council at Sept. 30, 1915, subject to a like notice by the Council, and to payment to the Company of the sum of £3500, or at Sept. 30, 1917, subject to a like notice and to payment by the Council of the sum of £2100. The Company, within four months from the date of the agreement (under a penalty of £1 per day) to provide new copper lanterns, burners, and fittings to all the public lamps in the borough, such lanterns, &c., to become the property of the Council on the termination of the agreement; the present lanterns, burners, and fittings to become the property of the Company as replaced. The number of lanterns to be approximately 1000 with single 80-candle inverted burners, 624 with two do., 200 with three do., and 38 with four do.—making a total of 1862.

The Company will supply gas at the rate of not less than 3½ cubic feet per burner per hour for the usual lighting hours—viz., 4300 per annum—and light, extinguish, cleanse, and paint yearly with two coats

of approved colour, and repair and maintain, the columns, lamps, and services at the following annual charges, to be payable in four equal quarterly instalments: Per one-burner lamp, £2 15s.; per two-burner lamp, £4 6s.; per three-burner lamp, £6; per four-burner lamp, £7 7s. 6d. The Company will supply gas and light and extinguish in times of fog or other special occasions at the following charges: Per one-burner lamp, ½d. per hour or part thereof; per two-burner lamp, ¾d.; per three-burner lamp, ¾d.; per four-burner lamp, 1d.

The Company will at all times, when replacing burners that have become worn out, replace with the most efficient burners adaptable and then obtainable. The gas supplied will be of not less than the statutory illuminating power; and in the event of reduction of the latter below 14 candles, the Company will make such alterations to the burners and [or] supply such extra quantity of gas as shall ensure a light equal to that provided for. The Company will indemnify the Council against all liability under the Workmen's Compensation Acts, and otherwise in connection with the work under the contract. On default of the Company to perform their obligations, the Council will be empowered to employ other persons at the Company's expense—all disputes to be referred to the arbitration of the President for the time being of the Institution of Civil Engineers.

The Committee further reported that the question of safeguarding the interests of the Council's workmen, who, in the event of the contract being arranged, would become the servants of the Company, had been further raised; and their views thereon were expressed in a number of extracts from a communication from the Company. The Company asked the Council to accept their promise, as an honourable corporation, to give employment to the men at present in the service of the Council, so long as these men continued to serve the Company faithfully and efficiently. It was pointed out that the Company subscribe liberally to the workmen's provident societies, which provide ample benefits for the men when they fall sick, with allowances at death and to the widows and orphans on a generous scale; and all aged workmen who have been in service for 25 years are pensioned.

The report concluded as follows: "The Committee are still of opinion that the proposals and terms offered by the Company are such as should be accepted by the Council. They accordingly again recommend the Council to accept the offer of the Company to undertake the improved lighting of the borough in the manner and in accordance with the terms indicated, for a period of ten years, commencing on the 1st of October next, subject to the option exercisable by the Council of terminating the contract at the conclusion of five years on payment of the sum of £3500, or at the expiration of seven years on payment of the sum of £2100; that it be referred to the Council's Solicitors to approve the necessary contract; and that steps be taken to terminate the engagement of the foremen, lamplighters, and gas-fitters on the 30th of September next. The Committee have resolved to again report to the Council that they are unable to advise the adoption of the proposals submitted by the County of London Electric Supply Company, Limited, for the experimental lighting by electricity of certain portions of the borough, and to recommend that the Company be so informed."

The only new point raised since the previous meeting was a letter from the Chief Inspector of the Gas Company (Mr. F. W. Goodenough), stating that the Company's benevolent and provident fund had a balance of £126,000; so that the interest of the men who would be taken over would be looked after in this respect. It was suggested that the Company should be asked to admit these workmen at once to the benefits of the provident fund, instead of waiting a year. The Chairman of the Works Committee said he would vouch for this.

There was no discussion; and the report was carried *nem. con.*

PUBLIC LIGHTING OF TOTTENHAM.

The Gas Company Secure a Contract.

At the Meeting of the Tottenham Urban District Council last Tuesday, the General Purposes Committee submitted a report upon correspondence which had taken place with the North Metropolitan Electric Power Supply Company and the Tottenham and Edmonton Gas Company on the subject of the public lighting. The first-named Company wrote stating that they were not prepared to tender for the lighting of the whole of the Council's district unless they were allowed to submit an offer for a minimum period of five years, or for lighting that part of the district in which their mains are at present laid for a minimum period of three years. The Gas Company had quoted reduced terms on the existing contract, subject to the Council entering into an agreement for a period of ten years. The Council's Engineer interviewed the Engineer and Manager of the Gas Company (Mr. A. E. Broadberry), and requested him to forward his Company's terms for the public lighting for one, three, and five years in addition to the period of ten years. In reply, the Company stated that they were unable to reduce the existing charges if the contract was renewed for one year only; but for a period of three years they would allow a reduction of 25 per cent. on the total reduction quoted for ten years, or for a period of five years an allowance of 50 per cent. on the quoted reduction. The net annual saving on these terms would be as follows: For three years, £63 4s. 4d.; for five years, £126 8s. 9d.; for ten years, £252 7s. 6d.

The Committee recommended the Council to accept the Gas Company's terms for a period of three years. An amendment was moved to refer the matter back; the proposer expressing the opinion that the Electric Light Company should be given a chance to light a portion of the district. This was, however, defeated. Another amendment was submitted that the agreement should be for twelve months only; it being suggested that a yearly agreement with the threat of competition might induce the Company to improve the lighting. This amendment was also defeated; and the Committee's recommendation was adopted.

At the meeting of the Woolwich Borough Council last Wednesday, they accepted the quotation of the Gaslight and Coke Company at £16 14s. 10d. for supplying and fixing gas-fittings in the new library; also their quotation of £2 18s. per annum for keeping the gas installation in order.

WATER SUPPLIES PROTECTION BILL.

The Committee's Report.

The Joint Committee of the two Houses of Parliament, to whom this Bill was referred, have agreed upon their report; and we publish it to-day—notwithstanding the fact that, in consequence of unusual pressure on our space of late, it has not so far been possible to complete the summary that is being given in the "JOURNAL" of the evidence adduced for and against the Bill.

REPORT OF THE COMMITTEE.

1.—The Bill proposes to restrict the powers of authorized water undertakers in the following ways: (1) By preventing the acquisition of fresh supplies without specific parliamentary authority; (2) by rendering the undertakers liable to give compensation for injury to private supplies caused by their works; and (3) where water is taken from one district to supply another, by conferring on the local authorities of the districts from and through which the water is taken the right to demand a supply from the works of the undertakers on terms to be agreed or fixed by the Local Government Board.

2.—On point 1, the Committee are in favour of the principle that Parliament, before sanctioning a scheme for the abstraction of underground water, should be in possession of full information as to the objects of the scheme and the means for carrying it into effect. But they consider that, in the present imperfect state of information on the subject of underground water, parliamentary control over such schemes can be better secured by the insertion of any necessary safeguard in each Bill which comes before Parliament than by making clause 3 of the present Bill part of the general law. The peculiarities of water schemes are manifold; and the adaptation of means to ends in respect of them is more likely to be secured by a rule of procedure susceptible of alteration on cause shown, than by a general law which might be at once too wide and too rigid in its application. The Committee are aware that clause 3 of the Bill is based on clause 8 of the Model Bills and Clauses (as amended in 1909); but, apart from objections taken to its alleged retrospective character, clause 3 of the Bill has been questioned—reasonably, the Committee think—as being too inquisitorial and too inflexible. For example, as the clause stands, it requires that a specification of the works for taking or intercepting water should be made. But evidence was adduced before the Committee to show that such a specification might often be impracticable and often undesirable; while it might sometimes be better to impose a limit on the quantity of water to be taken rather than to require a description of works or engineering plant, which might impede the adoption of new improvements in machinery or hamper freedom of action in emergencies. Therefore the Committee think it better, at all events for the present, that each case should be dealt with on its merits, and that discretion and full liberty of action should be preserved to Parliament in connection with each Bill presented to it.

3.—As regards the question of compensation (point 2 of paragraph 1), it is clear that to give a right to compensation for loss of subsoil water, even within the limitations proposed by the Bill, involves an important alteration of the general law, which, as it stands, recognizes no property in underground water unless it is flowing in a known and definite channel. But as the law was settled before the conditions in which its equity is now challenged had come into being, it is urged on the Committee as reasonable and proper that the law should be reconsidered in view of the altered circumstances of the present time.

4.—On the evidence given before them, the Committee are satisfied that serious damage has been done to private property in particular localities by the pumping operations of water authorities; and they think it not improbable that similar injury is also caused by collieries, breweries, railway companies, and similar agencies, who, like water authorities, extract water from the subsoil, but, unlike them, are under no statutory obligations as regards the use to which such water is put. It has been forcibly urged on the Committee that if it be fair and equitable to levy compensation, as the Bill proposes, from water undertakers for injury done by the abstraction of water from the subsoil of private property, then the application of the same rule or treatment to all other agencies or industries causing similar injury cannot be resisted. In other words, it is claimed that any such change in the law as the Bill proposes should, if approved by Parliament, be made of general and reciprocal application.

5.—An inquiry into the abstraction of underground water by the industrial and commercial enterprises referred to, lay outside the scope of the Bill; and the Committee were therefore unable to inquire into that aspect of the question with the necessary particularity, or to give the great interests concerned the opportunity of being heard. Moreover, the effect on the general health of the local community of the desiccation of the soil in the areas concerned, could not be fully investigated in connection with the Bill. In these circumstances, the Committee can go no further than to say that, while they consider as worthy of notice the considerable body of evidence on their minutes in favour of the principle of compensation for damage done by the extraction of subsoil water, and while they also desire to draw attention to the evidence as to the difficulties to which it is alleged the general application of the principle of compensation would lead, they are unable to form a definite conclusion or make any recommendation on the subject, which is indeed of vast and far-reaching importance, without further careful and detailed inquiry. It is not only for this reason but for other reasons, to be presently mentioned, that they wish to repeat the recommendation of the Royal Commission on Sewage Disposal contained in their third report, published in 1903, that a comprehensive inquiry into the whole subject of surface and underground water supplies should be held before any legislative action is taken of the kind proposed in this Bill.

6.—The Bill proposes that, where claims for compensation are made, the ordinary law as to the burden of proof should be altered, and, within the area specified in the Bill, the burden be transferred from the claimant to the undertakers. In support of this proposition, certain Acts of Parliament were cited before the Committee by which Parlia-

ment has changed the burden of proof in the direction indicated. But in every one of these Acts except one—the South Staffordshire Act of 1909—the protection given is limited either to specified persons or wells or to water supplies in particular estates or districts; while in the case of the South Staffordshire Act, both the circumstances under which the Act was passed and the language employed in it touching the burden of proof make the Committee averse to regarding it as laying down a precedent to be generally followed for imposing on a defendant the burden of proving the negative. The Committee consider that while the shifting of the burden of proof may be justified in reference to a designated person or specified source of water supply or narrowly limited area of land, it cannot, as a general proposition, be supported even within the limits laid down in the Bill; and as in the Bill this particular provision assumes the shape of a general principle, the Committee desire to express their disapproval of it as such. The Committee are also of opinion, in view of the dearth of information before them regarding geological formations in connection with underground water supplies, that no general definition or limitation of a "protected area" can be made with any pretence to accuracy. In respect to this point, each case should, they think, be decided on its merits.

7.—The Committee have heard a considerable body of evidence on the subject of distribution of water in transit (point 3 of paragraph 1), and have considered the recommendations made in that connection by the Royal Commission on Water Supply (1869). While the Committee are of opinion that a claim for water supply made by the local authorities of the area which would naturally have recourse to the source of supply proposed to be appropriated may, as a general rule, be reasonably complied with, they abstain from making any such recommendation in favour of other districts through which the mains may pass. Instead of supporting any such rule for the compulsory distribution of water (distribution by private agreement remaining unfettered), the Committee suggest that the question whether or not water should be compulsorily distributed *in transitu*, and if distributed then on what conditions and terms, should be determined when the authority to take water is first conferred. Indeed, they are of opinion that any local authority asking for such a distribution should be obliged to enter into a definite obligation to take or pay for the supply so demanded. This procedure will have the additional advantage of enabling the authorized undertakers, from the outset, to lay their plans and frame their estimates on a clear conception of the obligations they incur. The Committee are strengthened in this view by the desirability of conserving in all reasonable ways the water supply of the country. They think that local authorities should be encouraged, if not required, to turn all local sources of water supply to the best account; and they are apprehensive that this may not be always done if the districts other than the area above referred to are enabled to claim as of right a distribution of water *in transitu* from the mains of great undertakings.

8.—The Committee, while not desiring to diminish the existing powers of local authorities under the Public Health Acts, are of opinion that such authorities should be relieved from the necessity of promoting a Bill in Parliament in connection with water supply in all cases where the procedure by Provisional Order is applicable. In these cases powers are not granted without a public local inquiry, at which all parties interested are entitled to be heard. Opportunity for securing adequate protection would be thereby afforded to the various interests concerned, without imposing on the local authority and the ratepayers the expense of coming to Parliament by Bill, which would in many cases be prohibitive, and might involve serious delay. It should be added that rural councils have at present no authority to pay out of the rates the costs of promoting a Bill in Parliament without an undesirable alteration in the existing law being first made.

9.—In this connection, the Committee desire to draw attention to the inadequate powers at present possessed by local authorities for the compulsory acquisition of water rights. Under the existing law, they possess the powers of compulsorily acquiring rights in land, of course, on fair terms; but unless they can obtain rights in water by agreement, which involves the condition, insuperable in some cases, of obtaining the consent of every riparian owner, they are compelled to incur the expense of promoting a Bill in Parliament (which, as already stated, rural councils cannot do under the existing law) or to abandon their project. The procedure by Provisional Order enables all parties to have their claims adjudicated upon before the Order is made, and reviewed in Parliament before the Order becomes an Act and operative. In these circumstances, the Committee, having special regard to the obligations placed on local authorities to provide an adequate supply of potable water, suggest that, subject to due provision for compensation water being made, these authorities should not be in a worse position respecting the acquisition of water rights than they are respecting the acquisition of rights in land. The Select Committee on the Public Health Act (1875) Amendment Bill, 1878, recommended that "with the view of affording to local authorities facilities for acquiring the right to take water from any stream, the Local Government Board should be empowered to issue Provisional Orders which, on confirmation by Parliament, would confer powers on the local authorities for the purpose." The Irish Public Health Act, 1878, already confers this power upon Irish local authorities; and, in view of all the facts, the Committee fully concur in, and desire to repeat, this recommendation of the Select Committee of 1878.

10.—Having thus expressed their opinion on the more important clauses of the Bill, the Committee desire, in conclusion, to draw attention to the larger question which has been raised by the evidence placed before them. Several witnesses have expressed their apprehension that the water supply of the country is not being utilized to the best advantage, owing to the want of information on the subject of the general water supply, particularly the subsoil supply, and the haphazard and arbitrary fashion in which local sources of supply are sometimes wasted, sometimes withheld from use, and sometimes appropriated for the benefit of other, and often distant, places without regard to the needs of the locality from which the water is taken or of the country as a whole. The Committee were struck by the absence of trustworthy, and indeed often of any, information as to the subsoil water supply available in any particular district, and as to the effect of rainfall on the water levels in various parts of the country. They even saw some reason to doubt whether the powers for protecting rivers from

pollution possessed by local bodies are effectively exercised by them. They consider that a remedy for this state of things is urgently called for, and they think it may be found by creating an organization empowered to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint, to supervise the future allocation of supplies, and to serve as an authoritative adviser to Parliament in the consideration of particular schemes.

11.—This suggestion is really no new one. In the report of 1869, to which reference has been made in paragraph 7, the Royal Commission recommended "that no town or district should be allowed to appropriate a source of supply which naturally and geographically belongs to a town or district nearer to such source, unless under special circumstances which justify the appropriation." In 1893, the Royal Commission on the Metropolitan Water Supply drew attention to the importance of procuring accurate information as to the effect of pumping from the chalk on the level of the water in the wells from which it is pumped, and urged that definite obligations should be laid on water authorities to keep and supply such records. The Royal Commission on Water Supply within the limits of the Metropolitan Water Companies (1899) concurred in this recommendation, and added: "We do not think it necessary to specify in detail the observations which should be kept, because we suggest later on in this report that the Local Government Board should have a general power of requiring the companies to supply information as to their works."

12.—A more specific recommendation as to the creation of a Water Authority is contained in paragraph 31 of the interim report of the Royal Commission on Sewage Disposal (published in 1901), which runs as follows: "We are of opinion that the general protection of our rivers is a matter of such grave concern as to demand the creation of a separate Commission, or a new department of the Local Government Board, which shall be a Supreme Rivers Authority dealing with matters relating to rivers and their purification." The question was further developed in the third report (already referred to) of the same Royal Commission, which was published in 1903. In paragraph 44, it was stated: "In our opinion, a properly equipped Central Authority is essential; and we unhesitatingly recommend the creation of such an Authority." And, again, in paragraph 48: "The work of the Central Authority will be so intimately connected with the work of the Local Government Board, that it will be desirable to make it a new department under the Local Government Board rather than have an entirely separate department."

The same report goes on to recommend the creation of Rivers Boards throughout the country, to be formed out of Joint Committees of County Councils, each having jurisdiction over the whole of a watershed and river basin. The Central Authority would ascertain what grouping of counties was most effective, and then take steps to constitute Rivers Boards for these areas. With the aid of the Rivers Boards, the Central Authority would collect the information available throughout the country in regard to waste of water by pumping from mines, the use of water in industrial works, and the abstraction of water from one district for the supply of another. The report stated in conclusion: "We entirely agree that the collection of such information should precede the consideration of the question whether legislative interference in regard to these matters is desirable."

Finally, the fifth report of the same Royal Commission summarizes

their recommendations on this subject as follows (paragraph 356): "That ultimate control should be vested in an adequately-equipped Central Administrative Authority, and that, as far as practicable, the local Rivers Board should, in accordance with regulations framed by the Central Department, act as a first tribunal. Among the more important questions which have to be dealt with under the new conditions of administration which we are contemplating are the following: "(iii.) The protection of water supplies from pollution. (iv.) The collection of information as to the water supplies available in various parts of the country. (v.) The collection of information as to the need of water in various parts of the country."

13.—The Committee cannot find that any effective action—they may, indeed, say any action at all—has been taken on these repeated recommendations. Thus all, it will be perceived, assert the same principle—viz., that there is urgent need for a survey, at once comprehensive and in detail, of the water supplies and water needs of the country, and for the adoption of measures for conserving the supply and disposing of it to the best advantage. A number of witnesses, confirming the recommendations of these Royal Commissions, have pointed out to the Committee the desirability of establishing some authority to take cognizance of all questions, both atmospheric and geological, which affect water supplies, and to serve as an authoritative referee when in any future inquiries before Parliamentary Committees the allocation of sources of supply comes in question. With this view the Committee entirely agree; and they strongly recommend, firstly, the establishment (within the Local Government Board or independently, as may seem best to the Government) of such a Central Administrative Authority as is contemplated in paragraph 356 of the fifth report of the Royal Commission on Sewage Disposal (already quoted); and, secondly, the division of the country into watershed areas, and the appointment for those areas of local Representative Boards, who, subject to the guidance and control of the Central Authority, should prosecute systematic and continuous inquiries into the water supply of their jurisdiction, take all necessary measures to husband such supplies, both surface and subsoil, secure their preservation from pollution, and advise on their allocation for sanitary, industrial, and other purposes.

Water Charges for Motor-Cars.—In the Bill promoted by the Bradford Corporation this session, they sought power to make an extra charge for water supplied to a coach or motor-car house occupied and rated with a private dwelling. They had attempted to collect a charge of 1s. per horse power over and above the ordinary water-rate in respect of each private car kept by a consumer; but finding themselves unable to enforce the charge, they sought to obtain parliamentary powers to enable them to do so. The effect of the clause, had it become law, would have been to nullify certain decisions of the High Court of Justice which the Automobile Club were instrumental in obtaining. The clause would also have been a precedent upon which other water authorities would have asked for similar powers. On the initiative of the Bradford Automobile Club, a petition against the clause was presented by the Royal Automobile Club, who briefed Counsel to support it; but the Corporation agreed to make certain alterations in the clause which satisfied the opponents.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 251.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr 1	5	Alliance & Dublin Ord.	81-83	..	6 0 6	4,940,000	Stk.	May 12	8	Imperial Continental	179-181	+1	4 8 5
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
200,000	5	May 12	7	Bombay, Ltd.	6½-6½	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	222-224	..	4 16 9
40,000	5		7	Do. New, £4 paid.	48-58	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	210-221	..	4 10 6
50,000	10	Feb. 25	15	Bourne- 10 p.c.	29-30	..	5 0 0	718,100	"	"	7	Do. B	164½-165½	+½	4 4 7
311,810	10		17	mouth Gas B 7 p.c.	162-163	..	4 3 7	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10		6	and Water Pref. 6 p.c.	15-15½	..	3 17 5	75,000	5	June 29	6	Malta & Mediterranean.	4½-4½	..	6 4 8
380,000	Stk.	"	12½	Brentford Consolidated	252-255	+1	4 18 1	560,000	100	Apr. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
300,000	"	"	9½	Do. New	188-190	..	5 0 0	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	May 27	34	Monte Video, Ltd.	123-123	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	Feb. 25	4½	Newcastle & G'tesh'd Con.	103½-104½	..	4 3 9
220,000	Stk.	Mar. 16	1	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	83-91	..	3 16 11
246,320	"	"	8	Do. A Ord. Stk.	153-156	..	5 2 7	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	153-153½	..	5 1 10
467,000	"	Apr. 1	10½	British	44-45	..	4 14 8	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	119-121	+1	4 19 2	60,000	5	Apr. 1	8	Ottoman, Ltd.	64-64½	..	6 3 1
165,700	"	"	4½	Do. B 3½ p.c.	89-91	+1	4 18 11	31,800	53	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
82,278	"	"	5½	Do. C 5 p.c.	106-108	+1	5 1 10	60,000	50	"	13	Do. B.	126-128	..	5 1 7
55,000	"	June 29	3½	Do. C 3½ p.c. Deb.	85-87	..	4 0 6	100,000	50	"	12	Do. C.	119-121	..	4 19 2
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	97-99	+1	4 0 10	114,800	50	"	10	Do. D and E.	100-102	..	4 18 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	0 0 0	398,490	5	Apr. 29	7	Primitiva Ord.	74-74	..	4 13 4
100,000	10	"	—	Do. 4½ p.c. Pref.	58-62	..	6 0 0	796,980	5	June 29	5	Do. 5 p.c. Pref.	54-54	..	4 10 11
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	250,000	10	Apr. 1	9	San Paulo, Ltd.	154-154½	..	5 10 9
1,513,280	Stk.	Feb. 25	5½	Commercial 4 p.c. Stk.	108-110	..	4 14 7	62,500	10	"	6	Do. 6 p.c. Pref.	111-112	..	4 18 0
560,000	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	125,000	50	July 1	5	Do. 5 p.c. Deb.	49-50	..	5 0 0
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	135,000	Stk.	Mch. 16	10	Sheffield A	234-236	..	4 4 9
800,000	Stk.	June 10	5	Continental Union, Ltd.	91-94	..	5 6 5	299,984	"	"	10	Do. B	234-236	..	4 4 9
200,000	"	"	5	Do. 7 p.c. Pref.	135-137	..	5 2 2	523,500	"	"	10	Do. C	235-235	..	4 5 1
493,270	Stk.	"	7½	Derby Con. Stk.	121-123	..	4 9 5	70,000	10	May 27	7	Do. D	11-11½	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/4	South African	121-123	..	4 8 10
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	1,895,445	"	July 14	8	South Met., 4 p.c. Ord.	121-121	..	3 14 1
486,090	"	July 14	12	European, Ltd.	233-243	..	4 18 9	209,820	Stk.	Mar. 16	8	Do. 3 p.c. Deb.	157-158	..	5 1 3
354,060	10	"	12	Do. £7 ros. paid.	173-182	..	4 18 8	60,000	Stk.	Feb. 25	5½	South Shields Con. Stk.	121-123	..	4 12 0
16,198,672	Stk.	Feb. 10	4½	Gas 4 p.c. Ord.	105½-106½	+½	4 7 7	177,058	"	July 14	5	Do. 5 p.c. Pref.	121-123	..	4 1 4
2,600,000	"	"	3½	light 3½ p.c. max.	89-91	+1	3 16 11	502,310	Stk.	May 12	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,002,235	"	"	3	and 4 p.c. Con. Pref.	104-106	..	3 15 6	120,000	Stk.	Feb. 10	6½	Tottenham Ord. 5 p.c.	133-135	..	4 9 3
4,531,706	"	June 29	4	Coke 3 p.c. Con. Deb.	83-82	..	3 13 2	453,940	"	June 29	4	Tottenham A 5 p.c.	113-115	..	5 1 9
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	..	5 5 3	149,470	"	June 29	4	Do. B 3½ p.c.	97-99	..	4 13 6
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	182,380	"	June 10	8	Tuscan, Ltd.	9-9½	..	8 0 6
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	17-17½	..	6 5 9	149,900	Stk.	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
131,000	Stk.	Mar. 16	7	Ilford A and C	145-147	..	4 15 3	230,476	"	Feb. 25	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,780	"	"	5½	Do. B	109-111	..	4 19 1	255,636	Stk.	Feb. 25	6½	Wands- 1 B 3½ p.c.	139-141	..	4 14 0
65,500	"	June 29	4	Do. 4 p.c. Deb.	95-100	..	4 0 0	79,416	"	June 29	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

BACUP CORPORATION WATER SUPPLY.**Opening of New Works.**

Last Thursday, the new water-works of the Corporation of Bacup were opened in the presence of a large gathering of neighbouring authorities, who were afterwards entertained at luncheon by the Mayor (Alderman J. H. Maden), who laid the first stone on March 13, 1901, and who has been Mayor ever since. Waters are collected from a moorland drainage area of 593 acres situate in the Cowpe Valley, near Bacup; and 15 miles of pipes have been laid. During the progress of the works, a fault occurred in the strata, which necessitated the sinking of trenches to a depth of nearly 200 feet. The total length of the embankment is 422 yards, and the maximum width at the base 570 feet. The reservoir has a water area of nearly 17 acres, and a capacity of 135 million gallons. The works are capable of maintaining a supply of 850,000 gallons of water per day during three consecutive dry years. There is also a high-level reservoir at an elevation of 1323 feet above the sea. It holds 2½ million gallons, and will supply the higher parts of the district. The total amount sanctioned by Parliament for the scheme, of which Messrs. James Diggle and Son, of Heywood and Westminster, were the Engineers, was £215,000.

At the opening ceremony, the party assembled near the valve-house, and Mr. Diggle, after describing the works, presented Mrs. Hardman (wife of Alderman Hardman, the Chairman of the Water Committee of the Corporation) with a gold key for the purpose of opening the door. Alderman Hardman then requested the Mayoress (Mrs. Maden) to perform the ceremony of opening the new works by turning on the valve. This having been done, the Engineer made a presentation to the Mayoress. Votes of thanks terminated the proceedings.

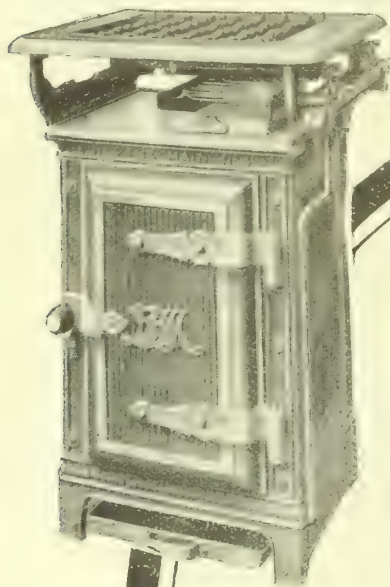
At the luncheon which followed, Alderman J. Shuttleworth said the coming generations would have cause to remember with gratitude the forethought, sagacity, and energy of the Corporation of Bacup, which had put the town in possession of fine water works. Mr. Diggle said the old water undertaking went on for something like half-a-century; and about the year 1887 he was called in by the Rossendale Water Company, and advised the construction of filter-beds at Sheephouse, as the quality of the water was very unsatisfactory, highly coloured, and not free from smell. At that time only 9800 people were being supplied out of a population of 24,000; the water, which was peaty, being collected from about 140 acres of land. It was unfit for drinking purposes, and at that time there was a lot of lead poisoning in the district. Filters were erected, and did some good; but they were not sufficient. They then entered upon the Cowpe Valley scheme, which had been consummated that day. The cost had been great; but the scheme would in the end prove a blessing to the district—the health of the community depending chiefly on a pure water supply. The scheme had occasioned considerable anxiety; but he was proud of it, as the Corporation had works that were water-tight from end to end. The Mayor of Rochdale (Mr. Wilson Dunning) said it was satisfactory

to them to know what pure water there was in the Cowpe reservoir. The scheme was a large undertaking; and Bacup was to be congratulated on its successful completion.

BARROW-IN-FURNESS WATER SUPPLY.**Completion of the Duddon Works.**

The new Duddon Water-Works for the Barrow-in-Furness Corporation were opened last Thursday by Lord Richard Cavendish. A compensation dam has been formed across Seathwaite Tarn at the head of the Duddon Valley, by which the water-level has been raised 20 feet, increasing the area of the tarn from 41 to 63 acres, and the capacity from 350 million to 625 million gallons. The scheme also included intake works from the River Duddon, settling-ponds some four miles above Duddon Bridge, and the laying of a 22-inch pipe-line to the Barrow high-service reservoir. The area of the watershed above the intake is about 12,000 acres, of which 1200 acres form the watershed draining into the Seathwaite Tarn. The foundation of the dam is solid rock for its entire length of 1212 feet; the dam being provided with an overflow 50 feet in length. The maximum thickness of the wall is 26 ft. 6 in., and the minimum 5 feet. The total capacity of the reservoir is 625 million gallons; and the water can be drawn off by means of an 18-inch discharge-pipe. The intake is constructed of cement concrete, with a limestone crest 104 feet in length. It is placed diagonally across the river, and contains a fish-pass in accordance with the requirements of the Board of Fisheries and Agriculture. The work of making the dam and intake was carried out by Messrs. Kennedy, Limited, of Glasgow, at a cost of £55,465; and the pipe-line was laid by Messrs. John Aird and Sons, at a cost of £68,375.

Vienna Water Supply.—After being under construction for about ten years, the new water-works of Vienna are nearly completed, and will be inaugurated at the end of this year. Supplies are derived from mountain springs, and brought to the city by an aqueduct, 113 miles long, built mainly of concrete, and measuring 6 ft. 10½ in. high by 6 ft. 3 in. wide. Numerous tunnels have been driven on the line of the conduit, one of them being 3½ miles long; while the total length of the tunnels aggregates nearly 53½ miles. As a general rule, valleys have been crossed by syphons with the collective length of 13 miles; but there are also about 100 bridges accounting for some five miles of the aqueduct. The new aqueduct will bring into Vienna an auxiliary supply of more than 50 million gallons of water daily, which will be a welcome addition to the yield from the existing works, the output of which ranges from 35 million gallons a day down to 26 millions, according to circumstances.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Perth Corporation Gas Department had a very prosperous time last year. It is reported that their ordinary expenditure, estimated at £26,184, amounted to £25,378; the cost of coal, for one thing, being £1800 less than in the preceding year. The receipts, estimated at £39,442, amounted to £40,011. The estimated balance was £13,258, and the actual balance £14,633. In the net revenue account, the balance on the year's working is stated at £101. At the beginning of the past year, the amount set aside for the sinking fund was £60,554, and during the year there was added £5426; bringing the fund up to £65,980. The amount of the sinking fund applied, inclusive of £21,228 which had been utilized previous to the past year, was £59,356; leaving a balance of £6624. The reserve fund shows a credit balance of £5533. The total liabilities of the department amount to £209,616, and the assets to £269,871—showing a surplus of £60,255. During the previous year, 21,616 tons of coal were carbonized, the average price of which was 10s. 0.5d. per ton—the lowest price on record. Last year, 22,866 tons of coal were carbonized, the average price of which was 11s. 15-18d. per ton. The quantity of gas manufactured last year was 226,553,000 cubic feet—an increase of 5,975,000 cubic feet. The receipts from the sale of gas were £31,763, as compared with £31,039 in the previous year.

An alleged fault in the station meter was the subject of discussion at the monthly meeting of the Greenock Town Council on Tuesday. In presenting the minutes of the Gas Committee, Bailie Chalmes said they showed an increase of 32 million cubic feet as compared with the previous year; but he explained that, as was shown elsewhere, the increase was more apparent than real, because the special test meter had been found to be 3.9 per cent. fast, which reduced the increase to 18 million cubic feet. Mr. Mitchell pointed out that the new station meter was obtained a few years ago, and said he considered it extraordinary that it should be wrong. The makers should have been informed of it. The Corporation had been living in a Fool's Paradise during the year, because they had been anticipating an income from the 32 million cubic feet increase; whereas they would have it from 18 millions only. This might also disappear when they got the balance-sheet. It was a most unfortunate state of matters, and he considered it not at all creditable. Mr. M'Callum thought it was rather astounding to hear Bailie Chalmers and the Manager trying to show that the meter was not quite correct at the end of the year's working. This information should be given when they got the financial results. Bailie Chalmers explained that the minute was preparing them for the financial statement. He was not aware of the situation till the Manager presented his statement at the last monthly meeting. The subject then dropped.

The report to the Corporation of Falkirk by Mr. W. Wilson, the Gas Engineer and Manager, submitted this week, states that for the

year ending May 15 the quantity of gas made was 196,370,000 cubic feet, as compared with 200,445,000 cubic feet in the preceding year—a decrease of 4,075,000 cubic feet. The gas sent out was 3,867,300 cubic feet less—equal to 1.92 per cent. Gas accounted for last year amounted to 171,974,800 cubic feet—an increase of 287,800 cubic feet; and the gas unaccounted for was 24,396,900 cubic feet, equal to 12.42 per cent., as compared with 14.34 per cent. the previous year. The coal carbonized amounted to 21,380 tons, as compared with 22,280 tons. The average yield of gas per ton of coal was 9184 cubic feet, as compared with 8996 feet. There was a decrease in the number of ordinary consumers of 90, and an increase of 304 prepayment meter consumers. The total number of consumers on May 15 was 9435—4780 ordinary and 4655 prepayment. During the year there was an increase of 479 in the cookers in use; the number now on loan being 2146.

Mr. R. W. Russell presided at the annual meeting of the Selkirk Gaslight Company last week. The report of the Directors submitted stated that the quantity of gas made during the year ending April 30 was 40,492,500 cubic feet—an increase upon the preceding year of 2,469,000 cubic feet. Gas accounted for amounted to 37,338,500 cubic feet. The quantity of coal carbonized was 4029 tons; and the yield of gas was 10,174 cubic feet per ton. In order to provide additional storage accommodation, the Directors had enlarged an existing gas-holder. The damage caused by the explosion in the works in March last amounted to nearly £86. It was, however, covered by insurance; and the buildings had been renewed. The profit for the year amounted to £1359. The Directors recommended a dividend of 4 per cent., that £250 be allowed for depreciation, that £384 be carried forward, and that the price of gas remain unchanged. In the balance-sheet, the share capital was stated at £18,140, and the value of the works at £18,864. The total revenue during the year was £6070, of which £4671 was derived from the sale of gas. The expenditure was £4711. The report was adopted, and Mr. Russell was elected Chairman of the Company, in room of the late Mr. G. Roberts, who held the position for many years.

It was reported to the Finance Committee of the Dundee Town Council on Thursday that it had been the practice to pay *ad valorem* duty on the purchase of gas annuities, but that a change had now been made. Originally the amount of the gas annuities was £8662 10s., and their nominal value £216,562 10s. Previous to April 30 last, annuities to the value of £2549, and of the nominal value of £63,748, had been redeemed. It had been the practice to pay an *ad valorem* duty of 10s. per cent. Negotiations with the Inland Revenue authorities were entered into by the Town Clerk, with the result that the duty is to be no longer exacted. This will mean altogether a saving of £1500. The Finance Committee expressed their satisfaction with the action that had been taken.

The Helensburgh Town Council held a special meeting on Thursday, to hear a report by a Special Sub-Committee as to extensions at the gas-works. The report was submitted by Bailie Mitchell, the Convener. The recommendation of the Committee was to adopt the Glover-West system of vertical retorts. It was stated that the Sub-

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Committee had visited St. Helens, and they were satisfied with their inquiries and with the opinions they had got from experts. Including additional ground, new coal-store, siding at the railway station, and railway into the works, the total estimated cost was £14,711. Bailie Mitchell said the constructors gave a guarantee that each retort would carbonize 2½ tons of coal per day, and that the same quantity of gas would be got out of 5000 tons of coal under the new system as was obtained from 6000 tons under the present system. They also claimed that there would be an entire absence of fumes, smoke, or nuisance of any kind. The installation would be the first of the kind to be erected in Scotland. The recommendation of the Committee was adopted unanimously, and they were authorized to accept estimates and to proceed with the work.

At the recent annual general meeting of the Montrose Gas Company, the Engineer and Manager (Mr. A. Mackay) submitted his report, which showed that upwards of 33 million cubic feet of gas had been made during the year—an increase of fully 600,000 cubic feet compared with the preceding twelve months. Meters to the number of 447 had been fixed, of which 128 were for new consumers. The number of gas cookers, &c., put in was 370. The balance-sheet showed a profit, after allowing for depreciation, of £1281. It was unanimously agreed that a dividend of 50s. per share should be paid.

The revenue of the Annan Gas Company, Limited, for the past year amounted to £3804, and the expenditure to £3050; leaving a surplus of £754, out of which a dividend of 7 per cent. has been paid.

The Berwick and Tweedmouth Gas Company earned a profit last year of £1213, and have paid a dividend of 10 per cent.

The Brechin Gas Company, Limited, had a profit upon last year's working of £2002, exclusive of a balance of £17 brought forward. There had been paid as dividend on preference shares £235, written off as bad debt £16, allowed for depreciation on works £440, and as a proportion of the cost of new gasholder £100; leaving a net balance of £1228. The Directors recommended that a dividend of 7½ per cent. be paid, and that, subject to such remuneration as might be voted to them, £103 be carried forward. At the annual meeting on Wednesday, these recommendations were adopted. The Chairman—Mr. J. Guthrie, J.P.—said that, as hinted at the meeting last year, the dividend had been increased by 1s. per share. The gas consumed last year amounted to 28 million cubic feet—an increase of half-a-million cubic feet. As compared with the previous year, there had been a saving of £80 on their coal bill; but as a set-off against this, their taxation had increased by a similar sum. The Directors were voted £75 for their services during the year.

From newspaper reports, it appears that fire-guards for gas-stoves were recommended by the Wimbledon Coroner at an inquest on a little girl who was burned to death through her dress catching the lighted jets of the stove while she was washing her doll's clothes. The Coroner added that it was curious that there should be a disposition to censure people who did not provide fire-guards for open grates, when the tendency to-day was so largely to use gas-stoves.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, July 23.

At the commencement of this week there was an easy market, but towards the close improved demand set in, and this brought about a firmer tone. Values, however, do not to-day exceed those of last week—viz., £11 15s. per ton f.o.b. Hull, £11 16s. 3d. f.o.b. Liverpool, and £11 17s. 6d. f.o.b. Leith. In the forward position, further transactions are reported to have taken place at an advance of 2s. 6d. per ton on current prices, but consumers for the most part are unwilling to pay the premium required.

Nitrate of Soda.

The quotations for this article have again been reduced, and they are now 9s. 1½d. per cwt. for ordinary and 9s. 3d. for refined quality, on spot.

Tar Products.

LONDON, July 25.

Markets for tar products have been very quiet throughout the past week. Pitch is unchanged. Business is still very difficult to transact on the Continent, as buyers are confident that, by waiting, they will secure lower prices. Business has been done on the east coast at 33s. per ton. On the west coast, rather better figures have been talked of; but it is impossible to find that any business has been done. Creosote remains steady. Further orders, however, are scarce. Business in benzol is quiet; but there has been no further fluctuation in price. Solvent naphtha is quiet, and in some cases buyers are looking for lower prices. In crude carbolic acid, business is again at a standstill.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., *ex works*. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 31s. 6d. to 32s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The price of this article has been steady throughout the past week, and there has been little buying. No doubt this is covering-in for the month's requirements; but, on the whole, the prices have not actually changed. To-day, on Beckton's new terms, the price is £11 10s. Outside London makes are £11 5s. to £11 6s. 3d.; Leith, £11 17s. 6d.; Hull, £11 15s.; Liverpool, £11 15s. to £11 16s. 3d.; and Middlesbrough, £11 15s.

DAVIS'S

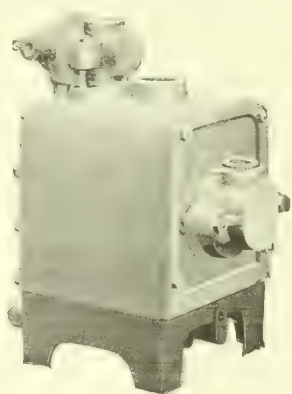
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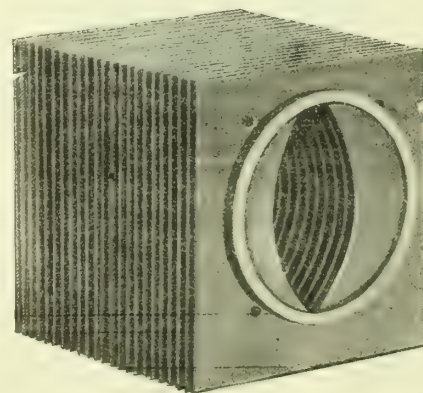
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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has been greatly disturbed by the railway strike. For some days the quantity of coal sent out has been decreasing, until at last it consisted only of that which was shipped direct, and passing over private lines. Under such circumstances, prices are nominal, and are based on from about 10s. per ton f.o.b. for best Northumbrian steams, 9s. to 9s. 3d. for second-class steams, and 5s. 6d. to 6s. 9d. for steam smalls. In the gas-coal trade, the condition was also rather serious, production being small, because of the inability to get quantities away. Durham gas coals are nominally from 9s. to 9s. 9d. per ton f.o.b. for the usual classes, according to quality, and up to 10s. 6d. for Wear specials; but these prices are also nominal, though the situation has been altered, and the working of the collieries is now recommencing. Production has been checked, and there will be some little leeway to make up. Consumption must now be expected to increase as the days shorten; while the fuller trade should enlarge the demand for gas coal. As to coke, the market is steady. Gas coke is still rather scarce, with prices varying from about 14s. to 14s. 6d. per ton f.o.b. in the Tyne for good quality.

Scotch Coal Trade.

On account of the summer holidays, business was suspended; and there is no market report. Coal exports amounted to 345,896 tons for the week—an increase upon the preceding week of 23,026 tons, and upon the corresponding week of 8748 tons. For the year to date, the total shipments have been 8,628,821 tons—an increase upon the corresponding period of 615,408 tons.

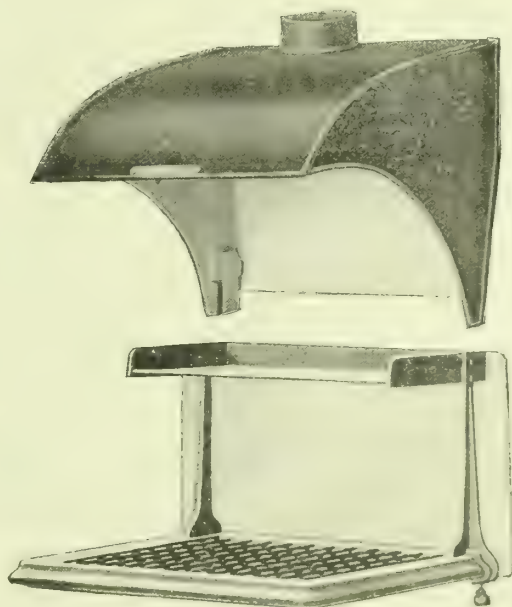
Gas v. Electricity for Lighting Large Halls.—The Baths Committee of the Lewisham Borough Council invited estimates from the South Metropolitan Gas Company and the South Metropolitan Electric Light Company for improving the lighting at the first-class hall in the baths at Ladywell when used for entertainments during the winter months. The estimates were duly received, and the Borough Surveyor had personal interviews with representatives of both Companies on the subject. The Gas Company offered to supply and fix in approved positions nine of Sugg's "Swanley" inverted lamps, each having a lighting efficiency of 520 candles, such lamps to be removed and the existing installation reinstated by them free of all cost if not approved, but if retained the Company to be paid the sum of £29 10s. The Electric Light Company gave an outline of their scheme for lighting the hall with fourteen 100-candle power metallic filament lamps suspended from the existing tie-rods, occupying approximately the same position as the double gas-pendants now in use, at a cost of £37, together with all lamps, main fuses, switches, and shades. The Committee have accepted the offer of the Gas Company.

Quality of London Water.

At the last meeting of the Metropolitan Water Board, the fifth report of the Director of Water Examinations (Dr. A. C. Houston) was presented. It showed that the microbes of epidemic waterborne disease cannot be uniformly present in the new Thames and Lea water unless in very small numbers. The Water Examination Committee, commenting on the report, said: "From the practical point of view, this report is perhaps the most interesting and convincing of the series, for it shows how the whole supply can be under supervision previous to filtration. Since with more than 160 filter-beds in use, supplying water at the rate of upwards of 200 million gallons a day, it is obviously impossible to test the output from each filter even once in the 24 hours, it follows that water is constantly going into supply, the purity of which has not been actually established by tests. To cover this point, the pre-filtration method of examination has been elaborated. Representative samples of all the water antecedent to filtration are now examined bi-weekly. Owing to the remarkable equalizing effect of storage, this is almost equivalent to determining constantly the quality of the water supply previous to filtration. The results show, in the most convincing manner, that London is not really drinking filtered raw river water, but water which antecedent to filtration has undergone a remarkable transformation for the better. We regard this pre-filtration check on the quality of the Metropolitan Water Supply as of paramount importance."

Holyhead Water Supply.—At a special meeting of the Health Committee of the Holyhead Urban District Council, Dr. Clay, the Medical Officer of Health, reported that he had received a report of a bacteriological examination of a sample of water taken from Kingsland on July 4; and it was unsatisfactory. The Committee appointed a deputation to wait upon the Holyhead Water-Works Company, and lay the matter before them, and to request that the pumping of the Trawfll water, which is the source of the supply to the town, should be stopped pending immediate steps being taken to secure proper filtration. Subsequently a special meeting of the Council in committee was held, when the deputation reported that they had interviewed Mr. J. C. Lawfield (the Secretary of the Water Company), who intimated that the Directors were all away from home, and he had no means of communicating with them; and that he could not, upon his own responsibility, cease pumping the water, as requested by the Council. Dr. Clay further reported that, owing to the unsatisfactory nature of the report, he had advised that circulars should be issued to all the householders suggesting the advisability of boiling the water before it was used for domestic purposes. The Council then decided, after fully discussing the matter, that a letter of complaint be sent to the Secretary calling upon the Company to supply pure and wholesome water to the town, and stating that in default the Council would send a copy of the Analyst's report to the Local Government Board, and take proceedings, under the Company's Act, for the appointment of an Arbitrator, and, if necessary, recover by penalties. The reports have been adopted by the Council.

RICHMOND'S PLATE RACK, WALL PLATE AND HOOD.



THE usefulness of the Rack for plate-warming, or for the accommodation of dishes when "dishing-up"—in fact, for several purposes while cooking is in progress—is apparent. It can be folded back out of the way when not in use. The white enamelled back plate is removable by hand and is for the protection of wall and to prevent splashings from cooking on cooker Hotplate. The Hood gives a "completeness" to the Cooker and carries away fumes, as well as conserves the heat.

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Presentation to a Bolton Corporation Gas Official.

Mr. Robert Baker, the Superintendent of the Bolton Corporation Gas and Electricity Fittings Department, has just been the recipient of a gold hunter watch, subscribed for by the employees of the department, as a mark of esteem on the attainment by him of his twenty-first anniversary as Superintendent; a gold brooch, set with diamonds, being a gift from the same source to Mrs. Baker. The presentation was made on the occasion of the recent annual outing of the employees in the department, when the party included Mr. W. Webster, the Chairman of the Gas Committee, and Alderman Miles, J.P., a former Chairman. In the course of his speech, Alderman Miles called attention to the development of the department under Mr. Baker's control. In 1889, when he took over the duties as Superintendent, they had twelve fitters, six assistants, and two clerks; and during that year they fixed 147 cookers and 142 grillers. For the official year just ended, they had a staff of 58 fitters, 7 labourers, a carpenter, 29 assistants, and 12 clerks; and in the twelve months 471 cookers and 3387 grillers had been fixed. The gifts were presented by Mr. Webster, who paid a tribute to Mr. Baker for the way in which he had discharged the duties of his office.

Gas to Replace the Electric Light.—The members of the Haslingden Town Council, at their monthly meeting last Wednesday, acceded to the request of the Outfall Sewage Board that the road leading past the sewage works at Ewood Bridge should be lighted by gas instead of by the electric lamps previously used; and it was resolved that the Chairman and Vice-Chairman of the Lighting Committee should be deputed to see to the erection of lamp-pillars for lighting the road.

Liability for Damage to Street-Lamps.—At a recent meeting of the Stepney Borough Council, they were reminded that the Works Committee in January last brought to their notice a communication received from the Town Clerk of Kensington, intimating that the Council of that borough were unable to recover a large proportion of the money expended on repairing street-lamps damaged in the borough, owing to the fact that they could not look to the owner of any vehicle causing the damage for the cost of repairing it, but only to the driver of the vehicle—he being the person responsible within the meaning of section 207 of the Metropolis Management Act, 1855. The Stepney Council resolved to support a request addressed by the Kensington Borough Council to the London County Council that that authority would insert a clause in one of their General Powers Bills having for its object the amendment of the Metropolis Management Act. The Committee now reported that they had had submitted to them a communication from the Clerk of the London County Council, intimating that the following resolution had been passed: "That legislation be promoted in the session of Parliament of 1911 to extend the provisions of section 207 of the Metropolis Management Act, 1855, so as to make liable for such damage the owner as well as the driver of a vehicle causing damage to any property erected in streets and belonging to the Council or to a local authority."

The South Hants Water Bill.

The Southampton Borough Council, at a special meeting on Monday of last week, adopted a report of the Parliamentary Committee, which contained the following items: The Town Clerk reported that the Bill promoted by the South Hants Water-Works Company had been heard by a Committee of the House of Commons, who had passed the Bill, subject to certain modifications, and had not inserted the clauses asked for by the Corporation with reference to the second well sunk by the Company at Twyford, and for the purpose of suspending the operation of the Bill pending the promotion of a Bill by the Corporation next year for the purchase of the undertaking; and that, in view of the decision of the Committee of the House of Commons, he had conferred with Counsel as to the further steps to be taken with reference to the Bill. It was resolved: (1) That the Bill be opposed by the Corporation in the House of Lords; and (2) that the Town Clerk and his Parliamentary Agents do prepare the necessary petition, and that the Corporate seal of the Corporation be affixed thereto. On July 11, the Sub-Committee reported as follows: The Sub-Committee beg to report that, as a result of the opposition by the Corporation to this Bill before the Select Committee of the House of Commons, the capital authorized to be raised was reduced to £60,000, with borrowing powers of one-fourth (£15,000), and that the Select Committee expressed and placed on record the following opinion: "That the Committee, realizing that the Company and the Corporation are drawing from the same source of supply, think that in the general interests of the community certainly the water supply should be under the control of one authority, but do not express any opinion as to the composition of the said authority." The Select Committee did not insert any clause limiting the amount of water to be taken from the wells at Twyford. The Bill as amended in the House of Commons was considered by a Select Committee of the House of Lords, and there opposed on behalf of the Corporation, when the Committee inserted a clause limiting the amount of water to be pumped at Twyford to 2½ million gallons per diem.

As the result of the initiative of Mr. Matt. Dunn, the Superintendent of the Stockton-on-Tees Gas-Works, the senior boys at Elmfield College, York, where Mr. Dunn's son is a pupil, were enabled a short time since to visit the York Gas-Works. The party consisted of 35 of the boys, and, headed by the Science Master (Mr. Willott) they made the inspection under the guidance of Mr. Dunn, who devoted the afternoon to showing them over the works, and enlightening them upon the manufacture of gas and the measurement of its illuminating power. At the close, a vote of thanks was accorded to Mr. Dunn for his explanations; and the kindness of Mr. Hill, the Engineer, Manager, and Secretary of the York Gas Company, in freely throwing open the works to inspection, was also acknowledged. An account of the visit is contained in the "Elmfieldian" (the College magazine) for June, from which we learn that Mr. Dunn is to give the pupils a lecture on the history of artificial light some time during the coming winter.

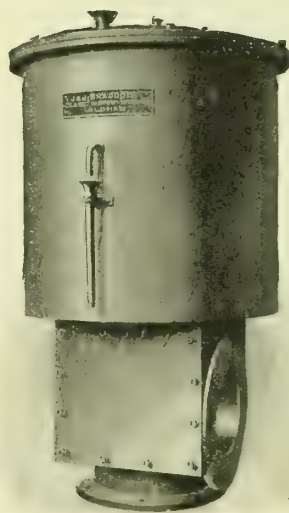
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Burst of a Water-Main.—The Cardiff 20-inch water-main burst at Abercanaid last Saturday, flooding the Merthyr-Cardiff road two miles below Merthyr, and rendering it impassable for traffic. Before the Cardiff supply can be resumed, the main will have to be repaired; and a large number of workmen were put on to the job as quickly as possible.

Birmingham Public Lighting.—In the course of an article on the government of Birmingham, the local "Daily Post" says that in its responsibility for the lighting of the city, the Public Works Department has at present to maintain over 14,000 lamps. The whole of the lamps are fitted with incandescent burners; and there are 158 fitted with inverted burners. The expenditure on public lighting works out at £1 12s. 11½d. for each of the 16,342 burners in the lamps. The consumption of gas has been greatly economized by the adoption of the incandescent burner; while the lighting power has been considerably increased. The actual reduction in the amount of gas used per burner was at first almost balanced by an increase in the number of burners; but as showing the economies which are now effected with the improved lighting arrangements, it may be stated that in 1861 the maintenance of each of the then existing 3678 public lamps cost £3 10s. In 1884, there were 6892 public lamps, each of which cost £2 5s. 7½d. for upkeep. During recent years, with more than 14,000 lamps, the expenditure on each has averaged no more than £1 17s. per annum.

Gas at Birmingham Workhouse.—As the result of the consideration of the question of the Birmingham Workhouse and Infirmary being supplied with gas by the Corporation, instead of manufacturing it at the Union gas-works, the Engineering Sub-Committee recommended that the present system should be continued; and consequently the Management Committee decided to ask the Board to continue manufacturing their own gas for the present, a course which was duly agreed to. It was explained that the Corporation offered to supply the Guardians with gas at 1s. 4d. per 1000 cubic feet net; but, in addition, there were certain things to be done by the Board which would increase the expense to 1s. 6d. At the workhouse they were producing gas at 1s. 4½d. per 1000 feet. The workhouse-made gas answered its purpose well; and there was the further fact that the gas-works were in good order, and would not necessitate any outlay upon them for two years at least. Mr. Pentland said they were told that the Corporation could make and sell gas at 1s. 4d. per 1000 cubic feet. As they charged over 2s. per 1000 feet, was it, he asked, surprising that they could give £50,000 to the relief of the rates? Mr. Turner expressed the view that if a poor-law authority elected to manage a workhouse could not make a profit on a commercial undertaking, it was wise to abandon it, and take a supply from a concern which was manufacturing a larger quantity and a better article. The Infirmary Committee had complained of the quality of the gas. He regarded the Corporation offer of 1s. 4d. per 1000 cubic feet in bulk as being favourable. Mr. Crump, however, pointed out that, as the gas-works were remunerative, it was most important that they should be continued, as they found work for inmates.

APPLICATIONS FOR LETTERS PATENT.

- 16,412.—BROWN, W., "Swing ring for mantle." July 9.
 16,414.—KEWNEY, A. L., "Pipe and expansion joint." July 9.
 16,503.—BREUNING, R. & E., and BAERTSCHI, O., "Self-closing gas valves and cocks." July 11.
 16,520.—SHAW, E. J., "Wall-brackets." July 11.
 16,567.—PETERS, C., "Gas-cooker rings." July 11.
 16,579.—PARKINSON AND W. & B. COWAN, LTD., and CHESHIRE, W., "Gas-meters." July 12.
 16,589.—WINKLEMAN, G. E., "Gas-ovens." July 12.
 16,596.—BURSTALL, F. W., "Removing tar and other suspended matter from gases." July 12.
 16,625.—PALMER, W. V., "Prepayment meters." July 12.
 16,630.—WOODALL, H. W., and DUCKHAM, A. M'D., "Vertical retorts." July 12.
 16,631.—DUCKHAM, A. M'D., "Delivery of products from gas-retorts." July 12.
 16,642.—SAUL, D. H., "Gas cocks or valves." July 12.
 16,656.—ROSTIN, H. P., "Lighting gas." July 12.
 16,677.—CUSS, C. T., "Incandescent gas lighting, heating, and power." July 13.
 16,725.—WOODALL, H. W., and DUCKHAM, A. M'D., "Brick for heating flues." July 13.
 16,738.—KIRKBY, R., "Gas-engines." July 13.
 16,745.—HYDES, T., "Gas stoves and rings." July 13.
 16,769.—SMITH, A., "Heat-retaining device." July 13.
 16,801.—HELPS, G., "Joints for pipes." July 14.
 16,968.—ALLEN, E., and CO., LTD., OGILVIE, A., and SHORT, A. A., "Conveyors and screens." July 16.
 16,984.—DUNLOP, J., "Gas-producers." July 16.
 17,011.—DEUTSCHE GASGLUHLICHT AKT.-GES. (AUERGESELLSCHAFT) "Lamps or lanterns." July 16.
 17,015.—DRUMGOLD, C. T., "Globe supports." July 16.

Unprofitable Electricity Supply in Bermondsey.—At the meeting of the Bermondsey Borough Council last Tuesday, the Finance Committee submitted a report drawing the Council's "very serious attention" to the fact that on the year's working of the electricity undertaking a surplus of only £43 was shown for an outstanding loan indebtedness of £152,970. The Committee expressed the opinion that this result is partly due to the very low price at which energy is now being sold; and they felt it their duty to warn the Council to be very careful as to how the undertaking is managed in the future, more especially with regard to incurring further liability by way of loan. In conclusion, the Committee said next year's surplus was estimated at £660; but they doubted whether any such amount as this would be realized.



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Reduction in Price at Ramsbottom.—The Directors of the Ramsbottom Gas Company announce a reduction in the price of gas by 2d. per 1000 cubic feet, with special terms for use for other purposes than lighting.

Manchester Gas Committee's Coal Contracts.—Tenders for the supply of coal required at the several gas-works of the Manchester Corporation during the ensuing twelve months were considered at a meeting of the Gas Committee last Thursday. Orders were placed for about 400,000 tons, at a price a little in excess of last year. Alderman Gibson, the Chairman of the Committee, when asked about the prices, said it was not considered wise to give details; but, having regard to the state of the market, he was of opinion that the Committee had secured very favourable terms. About 25 firms, he added, would share the orders; and the prices generally were a few halfpence more per ton than was paid last year.

Vertical Retorts for the Dronfield Gas-Works.—The Vertical Gas-Retort Syndicate have secured a contract for a small installation of vertical retorts, consisting of one bed of four 4-metre (13 feet) retorts, at the Dronfield Gas-Works. The fact will have special interest for the managers of small gas-works.

Messrs. Leech, Goodall, and Co., of Hunslet, Leeds, have received an order from the Micklefield Coal and Lime Company for screening plant, including tipplers, picking-belts, jiggers, conveyors, structural work, &c., in connection with the new sinking at their colliery.

Goodwin Clarke, a Wakefield man, was found by his wife dead on a sofa, with a tube in his mouth attached to a gas-bracket, which was turned on. At the inquest, the Jury returned a verdict to the effect that deceased committed suicide while of unsound mind, probably owing to his wife's illness and financial matters.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMEN. No. 5268.
REPRESENTATIVE. No. 5270.
REPRESENTATIVE. "Gas-Works," c/o Streets, Cornhill.
CLERK. No. 5270.
FITTER. Leigh-on-Sea Urban District Council. Applications by Aug. 2.

Situations Wanted.

IN GAS OR WATER CONCERN. No. 5265.
MANAGER OR SECRETARY, &c. No. 5267.

Plant (Second-Hand) for Disposal.

PURIFIERS, &c. Malvern Urban District Council.
RETORTS, &c. Hastings and St. Leonards Gas Co.
WASHER-SCRUBBER. Newark Gas Company.

Meetings.

GASLIGHT AND COKE COMPANY. Chief Office, Aug. 5, Twelve o'clock.
COMMERCIAL GAS COMPANY. Cannon Street Hotel, Aug. 11, Twelve o'clock.
BRENTFORD GAS COMPANY. St. Ermin's Hotel, Aug. 5, 2.30 o'clock.
BROMLEY AND CRAYS GAS COMPANY. Gas-Works, Aug. 4, Six o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel, Aug. 5, Three o'clock.

TENDERS FOR

Coal and Cannel.

BARRY URBAN DISTRICT COUNCIL. Tenders by Aug. 6.
CLACTON URBAN DISTRICT COUNCIL. Tenders by Aug. 3.
HELDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Aug. 8.
STRETFORD GAS COMPANY. Tenders by Aug. 3.

Coke (Wanted). No. 5264.

Meters.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 6.

Pipes, &c.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 6.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

Sulphate Plant.

ACCINGTON GAS AND WATER BOARD.

Sulphuric Acid.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 6.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

Tinned Goods.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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In consequence of the BANK HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

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dard" WASHER-SCRUBBER, with ENGINE
for driving same.

Capacity, 350,000 cubic feet per twenty-four hours.
12-inch Connections. Cost £314.

For Price and further Particulars, apply to the
NEWARK GAS COMPANY.

FOR Disposal—10-H.P. Portable Steam-

ENGINE, practically new, by Marshall and Sons,
Gainsborough, insured by National (90 lbs. pressure).
4-H.P. Horizontal STEAM-ENGINE, 5-H.P. Horizontal
STEAM-ENGINE BOILER TANK, 7 in. Plate, capacity
3070 gallons, absolutely sound. Cheap. Stationary
STEAM CRANE, long jib. Offers Solicited.

W. JOHNSON, Junr., New Hythe, KENT.

SURPLUS Retorts for Sale, made by

Hickman, Stourbridge, 22 in. by 16 in. Oval D;
28 Mouthpiece Sections, 6 ft. 10 in. to 6 ft. 11 in. long;
13 Middle or Plain Sections, 6 ft. 9 in. to 6 ft. 10 in. long.
These Retorts are in Good Condition, and Offers for
same are invited, f.o.r. Hastings Station.

ENGINEER and GENERAL MANAGER, Hastings and
St. Leonards Gas Company, Queen's Road, HASTINGS.

FOR DISPOSAL—Brick Plant com-

plete. Including 400,000 Place and Hard Stock
BRICKS, 15s. to 25s. per Thousand f.o.r. Maidstone.
12-H.P. Portable STEAM-ENGINE by Marshall, of
Gainsborough, insured 90 lbs. Steam by National,
nearly as good as when delivered from Workshops, £140.
High-Pressure BOILER, new, insured 200 lbs. Steam.
Suitable for 2-Ton Lorry, £20. 4-H.P. Horizontal
STEAM-ENGINE, £25. 5-H.P. ditto, £6. Cheap 8-H.P.
Portable STEAM-ENGINE £25. Offers solicited.

Full Particulars on Application to Wm. JOHNSON,
JUNR., New Hythe, Larkfield, KENT.

PURIFIERS FOR SALE.

THE Malvern Urban District Council

are open to receive OFFERS for the following
PURIFIERS: Two 16 ft. by 12 ft. by 5 ft.; Four 16 ft.
by 8 ft. by 5 ft.; and Two Four-Way Valves and Con-
nections.

Permission to View and further Particulars can be
obtained from the undersigned.

The highest or any Tender will not necessarily be
accepted.

By order,
W. J. KENDELL BAKER,
Engineer and Manager.

SULPHATE OF AMMONIA PLANT.

THE Accrington District Gas and

Water Board are prepared to receive Drawings,
Specifications, and TENDERS for a Modern 3 Tons
per day Plant, erected Complete at the Great Harwood
Works of the Board. Taylor's Saturator.

By order,

C. HARRISON,
Engineer and General Manager.

Offices of the Board:
St. James' Street, Accrington,
July 26, 1910.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for
the Supply of TUBES and FITTINGS, SUL-
PHURIC ACID, and TINNED GOODS.

Specification and Form of Tender may be obtained
upon Application to Mr. W. Whatmough, Gas Manager.
Sealed and endorsed Tenders to be sent to me not
later than Nine a.m. Monday, Aug. 8, 1910.

By order,
Geo. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
July 20, 1910.

TENDERS are invited for a Twelve

Months' Supply of Screened GAS COKE for a
large Engineering Works in the Midlands (name will
be disclosed on Application).

Approximate total Quantity, 725 Tons. Delivery to
be taken as required.

Address No. 5261, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

BOROUGH OF DEWSBURY.

THE Gas Committee of the above Cor-

poration invite TENDERS for the Supply and
Delivery during the period ending the 31st day of July,
1911, of

SULPHURIC ACID,
WET and DRY METERS,
CAST-IRON GAS and WATER PIPES.

Specifications and Forms of Tender may be obtained
on Application to the Gas Manager, Mr. Geo. Wm.
Fligg, Gas-Works, Savile Town, Dewsbury.

Tenders, under sealed cover, endorsed "Sulphuric
Acid," "Meters," or "Cast-Iron Pipes," as the case
may be, to be sent to me not later than the 6th day of
August, 1910.

The Corporation do not bind themselves to accept the
lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury,

STRETTFORD GAS COMPANY.

THE Directors of the Stretford Gas Company invite TENDERS for the Supply of Unscreened GAS COALS, NUTS, SLACK, and CANNEL, to be Delivered at the Gas-Works, Stretford, on the Bridgewater Canal, or at Stretford Station (M. S. J. & A. Railway) during the next One, Two, or Three Years, according to the printed Conditions, commencing Sept. 1, 1910.

Tenders to be delivered to the Gas-Works, Stretford, not later than noon on Wednesday, the 3rd of August, 1910, endorsed "Coal," and addressed to the Chairman. The Directors do not bind themselves to accept the lowest or any Tender.

Forms of Tender and Conditions can be obtained on Application to the undersigned.

By order of the Board,
H. KENDRICK,
Engineer and Manager.

Stretford, July 15, 1910.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

TENDERS FOR GAS COAL.

THE above Board invite Tenders for the Supply of GAS COAL as required by them during the next Twelve Months, at their Gas-Works, Crown Nest, Hebden Bridge.

Tender Forms and Further Particulars may be obtained from Mr. E. J. Wellens, Engineer and Manager, Gas Offices, Carlton Street, Hebden Bridge.

Sealed Tenders, endorsed "Tender for Gas Coal," must be addressed to James Simpson, Esq., Chairman, Gas Board, Offices, Carlton Street, Hebden Bridge, to be delivered on or before Monday, Aug. 8, 1910.

R. CRABTREE,
Clerk to Gas Board.

Gas Offices, Carlton Street,
Hebden Bridge, July 23, 1910.

CLACTON URBAN DISTRICT COUNCIL.

COAL.

THE above Council invite Tenders for the Supply and Delivery of about 5000 Tons of Best Screened GAS COAL in quantities as may be required during the ensuing Twelve Months.

Particulars and Form of Tender may be obtained upon Application to the Consulting Engineer, Mr. Sydney Francis, Assoc. M. Inst. M. E., Town Hall, Clacton-on-Sea.

Tenders. Sealed and Endorsed "Tender for Coal," to be delivered to the undersigned not later than noon on Wednesday, the 3rd of August next.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall, Clacton-on-Sea,
July 19, 1910.

BARRY URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

TENDERS are invited for the Supply of GAS COAL (up to 17,000 Tons), to be delivered in such Quantities and at such times as the Engineer and Manager may require during One Year from August, 1910.

The Tenders must state the names of the Pits from which the Coal will be raised, the names of the Gas-Works at which it is used, and the Price per ton delivered into the Council's Siding at the Gas-Works, Barry, and must be accompanied by a copy of the Analysis of the Coal.

Any person whose Tender is accepted must enter into a Contract in the form required, also a Bond, with approved sureties, for its due performance.

Further Particulars may be obtained from Mr. T. E. Franklin, Engineer and Manager, Gas-Works, Barry.

Sealed Tenders, endorsed "Tender for Gas Coal," must be sent to the undermentioned on or before the 6th of August, 1910.

The lowest or any Tender not necessarily accepted.
T. B. TORDOFF,
Clerk.

Public Offices, Barry,
July 19, 1910.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 5th day of August next, at Twelve o'clock (noon) precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., July 19, 1910.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be held at the Cannon Street Hotel, in the City of London, on Thursday, the 11th of August, 1910, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1910; and to declare a Dividend.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 29th inst. to the 11th of August, both days inclusive, and the Dividends will be paid on the 1st of September next to the holders of Stock registered at the date of the closing.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
July 20, 1910.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 5th of August next, at Half-past Two o'clock, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 30th of June last.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford,
July 19, 1910.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 5th day of August, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last; to declare a Dividend for the same period; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 22nd day of July until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 18, 1910.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 4th day of August, 1910, at Six o'clock p.m. precisely, and on this occasion

AT THE WORKS OF THE COMPANY, IN HOMESDALE ROAD, BROMLEY, KENT, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 20th of July to the 4th of August, 1910, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 20, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

Just Published. Price 1s. net.

THE SALE OF GAS APPARATUS

BY

J. PATER WIATT.

Author of "Chemistry in Physics," "Internal Combustion Engines," &c., &c.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

JOHN HALL & CO. OF STOURBRIDGE, LIMITED, STOURBRIDGE, Manufacturers of

FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY, LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

TROTTER, HAINES, & CORBETT, BRETTLE'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

HEATHCOTE GAS COAL from the GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

'BUFFALO' INJECTOR

Operated Entirely by One Handle.

Class A lifts 24 ft.
Class B lifts 12 ft.

SEND FOR LIST.

Telegrams: "Temperature London."
Tel. No. 12,455 Central.

GREEN & BOUNDING, LIMITED,
28, New Bridge St., LONDON, E.C.

THOMAS DUXBURY & CO., 16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 87.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
90, CANNON STREET, E.C.

GRAETZIN LIGHT

Important Improvements.



BURNERS.

1. 20-Candle Power more light without increase in the consumption of gas.
2. Patent Gas Adjuster; cannot get out of order.
3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

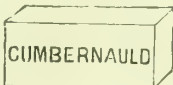
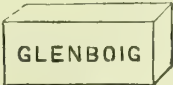
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE
MARKS.



The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS,
BLOCKS, &c. &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undenoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



Works: GLENBOIG, LANARKSHIRE.

Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas
of Honour.

Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.

ADDITIONAL REVENUE FOR GAS-WORKS.

COKE SELLING . . AT 11/6 A TON
COALEXLD SELLING AT 20/- A TON
IN THE SAME TOWN.



COALEXLD, LIMITED.
LANCASTER.

GAS COAL AND CANNEL.

WILSON CARTER & PEARSON,

LIMITED,

Gas, Steam, and other Fuel for Home and Export.

GAS COKE CONTRACTORS.

Chief Offices: 50, NEW STREET, BIRMINGHAM.

Telegraphic Address:
"CARTER PEARSON, BIRMINGHAM."

Telephone Nos.:
CENTRAL 3013 and 3014.

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ENGINEERS,
HASLINGDEN, nr. MANCHESTER.

LIME & OXIDE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

Coal and Coke Elevators and Conveyors.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.

HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

**DON'T BUY
GAS METERS OR
GOVERNORS**

UNLESS THEY ARE MADE BY
MILNE'S

Milne House Works, EDINBURGH; Midland Meter
Works, LEEDS; 111, St. Vincent Street, GLASGOW;
59, Farringdon Road, LONDON.

**CASES FOR BINDING
QUARTERLY VOLUMES OF THE "JOURNAL"**
PRICE 2s. EACH.



**Special Pressure and
Pressure & Exhaust Registers.**

For RETORT-HOUSE GOVERNORS.
For EXHAUSTER HOUSES.
For OFFICES AND DISTRICTS.

Fuller particulars on application to—

T. G. MARSH,
28, Deansgate, MANCHESTER.

**CLAYTON, SON
& CO., LTD.,**
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**SPIRAL-GUIDED
HOLDERS
A SPECIALITY.**

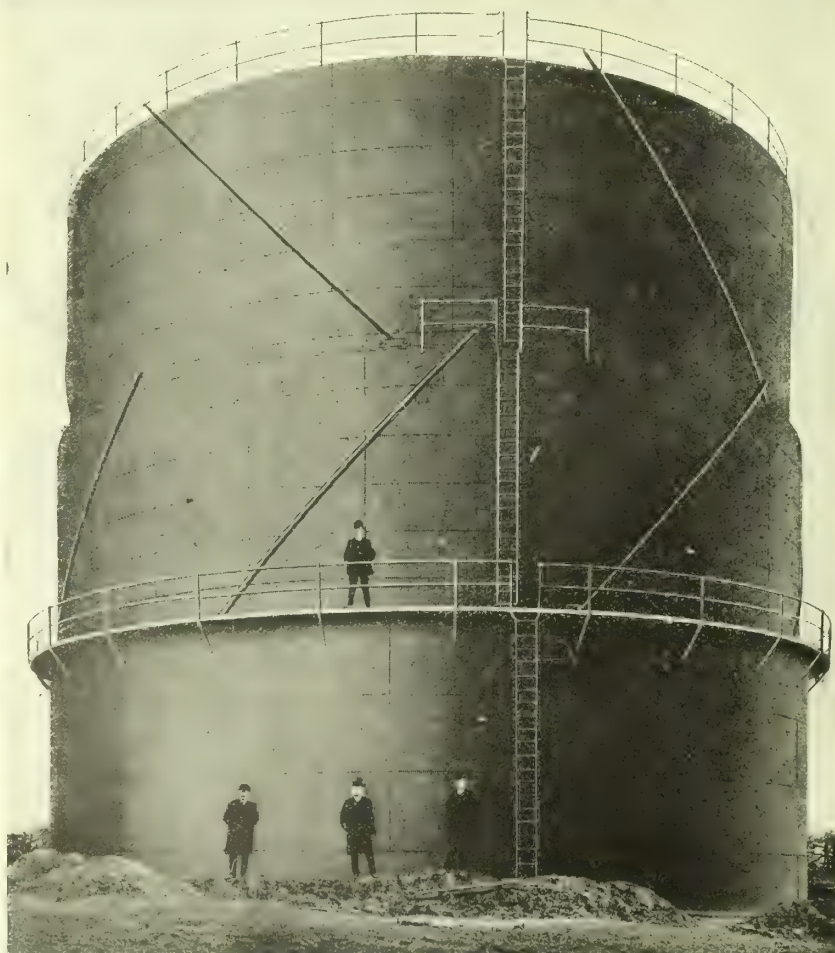
Original Makers.

Two-Lift Spiral-Guided
Gasholder and Steel Tank
(Clayton's Patent)
Made and Erected for the
Northallerton Consumers' Gas
Company, Ltd.

CAPACITY 110,000 cubic feet.

Telegrams: "GAS LEEDS."
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LONDON OFFICE:
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

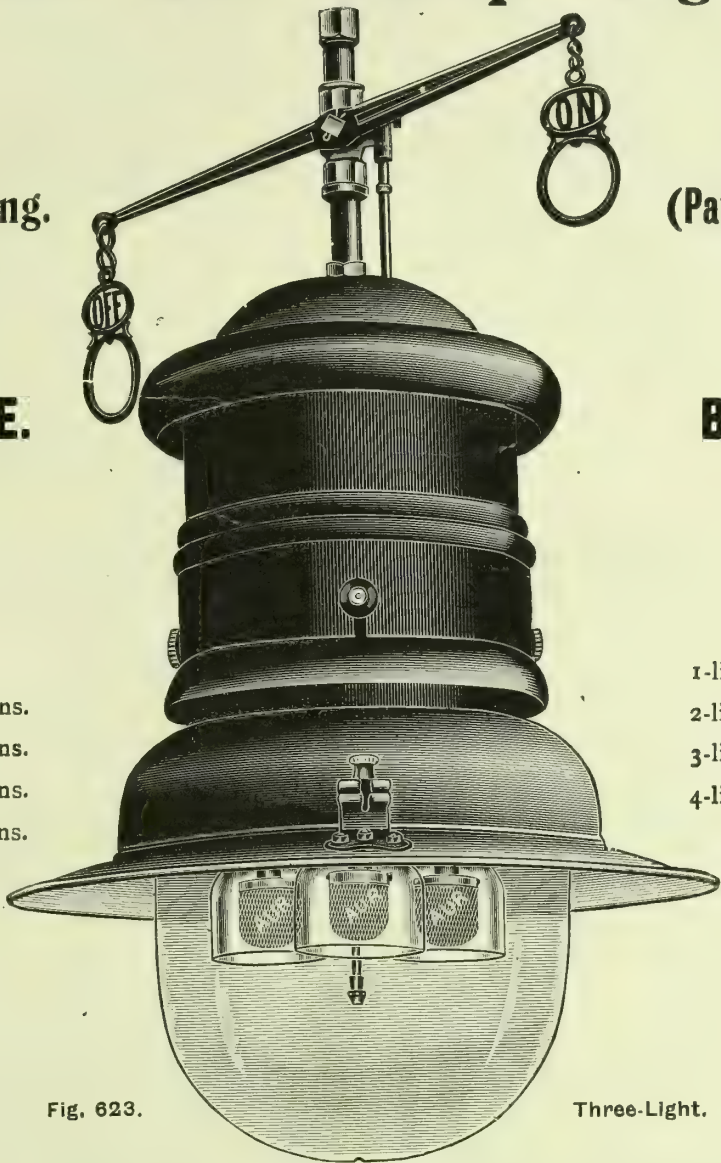


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.									
1-Light. 2-Light. 3-Light. 4-Light.					1-Light. 2-Light. 3-Light. 4-Light.				
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	29 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each	6d. subject as usual.			

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

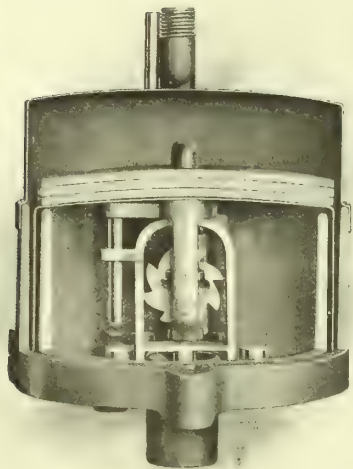
THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.
Telegrams and Cables: "WELSBACH LONDON."
Telephone 2410 NORTH.

The "A. & M." Patent Automatic Gas Apparatus for Street Lighting.

Small.
Simple.

Efficient.
Cheap.

CONTROLLED FROM THE GAS-WORKS.



SECTIONAL DIAGRAM. HALF FULL SIZE.

Saves Labour, Gas, Mantles, and Glasses.

Can be brought into action at any hour.

Requires no Winding.

Can Extinguish Different Lights at Different Times as required.

Nothing but Metal in it. No Leather, no Rubber, no Glass.

Has Stood the Test of Years.

Is "All British." Nothing Made Abroad.

ALDER & MACKAY,

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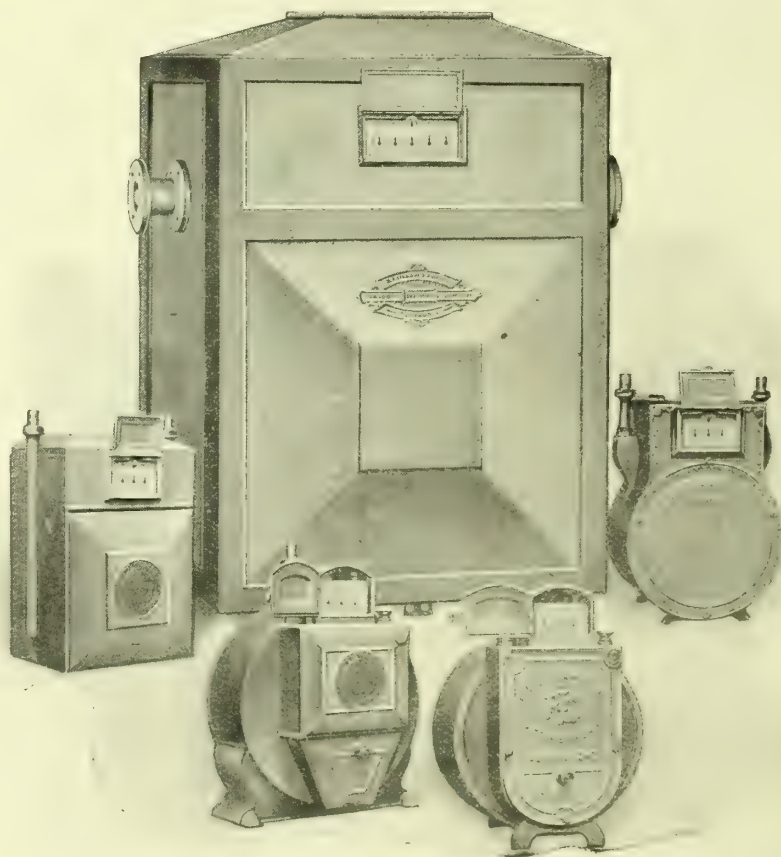
R. LAIDLAW & SON (EDINBURGH), LTD. GAS METER MAKERS.

DRY METERS
IN
TIN AND IRON CASES.

WET METERS
IN
TIN AND IRON CASES
WITH ORDINARY AND
COMPENSATING DRUMS.

All Materials used in the
Manufacture of these Meters
are of the best quality, and
the Workmanship of the
Highest Standard.

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EDINBURGH.
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LONDON, E.C.



LEECH, GOODALL & Co.,

Works—LEEDS.

CONVEYING PLANTS,
ROOFS, BUNKERS,
STEEL STRUCTURAL WORK,
ETC.

RETORT INSTALLATIONS
ON THE
HORIZONTAL, INCLINED, or
"DESSAU" VERTICAL
SYSTEMS.

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THOMAS PIGGOTT & CO., LIMITED, BIRMINGHAM, ENGLAND.

IMMEDIATE DELIVERY FROM STOCK.
UNBREAKABLE.
EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls.

Size, 16 x 12 x 8 ft. deep.

PATENT PRESSED STEEL TANKS.

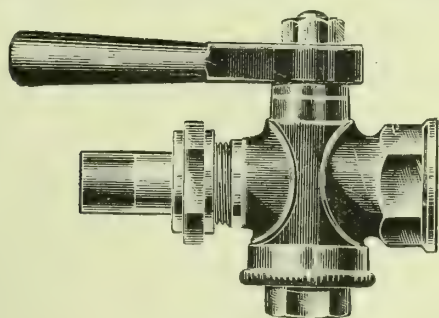
MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
OF 4 FT. LENGTH, WIDTH, OR DEPTH.

HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.

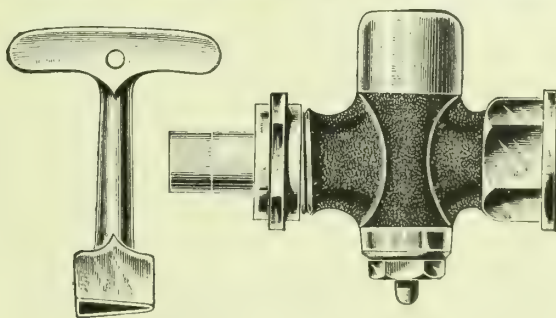
Aggregate capacity of Plants supplied,
233,000,000 cubic feet daily.

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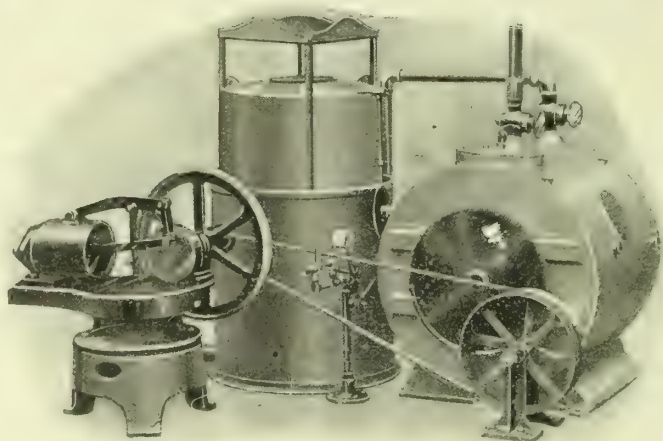
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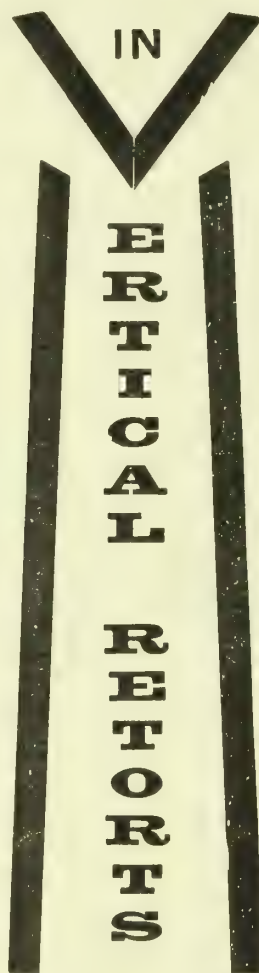
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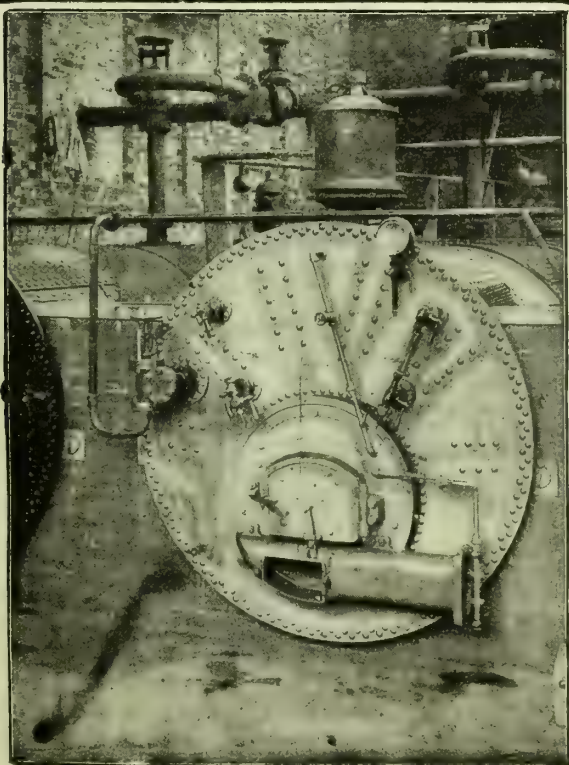
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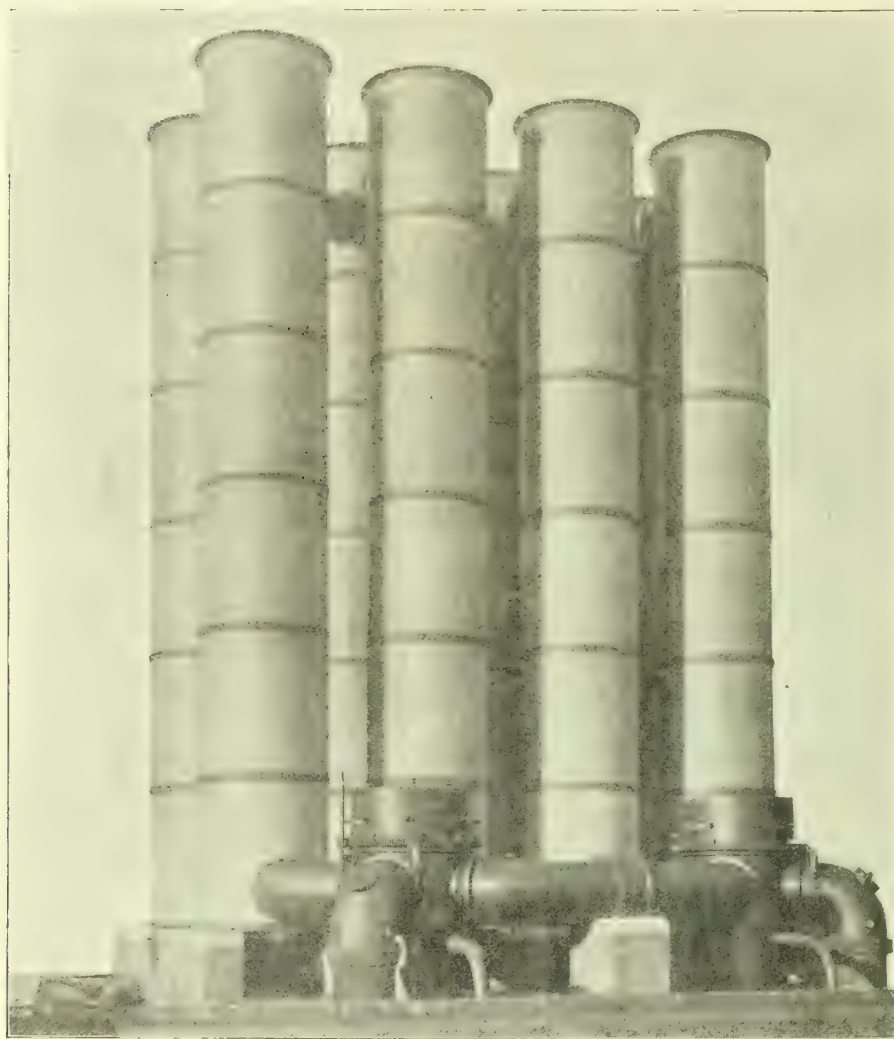
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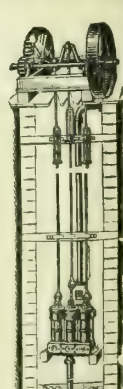
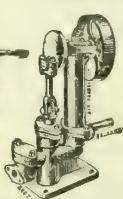
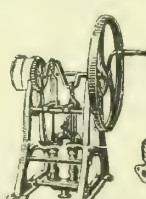
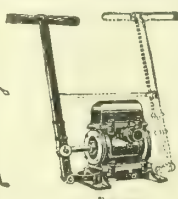
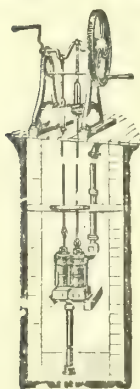
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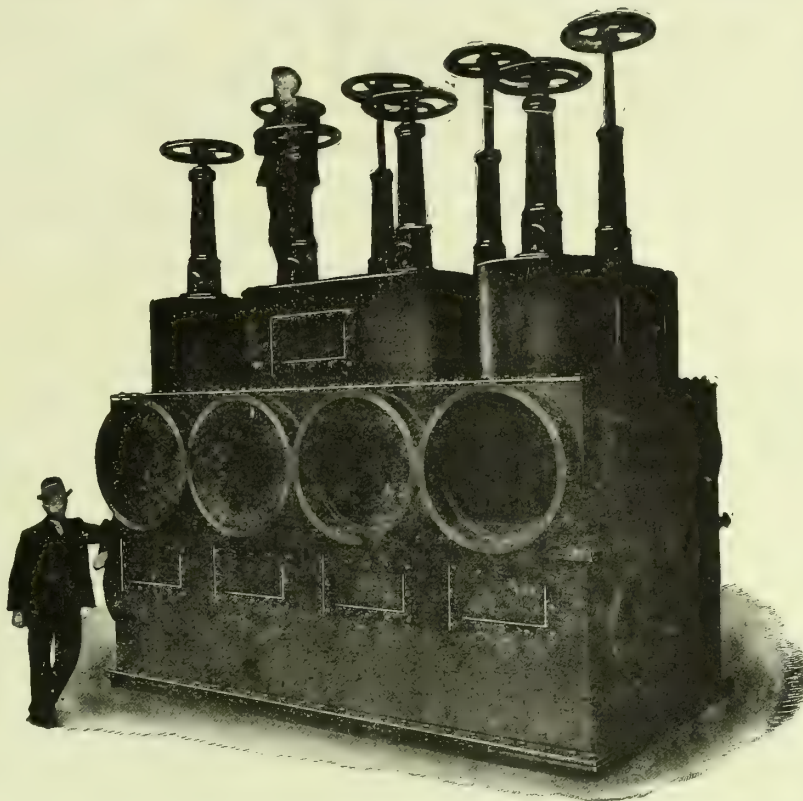
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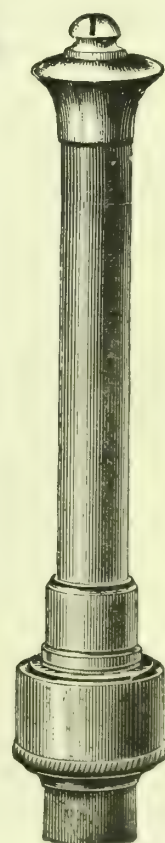
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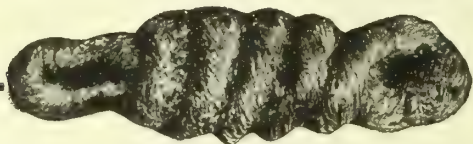
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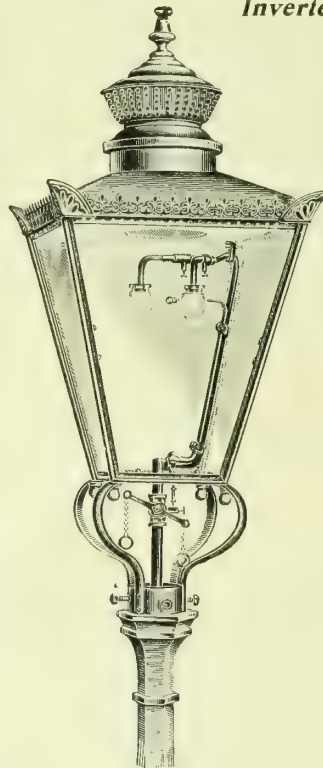
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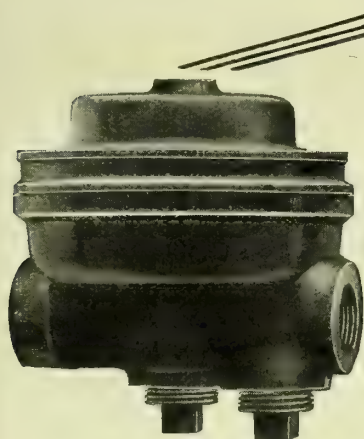
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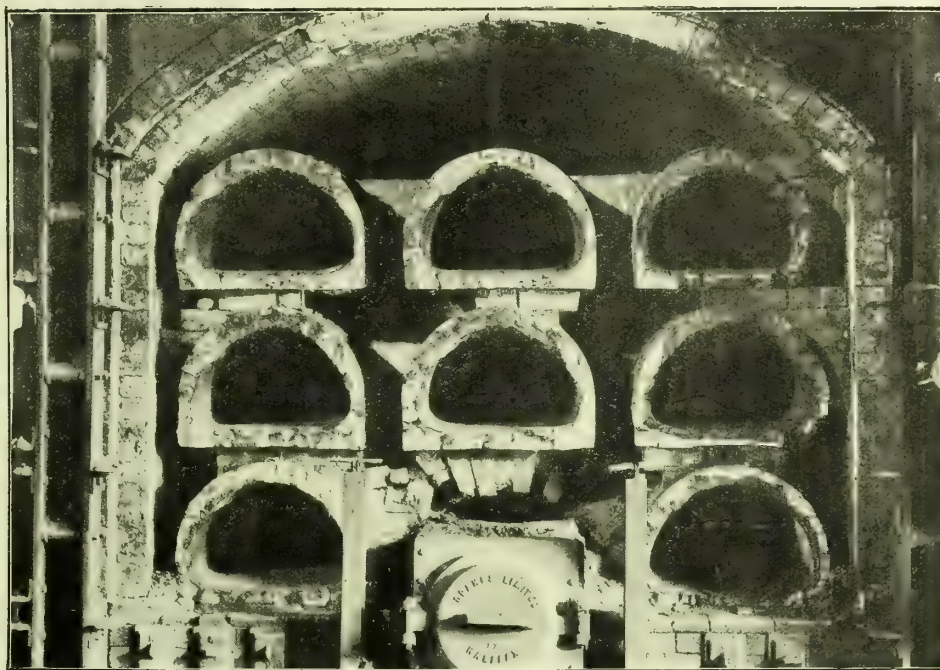
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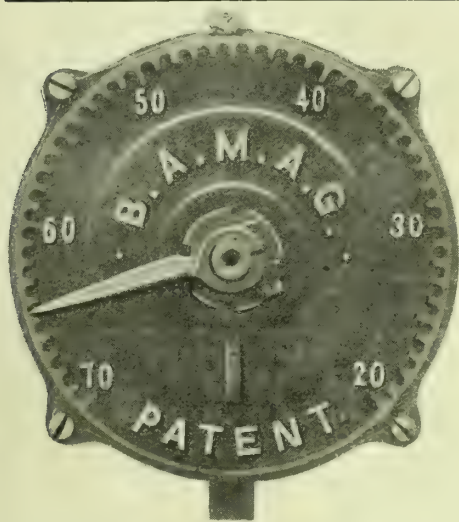
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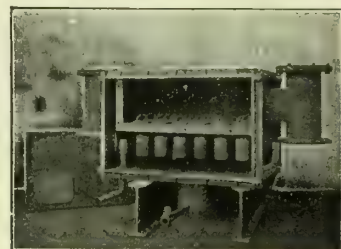
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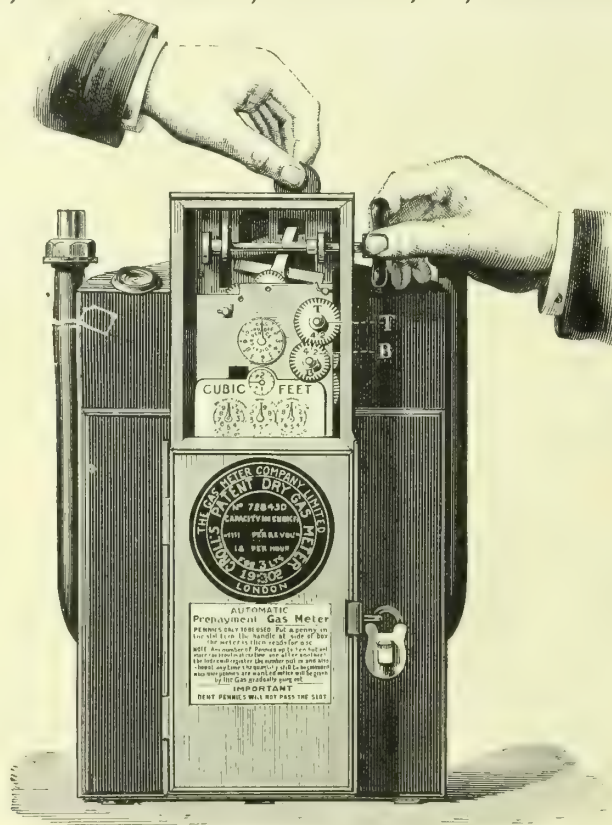
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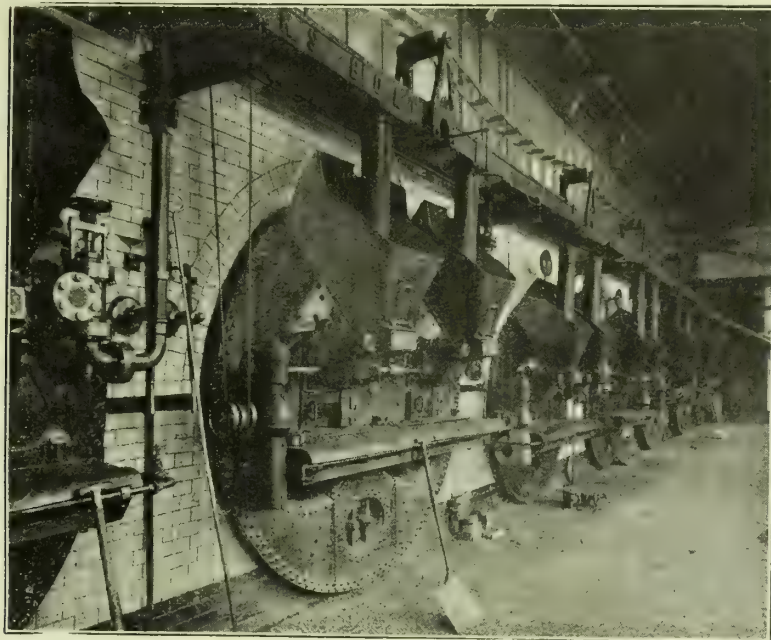
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Barrow	300,000	G. L. & C. Co., (2nd)	2,250,000	Redhill (2nd)	300,000
Barrow (2nd)	500,000	G. L. & C. Co., Nine Elms	2,750,000	Reichenberg, Bohemia	200,000
Bath	1,000,000	Gablonz, Austria	140,000	Reichenberg (2nd)	200,000
Belfast	1,700,000	Gelsenkirchen, Westphalia	175,000	Revel, Russia	350,000
Belfast (2nd)	4,500,000	Gelsenkirchen (2nd)	350,000	Rhymney Valley	175,000
Benrath, Germany	125,000	Geneva, Switz.	500,000	Romford	300,000
Berlin-Charlottenburg	2,500,000	Gosport	200,000	Romford (2nd)	350,000
Berlin-Rixdorf	650,000	Göteborg, Sweden	300,000	Rotterdam, Holland	850,000
Berlin-Rixdorf (2nd)	700,000	Göteborg (2nd)	600,000	Rotterdam (2nd)	1,500,000
Berlin-Tegel	3,500,000	Graudenz, Prussia	200,000	Rotterdam (3rd)	750,000
Berlin-Tegel (2nd)	6,350,000	Guildford	350,000	Rotterdam (4th)	750,000
Bilston	375,000	Guildford (2nd)	200,000	Rotterdam (5th)	600,000
Birmingham	1,500,000	Haarlem, Holland	850,000	St. Albans	700,000
Bishop's Stortford	200,000	Hamburg, Germany	1,750,000	St. Gallen, Switz.	225,000
Bochum, Westphalia	630,000	Hampton Court	500,000	St. Gallen (2nd)	225,000
Bogno	100,000	Hampton Court (2nd)	600,000	St. Joseph, Mo.	750,000
Bordentown, N.J.	125,000	Hartlepool	750,000	San Paulo, Brazil	700,000
Bournemouth	1,000,000	Hebden Bridge	200,000	Santiago de Cuba	400,000
Bournemouth (2nd)	500,000	Heidelberg, Germany	200,000	Scarborough	800,000
Bremen, Germany	550,000	Holyoke, Mass.	600,000	Schwelm, Westphalia	100,000
Bremen (2nd)	950,000	Hong Kong	450,000	Shanghai	225,000
Bremen (3rd)	850,000	Hull	1,500,000	Shanghai (2nd)	225,000
Brentford	1,200,000	Ilford	650,000	Shanghai (3rd)	1,600,000
Brentford (2nd)	850,000	Innsbruck, Austria	200,000	Southampton	800,000
Brentford (3rd)	350,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridgwater	200,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington	150,000	Kiel, Sleswig	1,000,000	Southgate	400,000
Bridlington (2nd)	200,000	Kiel (2nd)	880,000	Southport	750,000
Brieg, Silesia	100,000	L. & N.W. Rly., Crewe	700,000	Southport (2nd)	900,000
Brighton	1,750,000	Lausanne, Switz.	250,000	South Shields	650,000
Brighton (2nd)	1,850,000	Lawrence, Mass.	400,000	Stafford	500,000
Bromley	1,500,000	Lea Bridge	350,000	Staines	600,000
Bruges, Belgium	200,000	Lea Bridge (2nd)	350,000	Stettin, Germany	880,000
Brussels-Anderlecht	350,000	Lea Bridge (3rd)	400,000	Stockholm	1,500,000
Brussels-Anderlecht (2nd)	350,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
Brussels-Forest	1,000,000	Leeuwarden, Holland	400,000	Stockport	600,000
Brussels-Koekelberg	1,000,000	Leiden, Holland	500,000	Stockport (2nd)	600,000
Brussels-St. Gilles	1,000,000	Leiden (2nd)	575,000	Stockport (3rd)	400,000
Brussels-St. Josse	1,000,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels-St. Josse (2nd)	600,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels-St. Josse (3rd)	775,000	Lemberg (2nd)	500,000	Swansea (2nd)	1,000,000
Brussels-Ville	750,000	Liège, Belgium	1,000,000	Swansea (3rd)	450,000
Brussels-Ville (2nd)	750,000	Liège (2nd)	750,000	Swindon	300,000
Brussels-Ville (3rd)	1,500,000	Lincoln	500,000	Swindon (2nd)	450,000
Brussels-Ville (4th)	350,000	Liverpool	3,500,000	Sydney-Harbour	500,000
Bucarest, Roumania	1,100,000	Liverpool (2nd)	4,500,000	Sydney-Harbour (2nd)	500,000
Budapest, Hungary	50,000	Liverpool (3rd)	750,000	Sydney-Mortlake	500,000
Budapest (2nd)	1,750,000	Longton	600,000	Sydney-Mortlake (2nd)	500,000
Carlisle	600,000	Louvain, Belgium	800,000	Syracuse, N.Y.	850,000
Carlsruhe, Germany	500,000	Lübeck, Germany	400,000	Taunton	225,000
Chigwell	350,000	Maastricht, Holland	200,000	Taunton (2nd)	350,000
Chorley	300,000	Magdeburg, Germany	1,400,000	The Hague Holland	1,000,000
Commercial, London	850,000	Maidenhead	225,000	The Hague (2nd)	500,000
Commercial (2nd)	850,000	Maidenhead (2nd)	225,000	Tilburg, Holland	400,000
Commercial (3rd)	1,250,000	Maidstone	500,000	Torquay	350,000
Commercial (4th)	2,000,000	Malines, Belgium	500,000	Tottenham	750,000
Copenhagen	700,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
Copenhagen (2nd)	2,500,000	Malta	400,000	Tottenham (3rd)	350,000
Courtrai, Belgium	250,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
Coventry	600,000	Manchester (2nd)	3,500,000	Tottenham (5th)	1,000,000
Coventry (2nd)	600,000	Mansfield	330,000	Tottenham (6th)	1,250,000
Cracow, Galicia	200,000	Marlborough	100,000	Tunbridge Wells	1,000,000
Cracow (2nd)	200,000	Mayence, Germany	700,000	Utrecht, Holland	1,000,000
Crefeld, Germany	500,000	McKeesport, Pa.	500,000	Utrecht (2nd)	1,000,000
Croydon	1,250,000	Merthyr Tydfil	300,000	Verviers, Belgium	1,000,000
Croydon (2nd)	625,000	Middlesbrough	1,250,000	Vienna	3,500,000
Croydon (3rd)	625,000	Namur, Belgium	175,000	Vienna (2nd)	2,500,000
Croydon (4th)	550,000	Nelson	400,000	Waltham	400,000
Debreczin, Hungary	100,000	Newburgh, N.Y.	600,000	Wandsworth & Putney	1,800,000
Deventer, Holland	150,000	New York	5,200,000	Watford	300,000
Deventer (2nd)	200,000	Nictheroy, Brazil	250,000	Watford (2nd)	350,000
Dorking	150,000	North Middlesex	150,000	Wellington, N.Z.	350,000
Dublin	2,000,000	North Middlesex (2nd)	200,000	West Bromwich	550,000
Dublin (2nd)	2,000,000	North Middlesex (3rd)	75,000	West Ham	1,500,000
Dublin (3rd)	650,000	Norwich	1,000,000	West Ham (2nd)	800,000
Dundee	1,500,000	Norwich (2nd)	300,000	Weston-super-Mare	350,000
Dunedin, N.Z.	150,000	Norwich (3rd)	500,000	Weston (2nd)	350,000
Dunedin, N.Z. (2nd)	275,000	Nottingham	1,000,000	Wexford, Ireland	100,000
Durham	200,000	Nottingham (2nd)	1,000,000	Wiesbaden, Germany	850,000
Düsseldorf, Germany	1,000,000	Nuneaton	125,000	Winchester	225,000
Eastbourne	1,250,000	Oberhausen, Germany	175,000	Winchester (2nd)	125,000
Edinburgh	2,000,000	Oldenburg, Germany	200,000	Wolverhampton	1,500,000
Epsom	225,000	Ostend, Belgium	100,000	Zwolle, Holland	200,000
Epsom (2nd)	300,000	Ostend (2nd)	200,000	Zwolle (2nd)	200,000
Falmouth	150,000				

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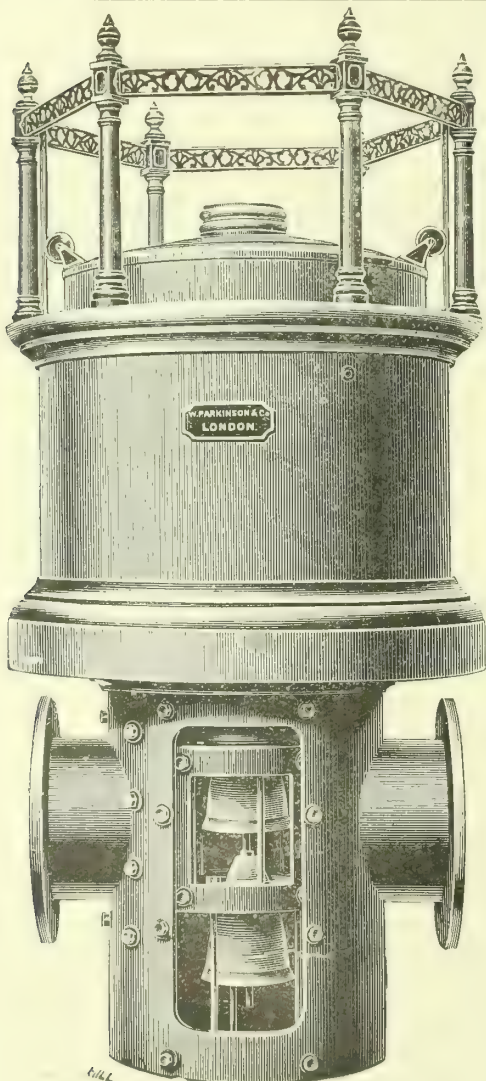
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VOL. CXI., No. 2464.—TUESDAY, AUGUST 2, 1910.

EDITORIAL NOTES—GAS, &c.

First Effects of the New Gaslight Conditions.

It may be regarded by some as being a little premature, at the close of six months' working of the enlarged Gaslight and Coke Company through the annexation of the West Ham Company's property and territory, and operating under the new Act (with the reduction of the illuminating power standard to 14 candles, as a partial offset to which is the calorific power standard), to say that the results of the working have proved the correctness of the Company's latest political changes. But to satisfy those who may be of that way of thinking, we will content ourselves by saying that the accounts for the past half year contain such substantial indications as to the wisdom of the policy—though there has not yet been time for more than preparatory work on the West Ham conditions—that we at any rate are exceedingly optimistic as to the future. For the purpose of enabling comparison to be made of the past half-year's results with those for the corresponding period of 1909, the revenue account figures of the then two separate Companies have been combined in marginal columns for the last-named period. This is useful, as otherwise a great deal of labour would have been entailed upon every individual who desired to make some contrast of the items—work that for all interested has been excellently done in the Accountant's Department of the Company. Taking the total figures first, the reductions in price that have been made in the old Gaslight area must be borne in mind. Before arriving at the totals, for the redemption fund there has been appropriated £10,000, for the reserve fund for the purposes of writing down the investment £10,000, and for the insurance fund £20,000; and if we turn to the revenue account, there is found a charge of £10,507 for retiring allowances under the Company's 1909 Act. The total balance is £430,150; and this when added to the amount brought forward gives £919,890 available for distribution. The payment of a dividend at the rate of £4 13s. 4d. per cent. on the ordinary stock will absorb £377,520, and thus leave £542,370 to be carried forward, which is £52,631 better than the sum conveyed into the half year.

There is no doubt that from the amalgamation we shall see several growing economies; but it will be difficult to bestow upon them any precise monetary value, seeing that concurrently the Gaslight Company are working to the reduced illuminating standard of 14 candles (which was the standard already existing in West Ham), though they have not been able to realize the full benefit of this lower standard through having to comply simultaneously with a calorific power standard. The new conditions and the improvement in manufacturing returns have to be rolled up together in considering the figures and savings. The quantity of coal carbonized during the half year was 922,779 tons, and the amount of oil used was 6,510,354 gallons, and of spirit only 42 gallons. The cost of the coal was £562,492, which is less by £61,746 than the two Companies paid in the corresponding period of 1909. Part of this saving is no doubt due to the reduced cost per ton, but not all—some being to the credit of enhanced yield per ton. On oil £59,107 was expended, which was a reduction of £38,226; and on coke and breeze for carburetted water gas manufacture £34,760 was spent, which is lower by £3311. The total of these three savings on raw material alone is £103,283. Notwithstanding, there was an increase of $1\frac{3}{4}$ per cent. in the quantity of gas sold; or, looking to the volume figures, the total sales were 12,375,374,000 cubic feet, which vast quantity represents an increase of 212,426,000 cubic feet—an amount alone equal to the total annual consumption of many a fair-sized town. This indicates an unbroken continuity of the tale of carbonizing improvement which commenced a few half years back, and of which more will, for certain, yet be heard. Still in the manufacturing depart-

ment, the items of salaries, wages, and purification all show declines in cost. On repair and maintenance of works £184,298 was spent, which is a diminution of only about £6000, and so does not contribute much to the reduction of the total manufacturing expenses (£962,110) by £117,270. This is an extremely gratifying feature of the accounts, though it must not be expected that the next two succeeding half years will come out so well, inasmuch as, though oil contracts have been made at satisfactory rates, the coal contracts have had to be entered into at somewhat higher figures than last year. Distribution expenses amounted to £313,534, which is an increase of £38,932; but we see that close upon £24,000 more has been spent on the repair and maintenance of mains and service pipes. Casting the eye down the other items of expenditure, it is noticed that the half-year's co-partnership charge is £12,798; making a total for the year of £25,799. The half year also bears a charge of £1387 in relation to the quinquennial revaluations; and, as previously mentioned, there is an entry of £10,507 in respect of retiring allowances under the Company's Act of 1909. In passing, it is also of interest to note a drop by £1558 to £8542 in the bad debts. The total expenditure was £1,571,048, which is a decrease of £68,546.

In considering the income side of the revenue account, it must be remembered that, in the corresponding half year, the Gaslight and Coke Company were charging by meter (other than for public lighting and under contracts) 2s. 9d. and 2s. 5d. per 1000 cubic feet; while in the past half year, the prices were 2s. 8d. and 2s. 2d. Therefore, notwithstanding upwards of 212 million cubic feet more gas were sold, the receipts for gas per meter were, with a total of £1,553,947, £13,605 less than in the comparative half of 1909. And if we include public lighting and under contracts, the total reduction in income from gas (£1,623,644) was £25,892. Though the expansion of the gas business was 212 million cubic feet, there was a decrease of rather more than 28 millions in the consumption for public lighting. It must not, however, be taken that this diminution in public lighting consumption is entirely due to displacement of gas-lamps by electric-lamps in the areas of Borough Councils who happen to control electricity supply undertakings, and who by-pass economy and efficiency in order to inflate the output of their own electricity stations. Part of the reduction is due to the growing use in the street lamps of the more economical inverted gas-lamp. Again, the lessening by 2935 of the total number of public lamps to 49,526 must not be entirely attributed to the wholesale absorption of the public lighting by Marylebone and other electricity ridden boroughs. Some of the reduction represents lamps of low candle power which have been superseded by fewer lamps of higher power. Of course, it must be acknowledged that the bulk of the loss is owing to the favouring of municipal electricity, and eschewing all consideration of the interests of the ratepayers at large, who are entitled to have the most efficient and most economical public lighting service, without any regard to the question of the ownership of the gas and electricity supplies. Passing on to the income from the rental of meters, stoves, and fittings, it is noticed that the total, £166,615, is up by nearly £3600. The revenue from residuals (£448,776) is better by £18,930—increases of a few thousand pounds being shown in every item. The total income was £2,244,268, which is a decrease of £3203. Having in view the large sum represented by a reduction of only 1d. in the price of gas in the case of a business of this magnitude, and having in view too the big decrease (£68,546) in expenditure, the reduction of £3203 in income may be looked upon as a mere bagatelle. The final result is that £673,219 is carried to the net revenue account, which is an advance of £65,342. It is a matter for congratulation that, with so much important change in the conditions of the Company, the computations of the Board as to the effects of their plans should have received this immediate tangible justification.

There is one interesting point as to the capital account. The outlay in the half year was £53,060; and the whole of

this, save £2915, has been laid out in the distribution department. Against the total of £53,060, £63,045 has been written off for depreciation of plant, meters, and stoves. The Board are wise in taking this course of solidifying the position of the Company. It is an aid in the protection of the future.

North British Presidential Address.

DUNFERMLINE gave the members of the North British Association a very hospitable welcome towards the end of last week; and this was unquestionably due to the position that Mr. Alexander Waddell, the Engineer and Manager to the Gas Commissioners, occupies in official and social capacities among his fellow townsmen. These, however, are matters that are dealt with in our report of the proceedings elsewhere. The technical work of the meeting claims attention here; but, in the first place, it is difficult to find much in Mr. Waddell's Presidential Address upon which to comment, as on all capital points one is in such complete accord with him.

The members met again under the shadow of loss, in the passing from the stage of life of Mr. Alexander Bell, whom the members revere as one of the fathers of the Association. There was in the address reference to this loss in well-chosen expression and sentiment. It was appositely followed by mention of the William Young Memorial Fund (the contribution to which the President regards as very satisfactory), and by a masterly appreciation of the life-work of that leader in thought, and labourer in the unravelling of chemical and physical problems. Most of us—the best and the most appreciative among us—are apt, with passing time, no matter how deeply a man has made impress on some particular line of work, to allow its value to fade from mind. But the members of the North British Association intend to keep green the memory of him who worked so intimately in conjunction with them, and gave them of the fruits of an exceptionally fine and fertile intellect. He worked with unremitting zeal, and brought a sharp penetrating capacity to bear on many questions appertaining to carbonization. We could welcome him now to assist in elucidating matters that are at the present time the subjects of hypothesis and theorizing. We want, for example, a definite explanation of the causes of the improved yields of gas, and other enhancement of result, from retorts worked after the most approved modes of the day. Those technicians who have thought over the matter have their own views; and the views are not all concordant. We saw this when Dr. Colman and Mr. Charles Hunt crossed swords at the last meeting of the Institution of Gas Engineers as to the sources of the increased yield, upon which point Mr. Waddell read an extract, practically *literatim*, from an editorial article in the "JOURNAL" dated June 21 (p. 773). From the section of the address dealing with carbonization, it is also gathered that the President's choice of vertical retort system has pronounced inclination towards the continuous or the continuous-intermittent, which, as our readers are aware, is a new development of Scotch conception, and about which we may hear more later from Glasgow and Edinburgh.

The President describes the coke-handling system that he has adopted to meet his special needs; and it strikes one, on such acquaintance as is permissible through the address, to be an economical and efficient plant in working. The greatest novelty in it is the cylindrical coke-quenching vessels, which no doubt have their disadvantages and compensating advantages. It can well be imagined that the length of time occupied in quenching in this manner is not the most economical; but the quenching being largely a matter of the deadening of the coke with self-generated steam from the water sprayed on to the incandescent material during its fall from the retorts into the quenching vessels, one can conceive an improvement in the coke compared with the depreciating treatment to which it is exposed by the usual drenching treatment. But the adoption of this system of deadening the coke was not with the view to its improvement, so much as to quench completely its effectual fires before depositing in the loading hopper; this being a matter of some importance where there has frequently to be prompt shipment.

Most engineers are having experience nowadays of high-pressure gas service to outlying villages; and Mr. Waddell is among them. An interesting experience of his in this connection is the distribution of gas in two villages at a pressure of $4\frac{1}{2}$ inches; and, using inverted burners, this

pressure is found satisfactory. In Mr. Waddell's opinion, sufficient consideration has not been given to the question of supplying to consumers gas at higher pressures than ordinarily; and, from his experience, he advances the view that with $4\frac{1}{2}$ -inch pressures in the street-mains, at least 90 per cent. of the complaints now received would not be heard of. The pressures of a past day in all well-ordered undertakings are not likely to be revived. With their increase down south, complaints have, it is true, diminished; but this gratifying condition has synchronized with the supply of a lower grade of illuminating gas. With the appreciation of the address expressed at the meeting we heartily concur.

Gaseous Fuel and Works' Costs.

THE two papers that were read at the meeting of the North British Association had a bearing one upon the other. This may perhaps be said of any two papers one of which deals with the sale and price of gas and the other with any plan or system that conduces to economy in the manufacturing department. The two papers now under observation were by Mr. J. W. Napier, of Alloa, and Mr. James Dickson, of Forfar—their subjects being respectively "Gaseous Fuel: The Duty of Gas-Supply Authorities to the Public," and "The Checking of Working Costs in Small Gas-Works." Among the managements of large, medium, and small works, there is an expanding view as to the desirabilities of the times. The formulæ of gas-works practices that were recited and acted upon in the past as being unimpeachably orthodox, have had to be remodelled to suit the circumstances of the day, though here and there there is survival through inaction, to the disadvantage of both undertakings and consumers. Mr. Napier speaks of the duty of gas-supply authorities to the public. The phrase is good as it stands; but in respect of the term "public," there can be substitution by the term "undertaking." There is an all too narrow view among many gas-supply authorities as to what are the full functions of the undertakings under their charge; and if they would look broadly at their position from this standpoint of functional ability, they would soon be striving to the goal of maximum duty to the public. A gas-works should be the central station for gaseous fuel, at a commercially competitive price, for lighting, for heating, and for power; and these branches of the business should be severally developed on the broadest possible lines, each directed by the nature of the competition it has to meet.

In considering the subject of duty, Mr. Napier narrows it down to duty from the aspects of prices and facilities for developing the heating business; and he keeps severely off that—for Scotland—very controversial, but still cognate, question of low-illuminating grade gas for heating purposes. In our view, this question to-day is inseparable from any discussion of gaseous heating and gas prices. And it is inseparable from the question of the development of the highest efficiency of heating appliances and of gas-engines. "Gaseous Fuel" is the main title of the paper; and a gas that is very rich in illuminating hydrocarbons is not the best "gaseous fuel," through the impossibility of getting a proper admixture of air and such gas. We want the right gas to meet the largest proportion of the uses to which the gas is put. And for these uses the richer the illuminating properties of a gas, Professor Hopkinson and Captain H. Sankey have told us, the greater the liability to incomplete combustion, to carbon deposition, and (in engines) to pre-ignition. And so, within limits, we have it that a gas that is of lower grade than that usually supplied in Scotland, is not only more efficient for the purposes of the present day, but it follows that a reduction from those high-grade illuminating powers must result in various manufacturing economies—through the abolition of enrichment, and the opening-up of ability to produce more gas per ton of coal carbonized—that it is the "duty" of gas-supply authorities to realize for the benefit of the public and of the gas undertakings they control.

Alloa has done extremely well for the public, and yet a high illuminating power gas is supplied. Alloa might do better still for the public in the matter of efficiency and price, if a lower illuminating grade gas were distributed. The price of gas is admittedly low; the average consumption per consumer, both ordinary and slots, is good. The proportion of ground unoccupied for lighting is diminishing through increase of occupation and competition; the point of saturation has almost been reached for cooking; gas is supplied for power at 1s. 4d. to 1s. 10d.; and so suction gas

is foreign to the town. The open field is gas-fires; but it is a question of price. In this field there is a commercial asset of such practical value to gas undertakings, and of considerable benefit to the public, that it should spur up an immediate endeavour to win it. That is the view of Mr. Napier; and he would have a differential charge for heating—1s. 6d. to 1s. 9d. according to quantity consumed—with a second meter (meter manufacturers should note his opinion that there is something better wanted in this way). He would also fix heating apparatus free, and give the consumers the opportunity of hiring, hire-purchase, or purchase outright at net cost. Now the differential price with additional meter seems a circuitous course for Mr. Napier to follow to gain his end. He has, we find (this accounts for the prices of gas in the town), a low capital per million cubic feet; and the charges for gas are low. Considering these favourable points, we should incline to the belief that his shortest cut to a commercial figure for heating purposes would be by a reduction of the illuminating quality of that unnecessarily high grade gas that he is still supplying. There must be considerable latent economy in this direction, recovering which would be of service not only in developing the heating business, but in giving a means of greater efficiency to the users of incandescent burners, cooking-stoves, industrial heating appliances, and gas-engines.

It is in the interests of economy, too, with the view to small gas undertakings rendering the maximum possible duty to the public, that Mr. Dickson wrote his paper on the "Checking of Working Costs in Small Gas-Works." But it is impossible to keep a day-by-day check on working costs without a systematic day-by-day record. Such a systematic record means a little additional trouble; but it pays. And in keeping such a record in small works, it is only the start that is a little irksome. Afterwards, when the work has got into proper swing, it becomes an easy matter. It is only by comparison of the working figures in each department day by day that one can put his finger on the places where there is a falling away from the best previously achieved. Knowledge of any retrograde movement enables the reason to be at once inquired into, and a check placed on the excess. There is in such system the secret of permanent working economy; and the means of ascertaining the directions in which to search and work for further savings. In small undertakings where the opportunities are not so great for development as in larger ones, it is quite as important as in the latter that the best method should be available for keeping a strict surveillance on the working, and that nothing should be left to chance. The paper is indicative of the many places in administration and working where there can be losses and gains, and therein Mr. Dickson's studious effort is valuable to the manager of the smaller undertakings. The application of system to the obtaining and maintaining of economy cannot fail to influence working costs; these in turn influence the prices charged for gas; and the lower the prices of gas, the greater the range of opportunities for business. The cycle of advantage is reproduced in the expansion of business; for business expansion brings beneficial influences to bear on working costs and standing charges. From all points of view, the author's method of advocating the checking of costs (which is only another way of saying checking waste) in small gas-works is admirable, and will carry weight, as there can be nothing but commendation of any system that promotes a clear survey and strict oversight of manufacturing operations.

Stand-By Clause Successes.

WE are glad the Warrington Corporation succeeded in retaining in their Bill (*ante*, p. 274) stand-by clauses in the form secured by the Heywood Corporation in their Act in the session of 1909, despite the preference of the Home Secretary for the Mountain Ash model, which has been reproduced in the present session in the Rhondda District Council Bill. A clause, giving the right to levy a charge covering the expenses entailed in making stand-by provision for meeting the maximum possible demand, can now be had by gas suppliers from Parliament for the asking—Government Departments and Committees having been converted to a recognition of the right of gas suppliers to protection similar to that so freely accorded for years past to all electricity suppliers. The granting of such clauses again this session, without any objection to the principle, is the confirmation of the foregoing assertion. Although the Heywood and (now) Warrington clauses are a little more extensive than

the Mountain Ash and Rhondda clause, we much prefer them, inasmuch as they include electricity as well as producer and suction gas, and define the limit of the standing charge that may be imposed, instead of—as in the Mountain Ash clause—leaving open to agreement or arbitration (which might result in endless disputes) the amount of the minimum annual sum to be paid. There is an uncertainty about this that there is not about the Heywood form of clause; and the manufacturer (in the absence of a specified limit) would no doubt more often than not think the gas suppliers were, in their demands, acting in an unreasonable, an arbitrary, and a retaliatory spirit. That is not a feeling the gas industry desire to do anything, even unintentionally, to foster; but they do want manufacturers to see and to understand that business considerations and equity give gas suppliers a right to recompense on money expended by them in safeguarding and assisting manufacturers. For the reasons stated, we prefer the Heywood clauses to the Mountain Ash form; and the Local Legislation Committee have, in the Warrington case, agreed, though the Home Secretary regards the Welsh precedent as more suitable for general adoption. Perhaps, however, on further consideration being given to the matter, he will be prepared to accept the Heywood version as providing full and sufficient protection for gas suppliers, and at the same time narrowing the scope for disagreement with the manufacturers.

Standard Burner Bills.

After repeated appearances of the notices in the parliamentary papers last week, the third reading of the Standard Burner Bills has been postponed to the Autumn Sitzings of the House; and the formality is now entered for Nov. 15. This deferring of the completion of the course of the measures is to be regretted; but the customs of Parliament and the opportunities for opponents to indulge in procrastination have to be borne, however much they may be disliked, by those concerned. But this fact need not be allowed to stand in the way of early preparations being made for a further promotion next session. Eleventh-hour obstruction, by irritated local authorities and business competitors, cannot deprive the gas industry of the triumphant successes of the Bills up to this point, and the unanimous verdicts of Committees of both Houses of Parliament.

South Metropolitan Accounts.

Through going to press earlier owing to the claims of Bank Holiday, we are unable to editorially notice in this issue with usual fulness the half-yearly report and accounts of the South Metropolitan Gas Company; but we publish them elsewhere, and will revert to them next week. Meanwhile, we may say that the proprietors will have the opportunity to again heartily congratulate the "co-partners," from the Chairman (Mr. Charles Carpenter) throughout the ranks of officials, staff, and workers, on the financial and manufacturing results of the half year. The profits will admit of the full statutory dividend of £5 9s. 4d. per cent. being paid. In the class of 4 per cent. consolidated ordinary gas stocks, this dividend, we should think, stands at about the head, if not at the very head. Regarding the financial result, the price of gas is 1d. lower than it was in the corresponding half of last year; and the dividend is 2s. 8d. per cent. higher. Nevertheless, the Company will be carrying forward a surplus of £12,932 from the profits of the half year, which is practically the same amount as the surplus yielded by the profits in the preceding half year. The result is that, the accumulated surplus of profit brought into the half year being £79,627, there will be carried out a surplus of £92,559. We should have to go back many years to find the equal of this. But with excellent reserves in their possession, the Company have never pursued the policy of holding large undivided balances, but have always, at the earliest opportunity, having regard to prospects, given the greater part of the surpluses to the consumers. The report and accounts show that the continued improvement in the financial position has largely to be credited to the carbonization department.

Lethal Qualities.

What was termed a "mystery" in June, but did not seem to us deserving of the description with the known facts at the time, has now been definitely cleared up. This was the Long Acre poisoning case, which the newspapers led the public to think

until corrected, was due to escaping coal gas. Several families were placed in a more or less precarious condition, eleven persons had to be removed to hospital, and they suffered considerably. With as little fuss as possible, the Charing Cross (West End and City) Electricity Supply Company lifted no less than 150 feet of fused cable from the roadway, and replaced it by new. This change was referred to in the "JOURNAL" for June 14 (p. 679). The bitumen of the fused cable was found in a molten condition, and giving off fumes, which the evidence assured could be seen, smelled, and tasted. This was the "gas" that did the mischief by percolating through the ground, and finding entry into the neighbouring houses. It was fortunate for the persons affected that the danger they were in was discovered so early. A canary succumbed; and *post mortem* examination of the bird satisfied Dr. Mott of the Charing Cross Hospital that the symptoms were those of carbon monoxide poisoning. During the beating of the big drum by "Metalite Limited," before issuing their prospectus, when speakers and lay representatives of the Press were under the influences of a generous lunch provided at the expense of the Company promoters, something was said as to the lethal qualities of coal gas! The report to the Holborn Borough Council on the Long Acre affair had not then been issued. The Council are sensible of the seriousness of the danger of cable-fusing, and are urging the Local Government Board to take such action as may be necessary to prevent a recurrence of similar mischief. The Board will be pleased.

Commencing Loan Repayments.

When the Bill of the Fylde Water Board was before the Chairman of Committees of the House of Lords a few days since, there was some discussion as to the period at which loan repayments for new works should commence. The Board were desirous of not being under any obligation to begin the repayment until the conclusion of the construction of the works, or alternatively at a period of seven years from the passing of the Act. Purchase of lands, construction of a covered service reservoir, a water-tower, an equilibrium basin, and road diversion are likely, according to estimate, to cost £140,000; and aqueducts, high-level mains, and extension of existing mains, an additional £12,000. The works are required for the supply of Blackpool, Fleetwood, Lytham, St. Annes-on-the-Sea, and other Lancashire places. Under the most favourable circumstances, with the period for repayment postponed, it is anticipated there will be a deficit in revenue, starting from 1913, which will in following years require a rate-in-aid of 2d. in the pound from the four urban districts served. The Board did not get all they wanted in regard to the matter of deferring repayments—the Lord Chairman considering that if they were granted five years from the passing of the Act as the date for commencing repayment, the circumstances of the case would be fully met.

The Burden of the Rates.

The agitation on the subject of the burden of local rates, which was referred to in last week's issue, appears to be spreading; for a conference convened by the Leeds Corporation has now been held, at which practically all the county and municipal authorities of Yorkshire were represented—showing, as the Chairman (Alderman C. H. Wilson) remarked, that the whole county had risen against an intolerable state of affairs. The object was similar to that of the Preston gathering—to protest against the manner in which the Legislature has placed upon county and borough councils the responsibility for services wholly or largely national, without increasing the contributions made towards the cost from the Imperial Exchequer. In proof of the way in which the burden of local rates really has increased, the Chairman quoted from a memorandum on the subject prepared for the Association of Municipal Corporations. In this it was pointed out that, during the period of twenty-two years from 1867-8 to 1889-90, the amounts of rates raised increased by only 5d. per pound of valuation, and 4s. 3d. per head of population; whereas in the period from 1889-90 to 1905-6—which represented sixteen years only—the increase amounted to 2s. 5d. per pound of valuation, and 14s. 7d. per head of population. Five causes, he said, were set down as being the reasons of this increase; and the one of which they chiefly complained was the imposition of new duties on local authorities, without corresponding contribution towards the cost of them from the Imperial funds. The need here shown for revising the present system, was also pressing in

regard to education. Towards the latter service, the Government at one time contributed something like 75 per cent. of the cost, while now they contributed hardly 45 per cent.; and the difference had to be made up by the local authorities. As the outcome of an interesting discussion, the resolution which found favour was in the following terms: "That, having regard to the fact that the expenditure by local authorities upon education and other services wholly or partially national in character has in recent years increased out of all proportion to the contributions from the Imperial Exchequer, and that, notwithstanding this inequality, the Legislature is annually imposing further duties upon local authorities involving additional charges towards which no provision is made for adequate grants in aid, this conference is of opinion that it is imperatively necessary that the financial relations between the Imperial Exchequer and local authorities should be revised at the earliest possible date, and that in the meantime provision should be made for a substantial measure of relief in the Finance Bill now passing through Parliament."

A Question of Procedure.

The affairs of the North Bromsgrove Urban District Council have lately had shed upon them a somewhat stronger light of publicity than that to which they are perhaps usually accustomed. The cause of this has been a dispute which in due course found its way into the Law Courts. The facts were fairly simple, and though doubtless a little outside the ordinary course of events, they, together with the outcome, may merit brief notice. From the statement of the case which appeared in "The Times" law reports, it appears that all the members of the Council went out of office in April last, in pursuance of an order of the Worcestershire County Council, made under a section of the Local Government Act of 1894. A new Council were elected, and held their first meeting four days after the dissolution had taken place. The twelve members of the Council, on the occasion of this meeting, were equally divided, and it was found impossible to agree on a Chairman. However, one of the newly-elected members, a Mr. James, who was the Chairman of the previous Council, offered to preside over the meeting, so that a Chairman could be appointed for the ensuing year. One member objected to this course; but the Clerk advised that it would be legal, if Mr. James was not himself a candidate for the chairmanship. Accordingly, Mr. James acted and when the voting was equal, he gave a casting-vote in favour of one of the candidates. Thereupon objection was taken that, under the circumstances, the appointment could not stand. The point of law which came on for argument was whether Mr. James was entitled to take the chair at the meeting, and as Chairman to give a casting-vote. The judgment of the King's Bench Division was to the effect that Mr. James had no power to act as he did. The Lord Chief Justice said that the question raised was one of considerable difficulty. As all the members of the old Council went out of office, there was *prima facie* no right for any one to enter the room except those who had been elected to the new Council. It had been urged that Mr. James had a right to preside at the meeting, as he had been Chairman of the Council for the previous year; but the inherent or implied rights to act as Chairman depended on membership of the Council, and if Mr. James had not been elected a member of the new Council he would have had no right in the room, unless he had been a Chairman elected from outside, under the Local Government Act of 1894. While admitting that it was unfortunate that there was no statutory provision, in the case of District Councils, continuing the Chairman in office until his successor was appointed, his Lordship pointed out that all the powers of the old members ceased when they went out of office in April; and the first act of the new Council should have been to elect a Chairman of the meeting.

The German Association Visit to England.

The Secretary of the Institution of Gas Engineers (Mr. W. T. Dunn) sends the following information: The visit of the German Association of Gas and Water Engineers to Great Britain, which was postponed on account of the death of King Edward, has now been arranged to take place during the week commencing the 2nd of October next. The visitors are to be the guests of the Institution of Gas Engineers, the Gaslight and Coke Company, the South Metropolitan Gas Company, the Croydon Gas Company, and the Corporations of Edinburgh and Glasgow respectively, of which latter city the Engineer of the Gas Department (Mr. Alex. Wilson, M.Inst.C.E.) is now the President of the Institution of Gas Engineers.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 354.)

THE Stock Exchange has had a short but a somewhat exciting week; showing how sensitive markets are, and how quickly and unpreparedly they can undergo an almost revolutionary change. The opening day was very dull all round, depressed by the liquidation which marked the latter part of the previous week and which now continued. The American and South African Markets were the chief sufferers; but others shared. Gilt-edged securities were lower, and Consols fell $\frac{1}{4}$. Rails were weak, and nervousness about further strike troubles made them worse. Dividend announcements, too, were not quite satisfactory. Foreign were weak on Continental selling. Tuesday was the beginning of the settlement—an anxious affair, having regard to the prevalent weakness. Prices in general shrank under liquidation; and there was much depression in speculative lines. On Wednesday came the extraordinary change. The American Market then turned completely round, and was buoyant and cheerful. The Continental selling suddenly ceased, and buying was the order. All departments felt relief from the strain. Consols advanced, and, with some good dividend announcements, Rails had a smart rise. On Thursday, the joyful recovery was well maintained, and prices in most lines continued to advance. With only one more day—the Exchange was closed on Saturday—business became very quiet on Friday. But the week closed well with undiminished strength, and satisfaction that the settlement had gone through so much better than was expected. In the Money Market there was extreme ease. The supply continued abundant, and discount rates relaxed. Business in the Gas Market was moderate—about a fair average for the season. Everything was very firm, and a few quotations advanced. Accounts for the half year to hand up to date should be satisfactory to shareholders, especially where increased dividends are announced. In Gaslight and Coke issues, the ordinary was very firm at from 105 $\frac{1}{2}$ to 106 $\frac{1}{4}$, the half-year's accounts showing out well. In the secured issues, the maximum made from 89 $\frac{3}{4}$ to 90 $\frac{3}{4}$, the preference from 104 to 105, and the debenture 80 $\frac{1}{2}$ and 81. South Metropolitan was quiet and firm at from 122 to 122 $\frac{1}{4}$. The debenture made 80 $\frac{1}{2}$. In Commercials, the 4 per cent. changed hands at 108 $\frac{1}{2}$ free. Among the Suburban and Provincial group, Alliance debenture was done at 97, Brentford "old" at 253, and Tottenham "B" at 115—a rise of 1; but the "A" stock rose 6. Both the Tottenham and the Wandsworth Companies announced increased statutory dividends. In the Continental Companies, Imperial was steady at from 179 $\frac{1}{2}$ to 180 $\frac{1}{2}$, ditto debenture realized 94, and European fully-paid 24. But Union changed hands at 91 and 91 $\frac{1}{2}$ —a fall of 2 $\frac{1}{2}$. Among the undertakings of the remoter world, Monte Video was marked at 12 $\frac{3}{8}$, Primitiva at from 7 $\frac{1}{4}$ to 7 $\frac{7}{8}$, ditto preference at from 5 $\frac{1}{4}$ to 5 $\frac{7}{8}$, ditto debenture at 97 $\frac{1}{2}$, and San Paulo at 16 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Microscopic Profits and the Assessment of Undertakings—Horrible Sufferings and Holocausts—The "Safety" of Electricity—Life of Metallic Filaments—A "Special" on Outdoor Lighting—Relation of Current Saving and Candle Power Diminution.

NOTICE was recently taken in the "Memoranda" of the deficits and narrow profits of several municipal electricity undertakings during the last financial year. The Bermondsey concern is one in whose fortunes all gas men should be interested, because this is the one in connection with which the Bermondsey clause—the forerunner of the Northumberland clause—had its origin. This piece of municipal speculation on the part of Bermondsey has not had a happy result. There have been big deficits, and no provision of proper financial reserve; and the concern has been favoured by being under-assessed. Last financial year, a "surplus" of £43 was made; and the Finance Committee are anxious as to the future. Over surpluses, however small, upon electrical undertakings, there is, on account of their rarity, great rejoicing in some municipal circles. But small surpluses are dangerous—a little change in condition in the next year may turn them into losses. The price of coal, for instance, has only to go up a few pence per ton to make a considerable difference in the ultimate financial result. The Bermondsey Borough Council Finance Committee recognize this. They consider the prices being charged for current altogether too low, and adjure the Council to be careful as to how the undertaking is worked in the future, more especially with regard to incurring further liability by way of loan. The undertaking is likely, too, to have to pay more in rates in future. It is not the only municipal concern of the kind in the country that is under-assessed. The present assessment is £2693 gross, and rateable £1796; while under the quinquennial valuation the figures have respectively been raised to £3399 gross, and £2266 rateable. The London County Council are objecting to the quinquennial valuation—not on account of its increase, but because it has not gone high enough. They claim a correction to gross value £8000, and rateable value £3000. The Borough Council do not like this. But there has been too much favouring of municipal electricity undertakings in the past in the matters of assessments and rates; and it is high time that they, like gas and other businesses, paid their fair proportion towards govern-

mental expense. The unfortunate thing is that good conduct in this respect may mean a bad presentation as to surplus profit when the annual accounts are next issued.

The "Electrical Review" is never so good at nerve-racking as when dealing with the lighting of trains by incandescent gas-burners. It has always been so; and a sort of morbid love of the thing seems to have taken permanent possession of it. It has just returned to the charge; and speaks of "horrible sufferings," of persons being "burnt to death" in sight of their friends, and of "terrible holocausts" in the event of accidents when a few cylinders of compressed gas are carried underneath trains for lighting purposes. Our contemporary has, of course, never heard of all these things happening in connection with trains that are not gas-lighted. While it is in the frame of mind, we should like it to quote the "many instances on record" in this country in which there have been these "horrible sufferings" and "terrible holocausts" due to the cause to which, through blind electrical bias, it chooses to assign them. Electricity is an illuminant that is, in the eyes of the ill-informed "Review," free from the dangers of gas. On the very day that the paper was treating its readers to the above-quoted examples of its fulminatory power, the eye happened to alight on a message from Paris, published in the daily press, which stated that "the inquiry into the loss of the *Pluviose* appears to have established beyond doubt that a fire occurred on board shortly before the collision owing to an electrical short-circuit, and that all on board were asphyxiated, not drowned." We will not enlarge upon the "horrible sufferings" of the men on board. There is recollection, too, of a "terrible holocaust" about last Christmas time at Clapham that the "illuminant that is free from the dangers of gas" was adjudged to have occasioned. Information was published last week, too, as to the Long Acre "mystery," reference to which is made in an earlier column. On Wednesday a fire occurred at the Earl of Portsmouth's residence in Mansfield Street, the origin of which was distinctly traced to electric wire fusing. We at one time thought the "Review" had arrived at years of discretion. Perhaps it has, and has left them behind.

While editorially our electrical contemporary does not recognize any danger from electricity, one of its correspondents does, for he writes: "For every accident of a less serious nature which is reported to the Board of Trade, and included in the statistics issued by the Home Office Inspector, it is safe to say that there are many which are not so reported, either because they occur on private premises, or because they are of such common occurrence as to be disregarded. This applies with full force to accidents in connection with fuses, which result in the attendant sustaining burns or shock of greater or less severity. The damage to apparatus, switchboards, buildings, &c., occasioned directly or indirectly by ineffective fuses, remains for the most part unrecorded, and often undiscovered at the time, or is attributed to another cause." In a later column, there is a quotation from the "Electrical World," which states that a fire recently occurred in a show window of a store in Chicago. A 40-watt tungsten lamp was hanging in the window in the ordinary vertical position, and attached to a standard fixture in the usual manner. Ten feet below it, on the floor of the window, was a mass of ladies' dress goods. In some manner the socket of the lamp suddenly broke, perhaps due to a short-circuit. The bulb fell on the textile fabric beneath, and set it on fire. The contents of the window were burned or badly damaged. The wiring leading to the lamp, when afterwards examined, was found to be quite right, and there was a 6-ampere fuse in the circuit. "It is rather remarkable that the bulb could drop 10 feet through the air, and still retain enough heat to set fire to the cloth beneath." The exact cause of the supposed "short" in the socket is unknown. There is nothing so safe as electricity—within the pages of electrical papers and central station advertising literature.

Advances are being made in respect of human longevity. Hardly a day passes now without one reads about some individual who has scored a century in age, and is still in possession of his or her full faculties. But in this matter of longevity, the human race must bow to the metallic filament lamp. When these lamps first came on the scene, a few hundred hours' life was spoken of; then it got to 1000 hours; and there has been progressive tendency in this way, until in the Metalite Company's prospectus the other day there was talk of a London Electricity Company having had thirteen lamps running 2226 hours, and of these on June 17 four were still burning efficiently. Why was not a statement made as to whether any of the four were still running a few days before the issue of the prospectus on July 24 and 25? But the Metalite Company must step aside to allow a superior lamp to take precedence. Mr. Byng, the Chairman of the General Electric Company, Limited, the makers of the Osram lamp, told the shareholders the other day the old, old "story" of how that wonderful invention had reduced the cost of electric lighting to less than that of gas, and then went on to say thousands—not paltry hundreds or dozens, but thousands—of Osram lamps were in use to-day that had burned over 6000 hours. How users of electric lighting wish they could confirm these thousands of hours' use as average figures applying to daily practical conditions. But they know, and those who quote the tall figures know, that they cannot. But after saying this, we are doubtful as to whether our electrical friends will believe us when we state that we have still in use some of the first bijou inverted burners made by the New Inverted Company years ago, and they have only very occasionally required the renewal of a mantle—not complete replacement of the whole burner, which burner cost initially less than the Osram, Metalit

or any other metallic filament lamp, the whole of which has to be renewed when its work is done.

The staff of the "Electrical Times" will no doubt be gratified to think that we remember their special effort last year in bringing out a special domestic electrification number. According to that issue, the electrical industry was then equipped with all that was required in appliances and in low costs for current to oust gas from every field that it occupies. We recollect the issue, electrical engineers also remember it, as a splendid example of bluster and misrepresentation. We had the courage at the time to properly describe the issue; electrical engineers received their copies, smiled bland and copious smiles, and said nothing except *sub rosa* among themselves. They were advised then by the "electrification number" to go up into Mount Pisgah, and view the land flowing with milk and honey. As we pointed out at the time, it was from Mount Pisgah that "Meteor"—or was it Moses?—took his first and last view of the Land of Promise; and the suggestion was also made in the "Memoranda," that the writer who advised a trip up Mount Pisgah should read an account of the modern conditions of the Promised Land. Nearly a year has sped its course; and domestic electrification has not made much progress in the land flowing with milk and honey—flowing with milk and honey though, it is calculated, 90 per cent. of the lighting business is in the hands of the gas industry, and a matchless trade (apart from solid fuel) is being done by it in the cooking, heating, and industrial lines. Now the "Electrical Times" is canvassing for material for another big issue, to see the light of day during the autumn. This time the "special" is to be devoted to outdoor lighting—street, frontage, sign, &c. The intimating circular is highly interesting, and prepares us for what we are to expect. In it we read—

Thanks to the modern arc and wire lamps, we have a stronger case against gas than ever before; and we desire, in our special issue, to collect all the available "powder and shot" for a campaign to capture more of the outdoor lighting in this country. We hope to present a valuable body of information and arguments that will help station engineers to secure more business in the immense and profitable field of external lighting. We intend to give particular prominence to street lighting, in order to supply a counterblast to the isolated and widely advertised "victories" of gas in Regent Street and elsewhere. With this object we shall be grateful if you will fill up and return the enclosed form. If there are any points that you would specially like to see dealt with, kindly let us know. We welcome suggestions, and shall doubly welcome any further information you may be able to send us. Thanking you in advance for your courteous assistance.

There are a good many "we's" in the communication. The term "isolated" is quite good as applied to the plurality suggested by "victories" in Regent Street and "elsewhere." The "Electrical Times" welcomes suggestions. We suggest the publication of the report on public lighting of the City deputation *in extenso*, the reports of recent discussions on public lighting in the Westminster City Council, information as to the contracts entered into at Bethnal Green and Hackney, also as to the latest London success at Finsbury. Particulars as to the action taken, after the Gaslight and Coke Company's tendered figures have been published, in submitting revised or new prices for electricity. If there is room in the special outdoor issue, the Editor might also for guidance indicate in some way whether or not, where there have been electrical "victories" in street lighting, the electricity supply undertakings are controlled by the local authorities; the price at which current is supplied for the purpose; and works' costs and capital and other charges per unit of electricity sold. These are a few suggestions; and we accept "in advance" the thanks of the Editor of our contemporary for our "courteous assistance." There need be no further acknowledgment.

We are told that this is an age of electrical novelty-mongering; and that from the novelties which are opposed to simplicity, to cheapness, and to efficiency, a great deal of harm is likely to arise to the electricity industry. "Meteor" of the "Electrical Times" feels very sore over the subject; and he has our profound sympathy, because we recognize fully that the difficulties of the electrical industry in pushing out their borders in the domestic electrification field are so great that it does not want these difficulties increased from within. There are regulating switches, resistances, &c., in connection with which, in the endeavour to satisfy that terrible craving in the electrical industry for profits, statements are made that are prejudicial to the cause of electric lighting in general, inasmuch as the statements are utterly fallacious. We are on quite good terms with "Meteor" in this matter, because there are several things that have lately been said in the electrical industry that are "utterly fallacious." But the matters of which "Meteor" complains all arise from the "glare" of the metallic filament lamp, to reduce which "the well-meaning young men who push such apparatus" advocate the use of regulating switches and similar devices. "The Times" has had a paragraph on the subject, in which the chief harm lies in making what appears to be a general claim that "electric lamps may be lighted brilliantly or otherwise as may be desired." "Meteor" waxes in wrath. "To use metal filaments thus would obviously wipe out their advantage over carbon filaments, and impede progress wherever such methods were adopted. The candle power falls much more rapidly than the current; and, to correct yet another fallacy, even a 12½ per cent. 'saving' in current involves far more than 12½ per cent. 'saved' in candle power. It means, for instance, that a 50-candle power lamp would merely be giving something like 30-candle power if of tungsten, and less if of certain other metals."

THE GASLIGHT AND COKE COMPANY.

THE following is the report on the working of the Company during the six months ending June 30, which, with the accounts (an abstract of which appears on p. 343), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £10,000 towards the redemption fund (in accordance with the provisions of the Company's Act of 1903), and contributing £10,000 to the reserve fund for the purpose of writing-down the investment, and £20,000 to the insurance fund, there remains a balance of £430,150 13s. 9d. The amount brought forward from the West Ham Company and this Company for the previous half year being £489,739 17s. 9d., there is a total sum available for distribution of £919,890 11s. 6d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum, which will absorb £377,520 7s. 8d., and leave the sum of £542,370 3s. 10d. to be carried forward to the credit of the current half year.

This is the first half year in which the accounts include the West Ham Gas Company, the amalgamation of which with the Gaslight and Coke Company duly took effect on the 1st of January last.

The sales of gas for the half year show an increase of 1½ per cent. compared with the quantity sold during the corresponding period of 1909.

There has been an increase during the six months of 12,835 consumers, and of 20,057 in the number of gas-stoves sold and let on hire.

The Directors have to report that they have entered into coal contracts at somewhat higher prices than last year. But they are pleased to add that the residual market shows improvement; and this should materially help to meet the increased cost of coal. Contracts for oil have been made at satisfactory prices.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distributing Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

CORBET WOODALL, Governor.

Horseferry Road, S.W., July 19, 1910.

SOUTH METROPOLITAN GAS COMPANY.

THE following is the report of the Directors of the Company for the six months ended the 30th of June, which, with the accounts [see p. 344], will be presented to the proprietors at the ordinary half-yearly meeting on the 10th inst.

The profit of the half-year's working provides for payment of the sliding-scale dividend at the same rate as before—viz., £5 9s. 4d. per cent. per annum—and leaves an increase in the surplus of £12,932 to carry forward. This result may be considered satisfactory, when it is borne in mind that gas is 1d. per 1000 cubic feet cheaper than it was a year ago. This reduction means £52,000 a year to users of gas in the Company's area.

Unfortunately, however, coal is costing more under the new contracts, apparently from no other cause than the disturbing effect of the Coal Mines Regulation (Eight Hours) Act. The proportion of the increase in cost which must come out of the pockets of the Company's consumers is about £40,000 per annum. The Act has been productive of great dissatisfaction in Northumberland and Durham, from which district the requirements of the Metropolis are mainly obtained.

The Port of London Bill, when it passes, will entail another hardship on the users of gas produced from seaborne coal. By the Bill, the rate to be levied (which may amount in this Company's case to £10,000 a year) will be applied mainly to the increase of dock accommodation, which will be of no benefit to the Company. Your Directors strenuously urged the unfairness of taxing to this extent a necessity such as coal; but they regret to say their endeavours met with no success.

It is more pleasing to turn to the manufacturing results, in which continued improvement has to be reported. The quantity of gas sold per ton of coal has now risen to 11,543 cubic feet; consequently a slightly increased demand for gas has been met concurrently with a reduction in the coal carbonized at the rate of over 50,000 tons per annum. The receipts from breeze and tar remain the same; those from coke are rather lower; while there is a distinct improvement in the item of ammonia. On the other hand, the cost of works repairs has considerably increased, mainly by reason of heavy renewals of coal-handling machinery at the Rotherhithe and East Greenwich works. Part of this outlay has already been justified by the reduced cost of carbonizing wages. Most items of "distribution" charges are heavier; but the money has been well spent in providing for the ever-extending requirements of the consumer.

The co-partnership continues its useful course, and much of the success with which the Company has been able to meet the obligations of increasingly competitive times is undoubtedly due to the loyal devotion given by the officers and workmen of its staff.

CHARLES CARPENTER, Chairman.

709, Old Kent Road, S.E., July 27, 1910.

PERSONAL.

Mr. HENRY BUTTERFIELD, who for the past 6½ years has been Gas Engineer and Manager to the Silsden Urban District Council, has obtained the appointment of Manager of the Swadlincote Gas-Works, in succession to Mr. G. B. Smedley, for which applications were invited in the "JOURNAL" a few weeks ago.

Mr. JOHN M. SMITH, Joint Manager with Mr. S. Dickie of the gas-works of the Dumfries Corporation, has been appointed Engineer and Manager of the Stirling Gas Company, in succession to his brother, who, as readers are aware, is moving to Belfast. Mr. John Smith obtained his position at Dumfries on the death of Mr. George Malam about four years ago.

In the "JOURNAL" for the 21st of June, we announced the death of Mr. Benjamin Haynes, the Secretary of the Stretford Gas Company; and in the issue for the 12th ult. an advertisement appeared inviting applications for the appointment. There were upwards of 600 responses; and they were first reduced to 100, and finally to seven. The vacancy has now been filled; the successful applicant being Mr. WILLIAM BLUNDELL, of the Gas Department of the Stockport Corporation, and formerly engaged in the Southport Gas Department. In connection with this appointment, it may be mentioned that Mr. H. KENDRICK, who was originally Engineer of the Company, is now Engineer and Manager.

Mr. F. L. WIMHURST, youngest son of Mr. Henry Wimhurst, of Sleaford, has been appointed by the Newcastle-under-Lyme Corporation General Manager to their gas undertaking. There were about 200 applicants for the position, and these were reduced to six, who attended before the Gas Committee on the 19th ult., with the result stated. The successful applicant served his articles with Messrs. R. & J. Dempster; and he was placed on their engineering staff. He was subsequently appointed Assistant to Mr. J. H. Troughton, the Manager and Secretary of the Newmarket Gas Company; but he has been for nearly eight years Assistant Engineer and Works Manager of the Cambridge Gas Company, under Mr. J. W. Auchterlonie. He will take up his duties at Newcastle (Staffs.) on the 1st prox.

Prize Winners in the City and Guilds Examinations.

In recent issues of the "JOURNAL," lists have been given of the candidates who passed the last examinations in "Gas Engineering" and "Gas Supply" in the Department of Technology at the City and Guilds of London Institute. We have now received from the Superintendent of the Department (Sir Philip Magnus, M.P.) a list of the prize winners in the subjects named, as well as in that of "Coal Tar Distillation and Products;" and the following are their names, and the centres at which they studied:—

Gas Engineering.

Honours Grade—First prize (£3 and a silver medal), Ernest Myers, Technical Department of the Sheffield University.

Ordinary Grade—First prize (£2 and a bronze medal), Roland A. Weston, Norwich Technical Institute; second prize (£1 10s. and a bronze medal), John William Dixon, Manchester Municipal School of Technology; third prize (a bronze medal), Rudolph H. Duxbury, Manchester Municipal School of Technology.

Gas Supply.

Honours Grade—First prize (£3 and a silver medal), Francis Charles Briggs, Westminster Technical Institute of the London County Council.

Ordinary Grade—First prize (£2 and a bronze medal), Stanley Barker Johnson, Hull Municipal Technical College; second prize (£1 10s. and a bronze medal), Francis Joseph Kennedy, Manchester Municipal School of Technology; third prize (a bronze medal), Robert Robertson, Bath Technical School.

Coal Tar Distillation and Products.

Honours Grade—First prize (£2 and a silver medal), Morris Fort, Huddersfield Technical College.

Ordinary Grade—First prize (£1 10s. and a bronze medal), Cecil Ramsden Smith, Leeds University; second prize (a bronze medal), Thomas Horner, Manchester Municipal School of Technology; third prize (a bronze medal), Sydney John Plaice, East Ham Technical College.

The money prizes in "Gas Engineering" and "Gas Supply" are given by the Goldsmiths' Company, those in "Coal Tar Distillation and Products" by the Salters' Company.

The late Mr. Alfred Colson, of Leicester, whose death on the 27th of May was noticed in the "JOURNAL" the following Tuesday, left estate valued at £23,219 gross, with net personalty of £18,353.

A memorial to the late Dr. George F. Deacon, M.Inst.C.E., in the form of a west window, erected by his widow and children, was dedicated at the church at Vyrnwy last Tuesday. The church stands at the head of the lake, the construction of which was initiated and carried out by him as part of the great scheme lately completed for the water supply of Liverpool.

THE AMERICAN GAS INSTITUTE:

REVIEW OF ITS HISTORY AND WORK.

[COMMUNICATED BY AN ENGINEER IN THE STATES.]

THE Institute is now nearly four years old, since its formation occurred on July 10, 1906. Time enough has elapsed, therefore, to warrant a survey of what it has accomplished. This may profitably consist in a consideration, first, of what organization has been developed for the service of the industry, and, second, what service has actually been rendered.

Everyone is familiar with the steps leading to its birth, and also probably with the reasons that impelled the merging Associations to lose their identity. These reasons, or rather the objects in view, as stated in section 2 of the Constitution, will, however, be repeated now in order to compare the actual progress of the Institute during the past three years with the future planned and hoped for.

The first object was amalgamation. This, of course, is now an accomplished fact.

The second object was to facilitate co-operation between the Institute and all District Gas Associations. This affiliation has been at least nominally secured from the Illinois, Iowa, and Wisconsin Associations; and it is quite probable that most of the other District Associations will also affiliate. Therefore, superficially, affiliation may be considered as being successful. When, however, its practical benefits to the industry are looked for, the truth seems to be that, except for a feeling of oneness with the Institute that probably accompanies (in the District Associations) the election of an affiliated director, nothing has been gained. The expectation of the Institute formers was that each District Association would be so eager to become affiliated with the Institute as to be quite willing to comply with the accompanying conditions in regard to original work. The facts are that Michigan, the one District Association which has for years been supporting original investigation, has refused to affiliate—principally because it wanted to be supreme in its own investigations. This is a quite natural feeling; but the Michigan men themselves would admit that, with the experience that the Institute has at its command, the Michigan investigations could be increased in value. The other Associations which are planning to begin, or have already begun, original work, are a little touchy on the subject of taking orders from the Institute about such work. The Institute itself, as will be seen later, is not organized to lay out a broad field of work to be divided among the District Associations. The net result of all this is that, after three years, affiliation has produced nothing in the shape of original work, except some experiments by the Illinois Gas Association on pumping gas; and their results were not offered to the American Institute, as not being entirely satisfactory.

The third object was "to secure a more rapid promotion and advancement of scientific and practical knowledge in all matters relating to the construction and management of gas-works and the manufacture, distribution, and consumption of gas." In the minds of the "Committee on Proposed Sections," which quoted these objects in their report to the Institute at its first meeting, this third object could best be secured by a division of the Institute into sections—in other words, by a specialization of the work. The report was unanimously adopted; but four years have passed, and as yet no sections have been formed. The natural result is that, as far as meeting programmes go, the Institute has differed little from any of its predecessors; and each year a large number of its members—especially those interested in accounting or new business matters—have found comparatively few papers of interest to them. It is not strange, therefore, that the record of the Institute's accomplishment, as a body, shows little progress in any sphere save that of engineering.

In default of sections, the Institute is simply a repetition of the American Gaslight Association on a scale twice as large, with one important exception to be now noted. The American Association, in its time, produced much good Association work, for which credit was due largely to its Research Committee. The Technical Committee was created to perform a similar service for the Institute; and in its short life of three years, it has well justified its existence, as will be shown in discussing later the accomplishments of the Institute. A great weakness, however, in the Technical Committee—as in the Institute in general, and as past history shows in most Associations, gas or anything else—is due to the fact that one man, or at most a few men, are expected to do, and practically forced to do, the whole work of a year. In the old days, the President and Secretary spent each year most of their time urging members to write papers. By the formation of the Technical Committee, with the provision of Sub-Committees drawn from the general membership of the Institute, it was hoped that the services of a large proportion of the members could be enlisted, and in this way much progress made without undue burdening of any one person. Membership of the Technical Committee, so it was thought, should seem attractive enough to the ambitious among the gas men to provide a yearly crop of willing workers, especially if there was a re-election of the most deserving, and a final reward of good work in the shape of election to the presidency and vice-presidencies. Actually, as far as getting papers is concerned, the formation of the Technical Committee has meant the transference of the worry of such solicitation

from the President and Secretary to the Chairman of the Technical Committee.

In theory, every member is willing to do his share of the work. In practice, the work is done by a very few men, and by these same men year after year. Consequently, the progress of the Institute, and therefore of the gas industry, lags behind the advance possible if every one would do his fair share. Personally, I believe that not until sections are organized will the Institute present the best means for attracting to itself the ability and the services of each individual member; and in the opinion of the writer, the Institute owes an apology to its members for not having yet offered to them a form of sectional organization for their approval or disapproval. This, however, does not excuse the membership from their general unwillingness to do work and offer the results of it.

So much for the present organization of the Institute. Now as to what it has done for its members and the interests of the gas industry. It issues, in convenient form, well indexed abstracts of all articles of interest in the leading technical journals. This very valuable service has, however, involved nothing on the part of the Institute but proof-reading, as the work of abstracting has been done gratis by the United Gas Improvement Company.

In the line of what might be called committee work, as distinguished from papers contributed by individuals, the prestige of the Institute, and the knowledge of its members on the "Committee on Uniform Systems of Accounting" was of the greatest value to the gas companies of New York State in influencing the compulsory system of accounts promulgated by the two Public Service Commissions. Had the accounts been approved as originally drafted by the Commissions, useless expense and confusion to companies and the public alike would have resulted. Also, if there had been no Institute with the right to speak for the entire gas industry, the representations of the Committee would have had much less weight with the Commissions.

Fully equal in importance are the results obtained by the "Committee on Calorimetry," as embodied in their report containing complete working data on all commercial calorimeters, and in the effect of their influence and advice on the Wisconsin Railroad Commission's rules for gas testing and standards.

The "Committee on Units of Light" has, in conjunction with other Associations, done yeoman work in furthering the establishment of an international standard of light. This has required much painstaking labour, and ability of a high order.

The "Committee on Uniform Methods of Taking Candle Power" has also made freely available valuable information upon general photometric work, representing the fruits of years of experience, of a kind not at all possible to the average Institute member.

The "Committee on Electrolysis" have in their various reports made available to each Institute member, in convenient form, a complete treatise on the theory and effects in different countries of electrolytic corrosion. The information contained in these reports summarizes the opinions of the experts on this subject; and thus is freely given advice far more valuable than is true of much for which big fees have been paid.

The "Bureau of Information" has also rendered valuable aid for three years to members in need of all sorts of help; and the answers thus sent out, form—with the revision of the "Question Box" and the "Practical Class" answers—the best available material for the student in gas matters. In the revision of the "Question Box," on questions relating to both manufacture and distribution, the Institute has placed in compact and easily obtainable form whatever there was of value on these subjects in the "Question Box."

Coming under the head of papers, the Institute has shown how uniform candle power can be secured with the minimum of expense, and has in "Dipping Meters" made the most important contribution in the history of the dry meter towards prolonging its life and period of correct registration, and decreasing the cost of meter maintenance. No other papers can be considered as being on a par with the two above described, or as rising above the usual level of an Association paper in which work of some nature is described, and from which, here and there, knowledge helping to build up the industry is obtained.

Anyone who knows the men who have been engaged in the above-mentioned work for the Institute, and whose knowledge of the gas industry is sufficient to enable him to appreciate the character of the work done, need not be told on how much higher a plane it is than were the papers or reports of the merging Associations. Because the Institute has unnecessarily confined its work too much to the technical side—neglecting the very important commercial and new business fields, and for this very reason made its meetings uninteresting to a large number of members, whose education and occupation unfitted them to appreciate engineering topics—a certain feeling has arisen that the Institute has failed to justify its existence. This feeling is, of course, entirely wrong; and probably most of the men who share it do not now use to anything like a full extent the opportunities that are offered to each member. The "Bureau of Information" alone will, by wise advice, save many times over the yearly dues. The abstracts available on payment of an extra \$5 are worth many times the sum. No gas engineer can find fault with the Institute on the score of it not returning good value for his money.

The record of Institute work as above given, shows how much stronger such work has been from the Committee than from the individual standpoint. It is a question whether the work awaiting

doing is of a character that any one man can do as well as a set of men. Probably not. There is no doubt, however, that the Institute will not do the work it should until its members rouse themselves and offer hearty aid to the "Technical Committee." If for any one year the few men who now do the Institute's work would take a well-earned rest, the ensuing meeting would be a striking revelation of how little work the majority of the members are willing to do. Each man who may be guilty of doing less than his share, owes it to himself and the industry to resolve to take up his own burden. If this were done, the Institute would not suffer as it does in comparison with some other Engineering Associations.

A Trial of Costs Suggested.

"Meteor" of the "Electrical Times" is apparently getting very tired of reading the gross falsehoods that have lately and frequently emanated from the electrical industry as to gas having to come down to 7½d. per 1000 cubic feet before it can compete with electricity and the metallic filament lamp, and as to an 8-candle power electric lamp being eclipsed a "brilliant" light. So upset is he that he hopes: "Some impartial body of citizens bent upon hunting down the truth will sooner or later equip two model houses (not laboratories) with the rival illuminants on strictly working conditions, and publish annual results." He adds: "We cannot organize it, the gas people cannot organize it; but in the interests of bewildered humanity something of the kind ought to be done forthwith." When the Welsbach Company—before entering into the metallic filament lamp business to give greater scope to their heritage of inflated capital and their exceptional distribution resources—offered a joint trial between themselves as representing incandescent gas lighting and separately several electric undertakings, conditioned so that the result should be beyond suspicion and question, the challenged electricians slunk from the proposed contest in most contemptible fashion. They were not disposed to meet the results—of the losing side having to contribute to some local charity, to bear the costs, and to face the indignity of an admission that they had been pursuing business on the lines of bluff and misrepresentation.

Hidden Lamps and Ventilation.

On the question of electric lamp glare, we may take it that the best method of using metallic filament lamps has been adopted by the Institution of Electrical Engineers to illuminate their new lecture hall. For this hall they have selected cornice lighting, for the express purpose of preventing that glare or "whiplash" on the eyes of which Mr. Mordey, ex-President of the Institution, was talking so pleasantly and frankly a short time since at a meeting of the Society of Illuminating Engineers. But though electric lighting (with the whiplash thrown in) is so much dearer than incandescent gas lighting by the newest types of lamps, to avoid the whiplash by hiding the lamps (as has been thought proper in the Institution lecture hall), and having only reflected light, means an expense for lighting that is altogether beyond the ordinary mortal's financial strength. We are reminded of this by an article in the "Electrician" describing the electrical arrangements in the Institution's new home. Although it is electrically lighted with the lamps situated in the cornices, a 42-inch horizontal discharge ventilating fan (with a capacity of 10,000 cubic feet of air per minute against ½-inch water pressure) is employed for extracting the air from the hall. This mammoth contrivance is, of course, indispensable with the electric lighting of the hall, just as one of the circulars of the Electricity Publicity Committee was telling us lately an electric fan is indispensable in every electrically-lighted house. It will be remembered that the circular stated: "Wherever electric light is installed, air in rooms can be kept fresh and pure by means of electric ventilating fans"—in fact, they are "indispensable for keeping the house healthy." To light a house by hidden lamps to avoid the whiplash, and to ventilate the rooms as advised, will make the service rendered very costly indeed.

Irish Association of Gas Managers.—The annual meeting of the Association will be held in the Banquet Hall at the City Hall, Belfast, next Tuesday, under the presidency of Mr. R. Harrison, of Monaghan. The proceedings will be opened by the Lord Mayor at 11.30 a.m. We learn from the agenda issued by the Hon. Secretary and Treasurer (Mr. George Airth, of Dundalk), that, in addition to the usual routine business and the delivery of the President's Address, there will be two papers—one on "Exhausters in Small Gas-Works," by Mr. C. Bryan Donkin, of Birmingham; and the other on "Distribution Pressures, Past, Present, and Future," by Mr. W. H. Roberts, of Newtownards. On the invitation of the President, light refreshment will be served at two o'clock. In the afternoon, the shipbuilding yard of Messrs. Harland and Wolff, the lead works of Messrs. Stevenson and Turner, and the gas-works of the Belfast Corporation will be open to inspection. An excursion for the members and lady friends has been arranged for next day to Parkmore, then through Glenariff and on to Garron Tower, where dinner will be served; the return being *via* Larne (for tea) to Belfast.

THE COAL AND COKE CONVEYING PLANT AT THE MOOSACH GAS-WORKS AT MUNICH.

A RECENT number of the "Zeitschrift des Vereines Deutscher Ingenieure" contained an article by Herr H. Hermanns, of Aix-la-Chapelle, on the coal and coke conveying plant recently installed at the Moosach Gas-Works of the Corporation of Munich. The following abstract translation of the article has been prepared and is given (with the accompanying illustrations) by permission of the Editor of the "Zeitschrift" and of the Author.

The question of the cheap and most suitable transport of materials is a vital one in all industries which have to deal with the shifting of materials in bulk. Such industries have been impelled to replace hand labour by machinery wherever feasible; and consequently in gas-works of late years manual work in the conveyance of the coal and coke has been restricted as far as possible. The primary object of the adoption of mechanical coal conveyors was the reduction of the amount paid in wages for the transport of the coal; but it was also found that the coal suffered less deterioration when handled by machinery than by hand. The reduction of the number of workmen also diminished the harm which might ensue from strikes. The large coal-store yard, which was formerly customary and indispensable, has now been replaced by tall coal stores which afford very considerable economy in the area of ground required for the storage of a given quantity.

The installation of conveying appliances at the Moosach works was projected and carried out by the firm of J. Pohl, of Zollstock, near Cologne. A plan of the gas-works is given in fig. 1, and a general view of the conveying plant is given in fig. 2. The coal arrives in railway waggons on an embankment, and is conveyed into the coal-store by means of an electrically driven travelling platform capable of carrying a load of 60 tons. This platform is shown in fig. 6. There are four lines placed one behind the other for discharging the coal in the coal store; and these lines run parallel to those by which the waggons arrive. The waggons are unloaded by hand in the coal store. Travelling waggon tips for discharging the railway waggons were provided for in the original scheme of the installation, as shown in figs. 3 and 4; but these have not yet been installed. Later, however, when the work to be done and the quantity of coal to be handled increase, they will be installed and the capacity of the whole plant will thereby be considerably increased. In fig. 4 are shown two cranes A with travelling jacks, which run through the coal store and pick up the coal in grabs, and deliver it on to a steel conveying band D (fig. 3) underneath the floor of the store.

In order that coal may also be brought direct from the railway waggons on to the conveyor, a hopper is provided over the latter in a position beneath the lines alongside the back wall of the store, so that the coal may be tipped from the waggons on their arrival at the store straight into this hopper, and so on to the conveyor. A view of the coal-store, which is capable of holding 16,000 tons of coal, is given in fig. 7, in which the coal loading cranes are shown. The travelling jacks can be transferred from one crane to another at eight points. The cranes are so disposed that the Hone grabs of $1\frac{1}{2}$ tons capacity can take up the coal from the store and deliver it in the gangway between the two travelling cranes on to the band conveyor D, which is provided with a feeding waggon E (fig. 3). The floor of the store is constructed in ridges, with suitably inclined surfaces for the coal to slide down. The band conveyor turns upward at the end, where it is boxed-in with sheet iron in order to prevent the lumps of coal falling off (fig. 8). The purpose of the rise of the conveyor at the end is to dispense with deep foundations for the coal-breaking and screening plant. The latter is erected in a special house attached to the retort-house. It comprises an oscillating screen F

(fig. 3), which separates the small coal up to a size of 3 inches, and a breaker below, which crushes large lumps. The sifted and broken coal falls into the buckets of a Hunt's conveyor H, which carries it to the retort-house. This bucket conveyor, which traverses all the coal bunkers from which the retorts are filled, is emptied by means of an automatically acting travelling tappet I (fig. 5), which distributes the coal uniformly among all the bunkers. An automatic weighing machine registers the quantity of coal delivered.

The buckets of the band conveyors are provided with a Sirocco fan and a dust collector for removing the coal dust, which is collected in sacks and utilized. The coal breaking and screening plant is in duplicate, so that one set may be kept in reserve. The whole plant has been designed with reserve equipment, so that interruptions of the working may be avoided. Thus, there is an

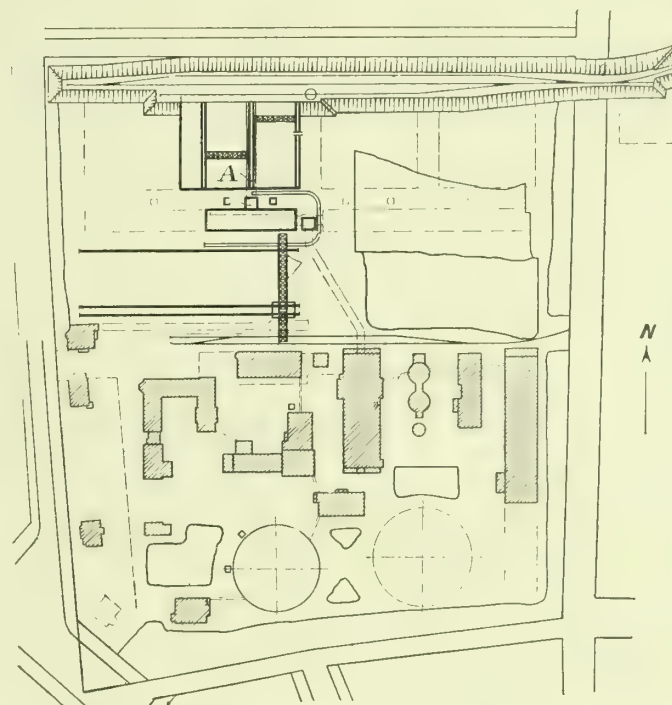


Fig. 1.—Plan of the Coal and Coke Conveying Plant at the Munich Gas-Works.

[A shows the conduit for the band conveyor in the coal-sheds, with the travelling cranes on each side of it. In front of the coal-sheds is the retort-house, with the elevator loading pit at its east end, and the coke yard and bridge crane on the south.]

inclined elevator K (fig. 3), rising up to the roof of the retort-house, which serves as a reserve plant in case of breakdown of the bucket conveyor. In ordinary working conditions this elevator is used for raising the coke for the producers. If, however, the bucket conveyor is thrown out of action, the coal from the store is discharged by the grabs into a charging hopper L, from which an electrically driven waggon M can be loaded. This waggon contains a receiver of about $3\frac{1}{4}$ cubic yards capacity, having inclined side-flaps. This receiver is taken up by the inclined lift and is discharged into a special hopper, from which the coal is drawn off



Fig. 2.—General View of the Conveying Plant.

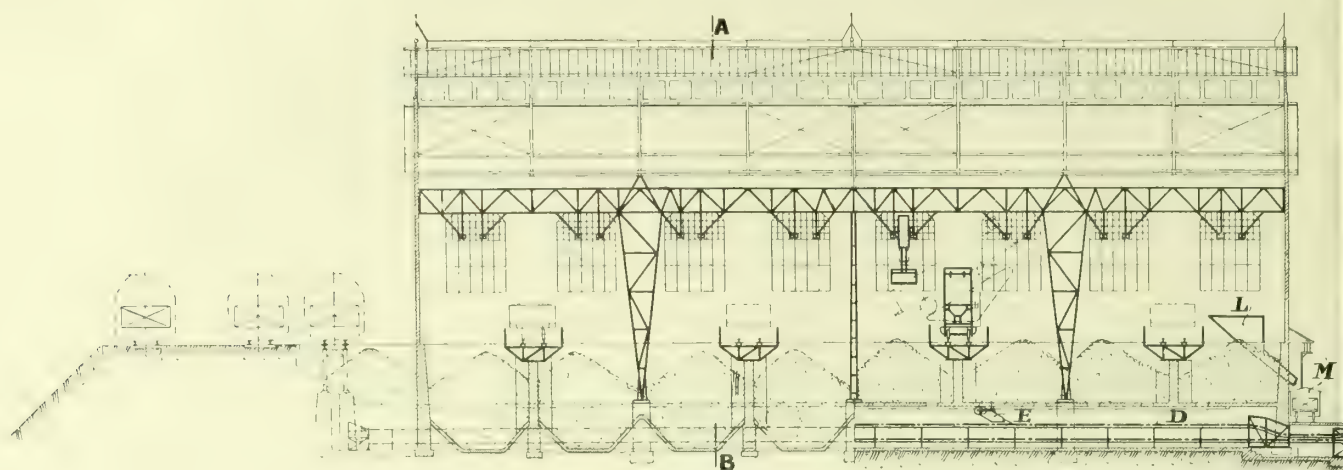


Fig. 3.—Longitudinal Section of the

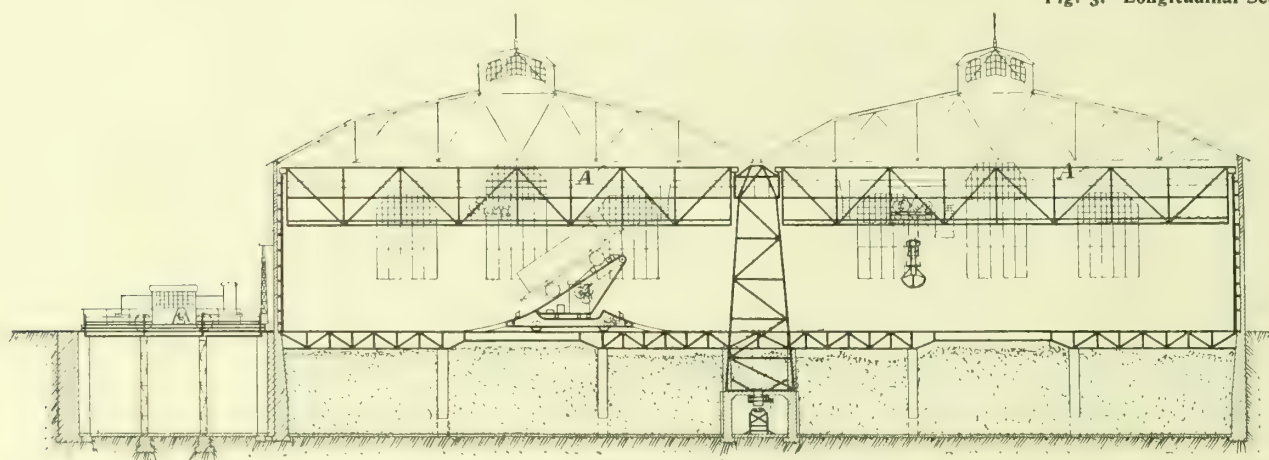


Fig. 4.—Cross Section on the Line A-B of Fig. 3.

into tip waggons N (fig. 5), which are tipped by hand into the coal bunkers above the retorts.

In ordinary working, the electrically driven conveying waggons of the inclined lift are filled with the coke for charging the producers from a hopper, which is carried by a hanging leg of the coke-loading bridge-crane. The coke is conveyed by the lift into a tank of $65\frac{1}{2}$ cubic yards capacity alongside the retort-house. This tank has four outlets, spaced at the distance apart of the length of the waggons; so that four waggons can be filled from it at the same time. The four waggons, which discharge at the side, form one train. Two of them are provided with electric motors, while the other two are trailers. But the motor on one of the waggons in ordinary working is kept merely in reserve. The train on its way to the producers passes over an automatic weighing machine which registers the net weight of the waggons in pairs. If the working of the inclined lift is interrupted, the coke is taken by tipping waggons from the retort-house to the bucket conveyor, from which, at the uppermost part of its track, the coke waggons,

standing on the producer charging floor beneath, are filled by means of a shoot. The coke-loading bridge-crane is supported on the one side by the hanging leg already mentioned, and on the other side by the principal supports which run on two rails set at a distance apart of about 21 feet. The bridge has a span of 137 feet; and the track on which it travels is about 236 feet long. The bridge is driven on the rails by a separate motor on each support. The two motors are controlled by a resistance governor which imparts the same speed to each of the supports, and prevents the sides of the bridge getting askew. The governing mechanism is such that, when one support gets in advance, the regulating device comes into action and puts a resistance on the motor of that support. If, despite this, one support gets ahead beyond a certain angle, the travelling mechanism of the bridge is put out of action by an automatic safety-clutch.

The travelling jack T is provided with a grab of $5\frac{1}{2}$ cubic yards capacity. The coke preparing and sorting plant is erected in the framework between the two main supports of the bridge crane

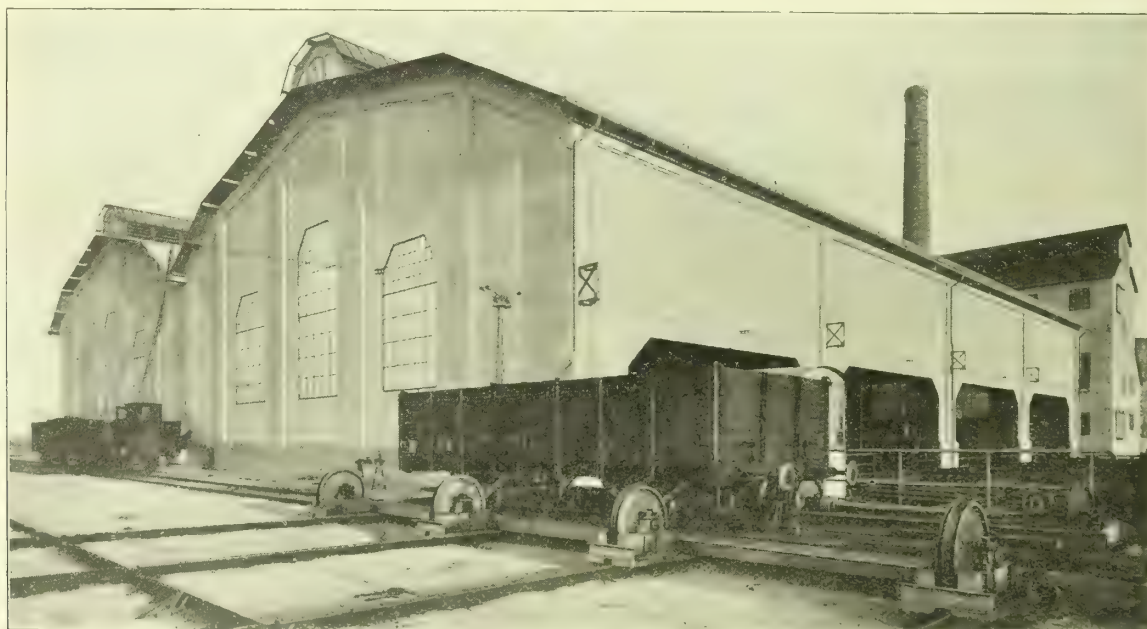
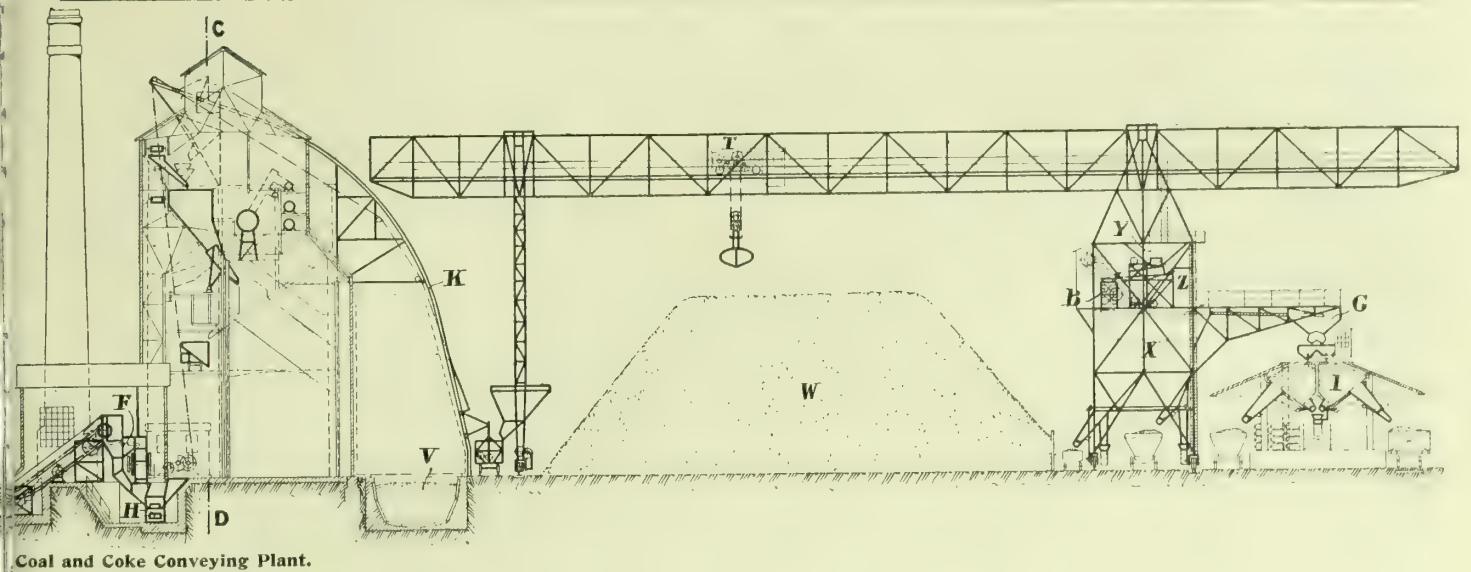


Fig. 6.—Electrically-Worked Sliding-Platform—carrying 60 tons weight.



Coal and Coke Conveying Plant.

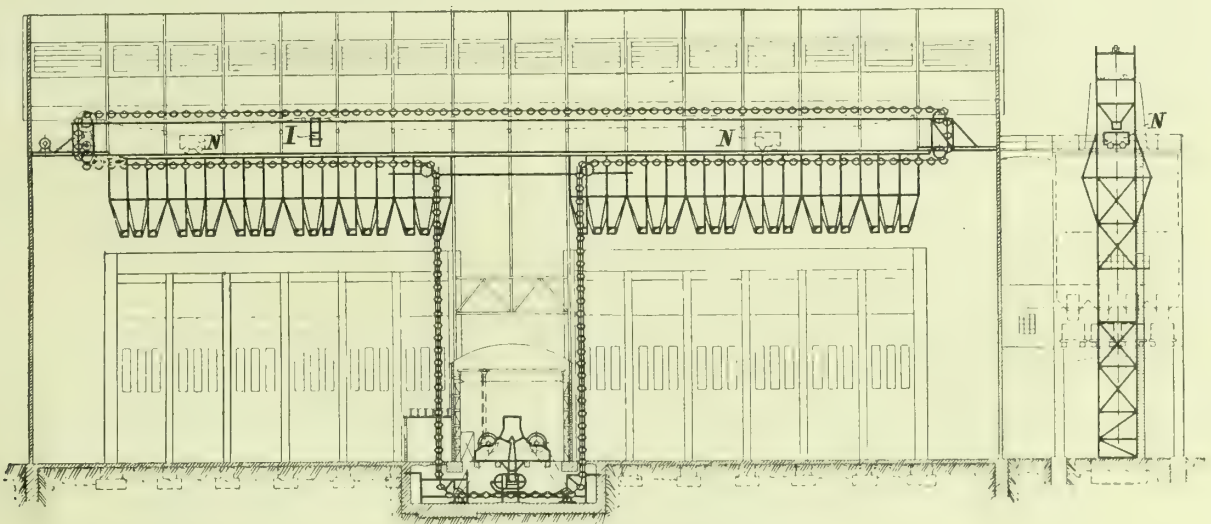


Fig. 5.—Cross Section on the Line C-D of Fig. 3.

(see fig. 9). A pit V (fig. 3) into which the coke is discharged, runs along the side of the retort-house; and from it a grab takes up the coke and conveys it either to the store W for subsequent breaking and sorting in the apparatus X, or, if desired, directly to railway waggons at the overhanging end of the bridge. The coke for breaking is dropped through a delivery funnel Y into the feeding drum Z, from which it passes through an intermediate screen to a double-drum breaking plant B. The intermediate screen separates the small coke, which falls along with the broken coke on to a principal screen underneath. The latter separates the coke into different sizes.

It may be observed that the coke breaking and screening plant is provided in duplicate, so that there is a full reserve in case of breakdown. The coke dust up to two-fifths of an inch in size, and the breeze from two-fifths to three-fifths of an inch, are collected in tanks erected in the framing of the principal supports of the bridge-crane. From these tanks they are drawn off either into

carts for sale by retail or into tip-waggons for use on the gas-works. The coarser coke is conveyed into a funnel hopper G which is carried by a bracket on the supports of the bridge, and contains sections for the different sizes of coke. Underneath the bracket are shoots with charging hoppers I (fig. 3), on the top of which runs an electrically driven waggon which distributes the different sizes of coke into the separate sections. The shed in which the sacks are filled (constructed in reinforced concrete) is shown in fig. 10. The coke tanks have a large number of discharging outlets closed by rotary slides. Automatically acting weighing machines show the weights of the filled sacks which are taken to a store capable of holding 3000 sacks. Lateral shoots serve for loading the coke into carts and railway waggons.

In conclusion, it may be stated briefly that at the Moosach works at Munich the coal, arriving in railway waggons, is distributed in the retort-house by means of an iron band-conveyor and a Hunt's bucket-conveyor. An inclined lift is provided for

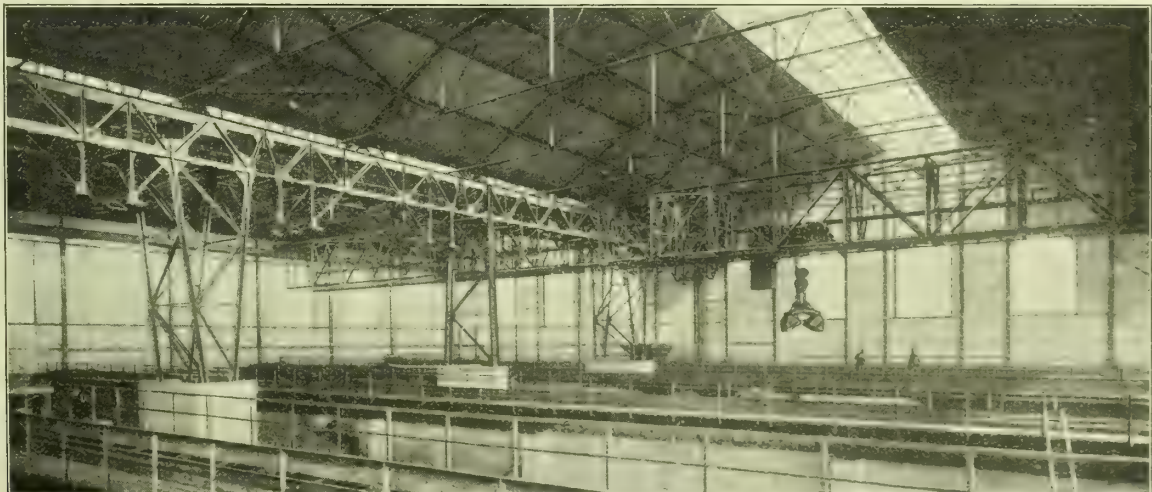


Fig. 7.—Coal Store, with Loading Cranes—to Store 16,000 Tons of Coal.



Fig. 8.—The Upturned End of the Steel Band-Conveyor.

charging the producers with coke. A bridge crane with grabs serves for transporting coke. In the supporting column of the bridge-crane the coke breaking and screening plant is placed. A shed (in reinforced concrete) is provided for filling sacks with the coke for storage or transit.

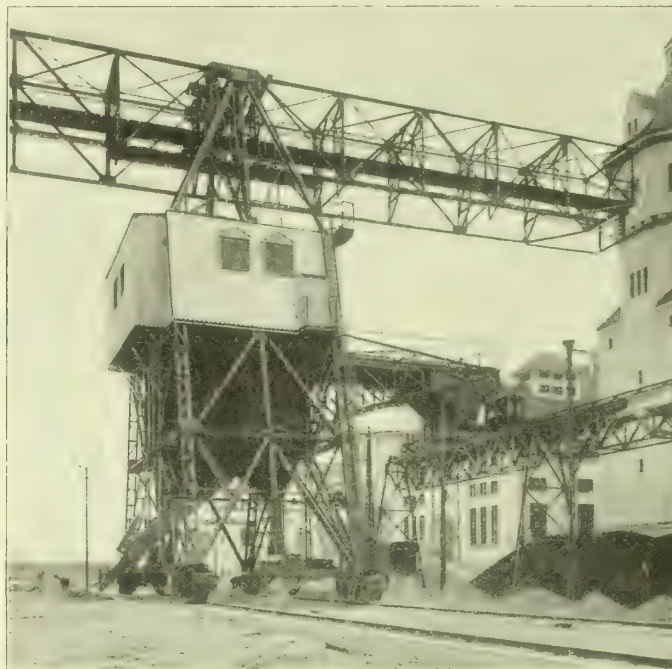


Fig. 9.—The Loading Hopper for Coke Breeze and the Coke Breaking and Screening Plant.

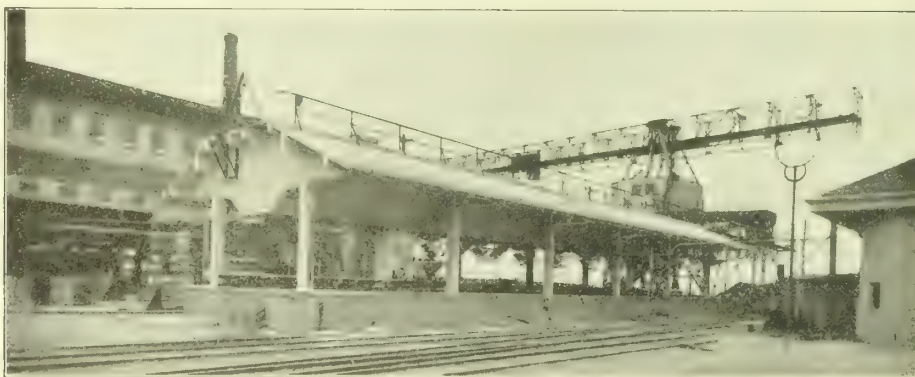


Fig. 10.—Shed for Filling Sacks with and Loading Coke.

ITALIAN GAS SOCIETY.

LAST month's issue of our contemporary, "Il Gaz," records the proceedings at the thirty-ninth conference of Italian gas engineers, which was held in Naples in June last. The President for the year, Sig. Ing. Chavannes, occupied the chair and welcomed the members on behalf of the Compagnia Napolitana del Gaz, of which he is the Manager. Cav. Rag. Beria followed, in order to congratulate the Compagnie Union des Gaz upon the successful result of their efforts in the great strike of their gas workers in Italy; and the names of Sigg. Gruss, Morton, Pesce, and Maggioni were mentioned in this connection.

A presentation of an address and gold medal was then made to Sig. Comm. Pouchain, together with his election as an honorary member, to commemorate his retirement after forty-two years from the Società Anglo-Romana del Gaz, and his long connection with the Italian Gas Society, of which he was President in 1877, 1886, 1893, and 1904.

New members were elected to the number of 37, after which suitable tributes were paid to deceased members, Sigg. Chamard, Meneghetti, and Derval. Awards were made to deserving workmen of long years' service; and the establishment of a Benefit Society for gas and water officials was discussed.

It was decided to change the title of the Italian Gas Society, which will in future be styled "Associazione Tecnica Italiana delle Industrie Gas ed Aquedotti"—i.e., Italian Gas and Water Technical Association.

The constitution of, and contributions to, the new Association were considered and modified. Sig. Giovanni Bonn was elected Honorary President; and Sig. Comm. Pouchain accepted the position of Acting-President. Sigg. Bacchelli, Francesetti, Maggioni, and Sospisio were appointed to the Council.

The technical matter contributed to the meeting included a description by Sig. Böhm of the Klönne gas-chambers at Padua, and a review by Sig. Calzavara of recent technical progress made in the gas industry, which is reported at length in the columns of our Italian contemporary.

A visit was paid to the blast-furnaces and coke-ovens of the Società Ilva at Bagnoli, a description of which was previously

handed to the members. A dinner given by the Neapolitan Gas Company, and an excursion to Capri, were much appreciated items concluding the proceedings of the annual gathering.

GAS AT A MEDICAL EXHIBITION.

THE Seventy-Eighth Annual Meeting of the British Medical Association was held last week in London—for the first time for a good many years—and in connection with it, there was the customary exhibition of things in which the doctor and the surgeon are specially interested. This was arranged at the University of London, Imperial Institute Buildings, South Kensington; but though it was of a very complete character, no notice of it would be called for in these columns, had it not been for the existence of one particular stand. This was under the auspices of the Gaslight and Coke Company, who, fully recognizing the many directions in which gas should appeal to medical men, wisely make it a practice to have a representative show of suitable up-to-date gas appliances in connection with exhibitions, of the character of the one now under notice, which may be held in their district. The attractive stand arranged for last week's exhibition was a great success, judging by the notice which was bestowed upon it by visitors during the short time that the writer spent in the hall. Its completeness will be gathered from the accompanying photograph, which so clearly depicts the different apparatus to be seen there, that a detailed description appears hardly necessary. However, it may be remarked that the important branch, to doctors and nurses, of hot water supply was fully represented—there being a Davey and Roberts coke-boiler connected up with a Wilson circulator; a Ewart "Califont," and a "Gem" lavatory geyser; a Maughan "Teba" instantaneous geyser; a Richmond "Avon" water-heater for laboratories or surgeries, to furnish hot water in small quantities; and a Potterton No. 14 gas-heated boiler of 25 gallons capacity. There was a latest pattern Davis cooker, with hot-closet; and, in addition, there were one or two excellent grillers. The fires were a Richmond "Bavarian," a Main "Worcester," an Arden Hill "Velox," a John Wright



The Gaslight and Coke Company's Stand at a Medical Exhibition.

"Stadium," in armour bright, a Wilson "Sheraton," in white enamel with brass canopy; and a Cannon Iron Foundries fire of Adam design, with brass ornamentation. One of John Wright's "Official" gas-steam radiators, with flue, was also shown. An interesting feature was a varied assortment of Fletcher Russell's laboratory appliances for all kinds of surgical and dental work—muffle furnaces, blow-pipes, crucibles, &c. The lights, which included different styles of large and small inverted burner fittings, were operated automatically on the Telephos system from either of two sets of switches, one of which was fixed at each end of the stand; and there was also on view a Telchow surgical reflector, in connection with an upright incandescent burner on a counter-balanced pendant.

GAS ENGINEERING AND SUPPLY EXAMINATIONS.

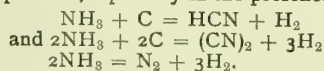
Answers to Questions Set.

"GAS ENGINEERING."

In the last four issues of the "JOURNAL," the questions put at the examinations in "Gas Supply" have been dealt with. We now give answers (suggested by a chemical correspondent) to two of the questions in the ordinary grade in "Gas Engineering."

What conditions in the process of carbonization are favourable to the production of the following: Ammonia, cyanide, sulphuretted hydrogen, and other sulphur compounds? Briefly describe the methods usually adopted for removing these impurities from gas.

Temperature is the chief factor in the production of most constituents of crude coal gas, as the natural limits in the formation of the various substances are: (1) Temperature of decomposition of the containing bodies; (2) temperature of combination of elementary gases; and (3) temperature of dissociation of the newly-formed bodies. Ammonia (NH_3) consists of nitrogen and hydrogen; and it is found that the quantity produced increases up to a certain temperature, and then decreases again. At low temperatures, the nitrogen exists in combination as various organic bases, such as aniline, pyridine, &c.; and these are not decomposed. Consequently, there is little free nitrogen to form ammonia. As the temperature increases, the amount of ammonia increases; for the bases referred to are decomposed. Again, a temperature limit is reached; for the NH_3 , when sufficiently heated, itself undergoes decomposition, especially in the presence of carbon. Thus:



From the above, it is also seen that very high heats tend to increase the amount of cyanogen in the gas.

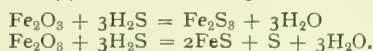
As a general rule, the higher the temperature the greater the amounts of sulphuretted hydrogen, carbon bisulphide, and other sulphur compounds. At a high temperature, too, more sulphur is driven out of the coke; and combines with the free hydrogen to form H_2S and with the carbon to form CS_2 . The processes for the removal of the above impurities are briefly as follows.

Ammonia.—This being a very soluble gas, it is completely removed by washing the gas well with water in the washer and scrubber. Much ammonia is removed by the water formed in the hydraulic main.

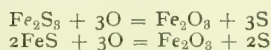
Cyanogen.—Two principal processes are in use for the removal of this gas. The Foulis process is as follows: A mixture of ferrous carbonate

and sodium carbonate is used in a separate scrubber. The gas (which must be free from ammonia) is led into this mixture, and sodium ferrocyanide ($\text{Na}_4\text{FeC}_6\text{N}_6$) is formed. Some insoluble prussian blue is often formed owing to partial oxidation. The ferrocyanide is run off as fast as it is produced, and is partially evaporated and crystallized. A process used by the British Cyanides Company depends upon the absorption of the HCN by polysulphide of ammonia ($\text{NH}_4)_2\text{S}_2$. This is thereby converted into NH_4CNS , ammonium sulphocyanide, which is worked up to its required strength.

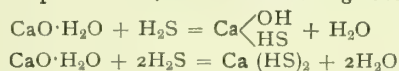
Sulphuretted Hydrogen.—This is removed either by the use of (1) iron oxide or (2) lime. In (1) the reaction is represented thus:



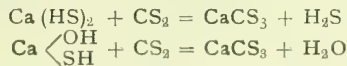
Both these reactions go on together. On exposure to the air, the sulphide of iron is re-oxidized, and can be used again until excess of sulphur is deposited in it. Thus:



Lime is used for purification; the reactions being as follows:



Lime which has been treated with H_2S is used to absorb carbon bisulphide and other sulphur compounds; the reaction being indicated by the equations:



Describe the Referees' sulphur test, and give the chemical formulæ on which it is based. If the condensed liquor from 5 cubic feet of gas measured at normal temperature and pressure gives 10·6 grains of barium sulphate, how many grains of sulphur would 100 cubic feet of gas contain? ($\text{Ba} = 137$, $\text{S} = 32$, $\text{O} = 16$.)

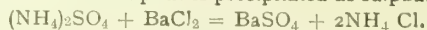
The Referees' sulphur test is the standard test by which the amount of sulphur in coal gas is determined. A special form of apparatus is used, so that the gas can be burnt at a certain rate and the products of combustion properly dealt with. The gas is burned at a small bunsen burner connected with a meter, and so arranged that it shall consume 10 cubic feet of gas in a given time—usually fifteen hours. Round the stem of the burner are placed lumps of sesquicarbonate of ammonia—a substance corresponding to the formula $(\text{NH}_4)_2\text{CO}_3$, $2\text{NH}_4\text{HCO}_3$, which readily gives off ammonia on being heated. When the gas is burnt, any sulphur in it is converted into sulphur dioxide (SO_2), and at the same time some ammonia is formed by decomposition of the sesquicarbonate. These substances, along with the other products of combustion, are drawn up the chimney surrounding the burner into a vertical glass condenser filled with glass marbles to promote condensation; and this is further connected with a long glass tube or chimney. In the bottom of the condenser a small outlet tube is fixed, so that any condensed product can be run off into a receiver placed beneath the condenser.

The sulphur dioxide being an acid body and the ammonia being an alkali, these two react and a process of neutralization goes on, resulting in the production of ammonium sulphite $(\text{NH}_4)_2\text{SO}_3$. Thus:



Since excess of air is admitted at the burner, the sulphite is oxidized

to ammonium sulphate. This is dissolved in the water which forms in the condenser, and is then run off into the receiver. The chimney and condenser are then well washed out with distilled water, and the washings added to the condensed products of the combustion. The liquid is divided into two equal portions; and one of these is used for estimation. The sulphur is determined as sulphate by precipitating it as barium sulphate. This latter substance is almost entirely insoluble; and so the whole of the sulphur is precipitated as sulphate, thus:



Excess of a solution of barium chloride is added to the condensed sulphate of ammonia and the mixture boiled for a few minutes. Complete decomposition ensues; and the barium sulphate obtained is separated by filtration. The precipitate is washed with hot water until the clear filtrate gives no precipitate with silver nitrate. This is necessary in order to ensure the removal of the whole of the barium and ammonium chlorides. The filter containing the barium sulphate is then carefully dried in a steam or hot-air oven, and transferred to a weighed platinum crucible. The crucible is strongly heated over a bunsen burner until the whole of the filter paper is consumed, and nothing but ash left of it. It is then allowed to cool, and is weighed carefully; the increase in weight being due to the amount of BaSO_4 obtained.

Since only half the condensed $(\text{NH}_4)_2\text{SO}_4$ was used, this is equivalent to the amount from 5 cubic feet of gas. Now the molecular weight of barium sulphate is $137 + 32 + 64 = 233$; and this contains 32 parts by weight of sulphur. Suppose, then, that the weight of BaSO_4 obtained in an experiment was x grammes (or grains, &c.), then since 233 grains of BaSO_4 contain 32 grains of sulphur, then x grains contain $\frac{32 \times x}{233}$ grains. But this is from 5 cubic feet of gas; \therefore in

100 cubic feet there would be $\frac{20 \times 32 \times x}{233}$ grains of sulphur, or approximately

$\frac{11 \times x}{4}$ grains of sulphur per 100 cubic feet.

In the example given, 10.6 grains of barium sulphate were obtained. Substituting this weight for x in the above expression, we get $\frac{11 \times 10.6}{4} = 29.15$ grains of sulphur per 100 cubic feet of gas.

"GAS SUPPLY."

In the course of the questions and answers in the Honours Grade given in the "JOURNAL" last week, the illustrations which formed the answer to question 9 (A) (p. 260) were by inadvertence omitted. These we now give, with the question.

- 9 (A). Give diagram showing the candle power at different angles below the horizontal of (a) any inverted burner, and (b) any up-turned burner, each working at ordinary (say, 2 inches) pressure, and consuming not more than 4 cubic feet of gas per hour. A simple sketch in sectional elevation of each burner must also be given.

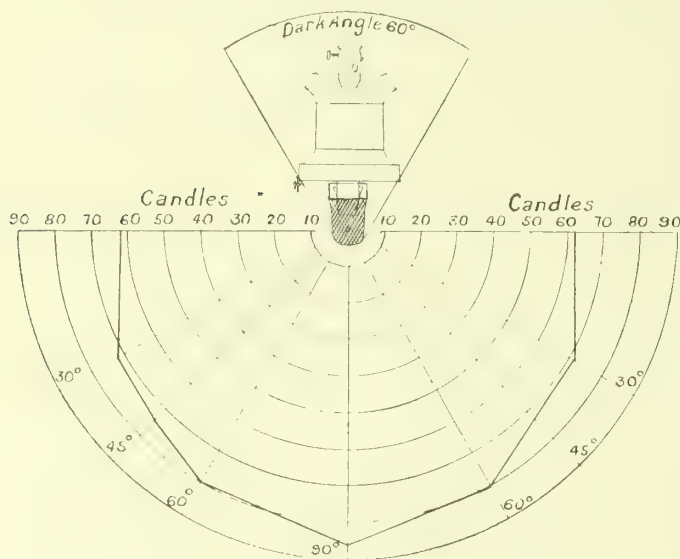


Fig. 12.

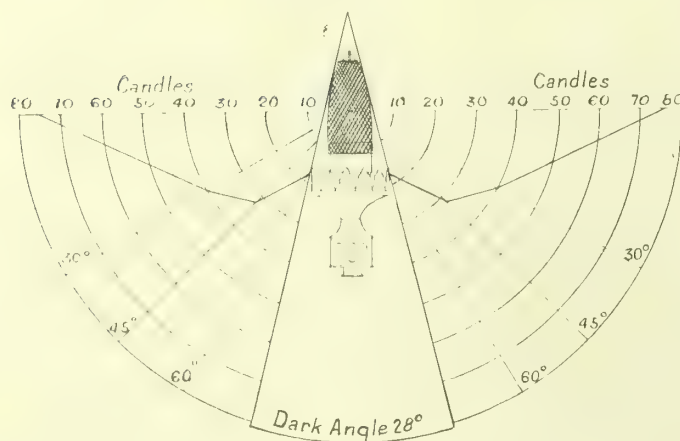


Fig. 13.

RETORTS v. LARGE CHAMBERS.

It was mentioned in our report of the proceedings at the annual meeting of the Association of Gas and Water Engineers of Austria-Hungary, at Innsbruck on May 27 last ["JOURNAL," Vol. CX., p. 695], that a paper was read by Dr. R. Geipert, of the Imperial Continental Gas Association's Berlin staff, on the relative advantages of retorts and large carbonizing chambers. A good deal of the matter dealt with in this paper has been already covered in previous reports by Dr. Geipert or some of his colleagues. Certain new points were, however, raised in the Innsbruck communication in regard to alleged defects in the working of large carbonizing chambers; and these allegations were referred to in Herr Rauch's remarks on the Munich chambers, of which a translation was given in last week's "JOURNAL" [ante, p. 262]. We therefore give a summary of Dr. Geipert's paper in which only the points of novelty are dealt with fully. The paper is published in full in a recent number of the "Zeitschrift des Vereines der Gas und Wasser Fachmänner in Oesterreich-Ungarn."

After referring to the paramount importance of economy in retort-house operations, and especially to the reduction of the fuel account, the author proceeds to say that the choice of the right system of carbonizing determines to a very large extent the efficiency of the working of a gas-works. The fundamental differences in the carbonizing plant available lie in the size of the vessels used and in their disposition. The systems of setting may be classified accordingly; and it becomes pertinent to consider which principle is preferable. The disposition of the carbonizing vessel obviously is of great importance in regard to economy of working; and the transition has been made from the horizontal to the inclined, and finally to the vertical, position with a view to economizing labour. The utilization of the force of gravity to bring the coal into the retort or oven, and to discharge the coke from it, is secured when the vertical position is adopted. But until recently the latter was not considered practically available. Nevertheless, this position is now accepted; and results obtained show its advantages.

The author quotes the report of the make and quality of gas obtained at Sunderland with the Dessau vertical retorts, as given by him in Table III. on page 168 of the "JOURNAL" for April 19 last, in the translation of his paper on the "Dessau Settings of Eighteen Vertical Retorts." He states that the other modern systems of retorts which are in use in England give results at least 4 per cent. inferior to the Dessau. He refers also to other reports from the Cologne, Zürich, Oberspree, and Mariendorf works [see "JOURNAL," Vol. CVII., p. 30; Vol. CIX., p. 27]. The distinction between retorts and chambers ordinarily is one of size, and, consequently, of the ratio of the heating surface to the quantity of coal carbonized. The question as to the influence of this relation on the factors which determine the economy of gasification is one of considerable importance. The correct answer to it will settle whether it is most advantageous to construct settings of narrow retorts having a comparatively large heating surface or large chambers having a relatively small heating surface.

In horizontal and inclined retorts there is a free space above the coal, in which decomposition of the products of gasification occurs. It is thus not easy to distinguish between the primary products of the gasification of the coal and the secondary decomposition products. The size of the free space also affects the transference of heat. Vertical retorts, being entirely filled with coal, are more favourable to observation. At the Mariendorf works, in Berlin, investigations have been made with vertical retorts in one case wider and in the other case narrower than the standard size. These experiments have afforded the means of judging the effect on gasification of the extent of the heating surface, and, consequently, have thrown light on the question of whether retorts or large chambers are the better. The results were unfavourable to large chambers on account of the heavy expenditure on fuel, if for no other reason. It was in consequence of the results of these investigations that the setting of eighteen narrow vertical retorts was constructed in place of the original setting of twelve retorts; and the results realized with the new setting have already been reported. ["JOURNAL," Vol. CIX., p. 27.] Further investigations with the setting of eighteen vertical retorts have, however, been made by Herr A. Wein, the Chief Chemist of the Buda-Pesth Gas-Works, and also by the author. The results obtained in these several trials of the setting of eighteen vertical retorts are summarized in the accompanying table.

Comparing these figures with results previously obtained with the settings of twelve vertical retorts, it will be seen, the author says, that they are much in favour of the setting of eighteen retorts. Consequently, it may be accepted that the gasification of the coal is favourably influenced by the relative increase in the heating surface. In regard to the effect of the increase of the heating surface on the fuel consumption, the author proceeds to follow the argument which he gave in his previous paper [vide "JOURNAL" for April 19 last, p. 167], which led him to conclude that the amount of fuel consumed in the setting of eighteen vertical retorts per 1000 cubic feet of gas made is only about two-thirds what it is with the Munich carbonizing chambers. He also quotes again the figures given in his former paper as to the greater capacity of the setting of eighteen vertical retorts and the better transmission of heat by which a higher duty is obtained from the setting. He points out again that the greater production

Results of Gas-Making Trials in Settings of Eighteen Vertical Retorts.

Description of coal . .	Silesian.		Dombrauer.			Saar.		West-
	H.	R.	Large.	Nuts.	Un-	R.	R.	phalian.
Observer	Bunte.	Geipert	Wein.	Wein.	scr'ned.	Geipert	Geipert	
Make of gas per setting per 24 hrs., c.ft.	262,218	245,090	252,153	255,685	247,916	255,332	244,737	
Make of gas per ton of coal, c. ft. . . .	13,384	14,281	14,532	13,743	14,137	13,814	14,353	
Gross calorific power, B.Th.U. per c. ft. . .	543	547	553	545	541	564	546	
Ammonia, per cent. by weight of coal	—	0.349	0.288	0.305	0.282	—	0.337	
Tar, per cent., by weight of coal	—	6.226	5.780	6.090	5.410	—	4.600	

of the setting reduces the cost of the installation and the amount of the wages per 1000 cubic feet of gas made. As a result of his observations, he concludes that the correctness is established of the principle applied in the setting of eighteen vertical retorts—viz., the increase in the amount of heating surface relatively to the quantity of coal carbonized. Conversely, he contends that it is shown to be wrong to diminish the heating surface as is done in large carbonizing chambers. In all cases he believes that retorts prove preferable to chambers.

In regard to the comparison of retorts and chambers, the author quotes results obtained at Leipzig and at Dresden with Munich chamber settings.* The Leipzig results are given on the authority of Herr Reinhard, the manager of the gas-works there, and show a make of 11,518 cubic feet of gas per ton of coal, having a net calorific power of 449 B.Th.U. per cubic foot, which the author assumes corresponds to a gross calorific power of about 512 B.Th.U. per cubic foot. Thus the calorific valuation figure, or B.Th.U. obtained in the gas per ton of coal carbonized, is 5,897,216. This result can be readily obtained or surpassed with any retorts. In Leipzig, indeed, the horizontal retorts have only given a make of 10,657 cubic feet per ton; but the calorific power of the gas is not stated, and it may be assumed that it was higher than that of the chamber gas. Herr Göbel, the Manager of the Dresden Gas-Works, gives a make for his chamber settings of 13,922 cubic feet per ton of coal, the gas having a specific gravity of 0.58. The latter figure shows that the gas is not pure coal gas, which would have a specific gravity at the most of 0.45, but a mixture of about 78 per cent. of coal gas and 22 per cent. of flue gas. Thus the make of coal gas obtained per ton of coal is actually reduced to about 10,900 cubic feet.

The author contends it is highly desirable that the proportion of nitrogen in gas made should be determined (most easily by the combustion of a measured volume of gas over copper oxide) in order to ascertain that the gas is not diluted with flue gas. The gas from vertical retorts, he says, never contains more than 1.5 per cent. of nitrogen, which is no more than is formed synthetically in the gasification of the coal. Herr Reinhard reported that the chamber gas made by charging the chambers once in twenty-four hours was liable to inadmissible fluctuations. Therefore, the project of working only in the day-time would have to be given up, and more than one shift of men would have to be employed. This disposes of the contention of the advocates of carbonizing chambers that with them night work would be dispensed with. If night work were dispensed with, exceptional measures would have to be taken to mix the gas produced at different times, which measures would be attended with considerable expense.

It is most important to the consumer, more especially when the inverted burner is used, that the gas should be throughout of uniform quality. Herr Reinhard also throws an unfavourable light on the distribution of the heat and the condition of the chambers at his works. The middle chamber of the setting is considerably hotter than the others, and has to be charged every twenty hours in order that it may not become overheated; while the outer chambers require twenty-four hours to work off the charge. The chambers which started work in December are so unsound that a vacuum of less than 1-10th of an inch in them causes so much flue gas to enter that the gas is reduced in quality to an unpermissible extent. Conversely, a reduction in the vacuum entails loss of gas; and, consequently, the exhaustor must be most carefully regulated in order to avoid slight fluctuations in the vacuum on the chambers. The results obtained at Dresden by Herr Göbel show that flue gas is sucked in, and that the satisfactory make of gas is obtained at the expense of great fluctuations in its calorific power. It is recognized in coke-works that the ovens are constantly getting unsound owing to the readiness with which they become distorted. Retorts are preferable because they are absolutely sound and retain their shape.

The author concludes his paper with detailed analyses of the Silesian and Dombrauer coals used in the trials of which the results are reported in the table. The figures given in the table for the make of gas per ton refer to the coal in the air-dried state. The Silesian coal in this state contained 22 per cent. of moisture and 6.1 per cent. of ash; the Dombrauer large coal, 1.6 per cent.

of moisture and 6.5 per cent. of ash; the Dombrauer nuts, 1.7 per cent. of moisture and 8.5 per cent. of ash; and the Dombrauer unscreened coal, 1.7 per cent. of moisture and 8.9 per cent. of ash. Steam was introduced into the retorts for two hours out of the eleven hours, which was the time usually allowed for working off the charge.

The author's general conclusion is that for the dry distillation of coal it is disadvantageous to employ a relatively small heating surface, such as occurs in large chambers, and that a relatively large heating surface, such as may be obtained by narrow retorts, is to be aimed at.

GAS OILS AND OIL GAS.

By Dr. H. HEMPEL, of Berlin.

THE following is an abstract translation of a lengthy thesis by Dr. H. Hempel, of Berlin, which formed his qualifying dissertation for the degree of Doctor of Engineering. The research work to which it refers was carried out at the Chemical-Technical Institute of the Technical College at Carlsruhe, under the guidance of Dr. H. Bunte, Professor in the Institute. The thesis was published in full in recent numbers of the "Journal für Gasbeleuchtung."

INTRODUCTORY.

The author refers first to the fact that pyrogenous actions have been applied industrially for about a hundred years in the manufacture of coal gas or oil gas, and it has been recognized in the course of time that those bodies were specially suitable for the manufacture of gas which were poor in oxygen and, consequently, rich in hydrogen and carbon. The manufacture of oil gas first attained large dimensions when the higher fractions of mineral oils became available as raw materials. In Germany, the distillates from lignite and bituminous shales were at first the only materials used, but petroleum distillates have been used for a long time in the United States of America, and more recently in European countries for the carburetting of water gas. These petroleum distillates also are used to a smaller extent in the manufacture of pure oil gas. Different results are afforded by different oils; and consequently it is necessary to determine the value of particular oils for gas-making. At one time it was considered sufficient to ascertain by the physical properties of the oil—viz., its specific gravity, viscosity, and fractionation—that the oil was a normal technical gas-oil distillate. But it was soon recognized that the heat and time of gasification affected the yield, and the value of the oils was then ascertained by gas-making trials in apparatus in the laboratory, and a valuation figure was calculated from the results of the trials. The valuation figure, however, did not always agree with the working results carried out on a large scale.

The practical solution of these questions involved the theoretical investigation of the pyrogenous decomposition of hydrocarbons at high temperatures. Work in this direction, in continuation of that of Berthelot, has been done by Lewes, F. Haber (working in turn with Samoylowicz and H. Oechelhaeuser), E. Müller, Lenze and Limberg, Ross and Leather, and A. Spiegel. Some of these observers studied the deteriorating effect of oxygenated bodies on the results of gasification, while others demonstrated the importance of a high proportion of hydrogen in the gas-oils. The author has employed a new apparatus which admits of clear separation of different influences, and with it has made a series of comparisons of the gas-making power and value of gas-oils. He has further investigated the phenomena of carburetting when the oils are gasified in the presence of gases such as hydrogen, carbonic oxide, and nitrogen.

THEORIES OF PYROGENOUS DECOMPOSITIONS.

The author first reviews the various theories put forward from time to time in regard to pyrogenous decompositions. The oldest theory is that of Berthelot, who held that carbon was never directly separated in the first stage of the pyrogenous decomposition of hydrocarbons, but that, by the continuous combination of the molecules to form more complex bodies, richer and richer in carbon, with the liberation of hydrogen, carbon ultimately was produced. Thus according to this theory the separation of carbon was effected only by condensation. He obtained acetylene as a product of decomposition of the most varied organic bodies, and attached special importance to the formation of acetylene and its polymerization in pyrogenous reactions. The occurrence of many products was explained by Berthelot as being due to their splitting off in subsidiary reactions. He assumed that a complex equilibrium existed for each stage of temperature between simple and complex hydrocarbons with carbon and hydrogen. Lewes later regarded the subsidiary reactions, by which Berthelot had assumed that certain products were split off, as primary reactions, and he did not recognize Berthelot's state of equilibrium. Lewes supposed that acetylene condensed continuously at moderately high temperatures, and at still higher temperatures began to decompose into its elements. The separation of carbon was due only to the decomposition of acetylene, and the formation of carbon by condensation did not occur. Thorpe and Young investigated the effect of pressure and moderately high temperatures on the decomposition of paraffin hydrocarbons. They found that these

*It may be pointed out with reference to these figures that Herr Rauch, in remarks given in last week's "JOURNAL," stated that the Dresden chamber here referred to were not of the Munich type [ante, p. 262].

hydrocarbons were decomposed primarily into olefines and lower paraffins, with simultaneous formation of only a small amount of gaseous products. Armstrong and Miller showed that simple gases with olefines, benzol, and higher aromatic bodies resulted from the splitting-up of petroleum hydrocarbons at high temperatures under atmospheric pressure. Their observations, however, led to the conclusion that the splitting-up occurred at the ends of the chain, whereas previous observations had been in favour of hydrocarbons splitting-up in the middle of the chain. Haber's investigations of the gasification of hexane and trimethylethylene at 600° to 900° C. gave results analogous to those of Armstrong and Miller. It followed from these researches that instead of hydrogen being split off it was transferred, while at the same time small terminal members of the component hydrocarbons with less than three carbon atoms were separated. These separated hydrocarbons were mainly methane, ethane, and ethylene. The lack of stability of the products of decomposition was also demonstrated by the fact that the residual unseparated molecule resulting by the splitting-off of gaseous products combined with other residues to form complex compounds. In this manner, tarry products were built up. Equilibriums, as understood by Berthelot, did not occur according to our present knowledge of equilibrium reactions.

The author next proceeds to discuss theoretical considerations relating to pyrogenous reactions based on the results of gas analyses. He concludes that it must be assumed that the groups splitting-off in the reactions must be chiefly those with either one or two atoms of carbon. The single-atom terminal groups must predominate, as methane occurred as a chief constituent of oil gas, and it could not result from a gas containing a high proportion of carbon. The members with two atoms of carbon—such as ethylene and ethane—did not result mainly from the further decomposition of the unsaturated residues left when the methane was splitting-off, as, if this were the case, constituents of higher boiling point would have been found in oil-gas tar. If the foregoing assumption were correct, this tar must contain bodies with ring-shaped formulæ. The investigations so far made on oil-gas tar supported this conclusion. The conditions moreover were not changed if gasification took place in the presence of indifferent gases, such as nitrogen or carbonic oxide. If, however, hydrogen was present during gasification chemical reactions took place. The resulting gases were substantially identical with those produced by the simple gasification of oil; but the yields of methane, ethane, and ethylene were increased considerably per unit weight of oil, while the tar was more freely fluid and in smaller quantity. It would appear in consequence that the hydrogen which occurred in simple oil gas as a result of secondary decompositions, exerted an influence on the splitting-up of the molecules which occurred in the gasification of oil. Experiments with varying amounts of hydrogen had shown that when the hydrogen reached a certain proportion—viz., 50 to 70 per cent. of the final gas—the formation of gaseous hydrocarbons was confined to a certain limited quantity. It would, therefore, appear that the average proportion of hydrogen in simple oil gas—viz., about 15 per cent.—was capable of exerting considerable action.

THE PRINCIPLES OF THE VALUATION OF GAS OIL.

The author then refers to methods followed for the valuation of gas-oil. The laboratory apparatus for testing the yield of gas from oil devised by Wernecke (now generally used in Germany), has been unfavourably reported upon by many observers; but others—e.g., Helfers and Eisenlohr—have found that the valuations which it gives agree generally with the results obtainable on the practical scale. In Germany, oils are commonly valued on the basis of Hirzel's valuation figure, which is the product of the yield of gas (stated in cubic metres per 100 kilos. of oil) and the illuminating power of the gas when consumed at the rate of 35 litres per hour. This valuation figure is, however, unsatisfactory, as the light and the yield of gas do not vary proportionally. The illuminating power depends primarily on the quantity of heavy hydrocarbons, which quantity varies with the conditions of gasification in a different proportion to the yield of gas, so that the product is not a constant. Very different values are, consequently, obtained with only small variations in the experimental conditions for one and the same oil. Helfers proposed to take into account also in a formula for the valuation of gas-oils the amounts of tar and coke produced in gasification. But his empirical formula likewise is unsatisfactory, in that the values it gives are affected by changes in the temperature of gasification. Owing to the diminished importance of the illuminating power of gas, it has since been proposed to value oils for gas-making on the basis of the product of the yield of gas and its calorific power. Ross and Leather have proposed to take as a valuation figure the product of the yield of gas and the percentage of olefines contained in it. The same objection to this valuation figure applies as to those of Hirzel and Helfers. The calorific valuation number on the other hand clearly expresses the total energy obtained, and it is nearly constant for changes of temperature of $\pm 40^{\circ}$ C. All the valuation figures attain a maximum at the temperature which is found most favourable for the gasification of the particular oil; but the exact expression of the gas-making value of the oil is only afforded by the calorific valuation number.

Pyrogenous decompositions are primarily functions of (1) the temperature; (2) the surface and duration of heating; and (3) the catalyzator present. The experimental apparatus of Wernecke fails in that it has not a sufficient length maintained at constant

temperature and a sufficient capacity compared with apparatus used on the technical scale. The investigations made by the author were carried out with an apparatus which presented a sufficiently large surface of which an adequate length was maintained at a constant temperature. Only in this way is it possible to produce the products of pyrogenous splitting-up of the oil in precisely the same conditions. The gasification could be carried out with this apparatus at different temperatures which could be exactly determined.

The investigations have shown: (1) The gas-making power of oils; (2) the smaller differences in the gas-yielding capacity of the oils than could be ascertained with former methods; (3) the great dependence of the composition of the gas in respect of its content of ethylene and hydrogen on the temperature of gasification; (4) the small dependence of the calorific valuation-number, within narrow limits, on temperature (varying $\pm 40^{\circ}$ C.) and rate of inflow of the oil (varyingly 25 per cent.); (5) that the most favourable temperature of gasification for the oils examined is between 745° and 790° C.; and (6) that the assumption of Spiegel that the gasification value of the oil and the amount of hydrogen it contains are related is true qualitatively, but not quantitatively.

The gasifications of the oils in the presence of foreign gases were carried out in the same manner as the simple gasifications of the oils. The results obtained were entirely concordant when the oils were gasified in a current of carbonic oxide or of nitrogen. The dilution with indifferent gases diminishes the secondary decomposition of the olefines and of ethane. Consequently, the percentage of methane falls by a little, while the percentage of ethylene rises. Nevertheless, the product of the yield of gas and the calorific power is not changed. When, however, the oil was gasified in a current of hydrogen at temperatures of 740° to 880° C., it was observed that: (1) In all the experiments hydrogen was to a large extent taken up by the products splitting-off, hydrogen was no longer split-off by the oils themselves; (2) there was always a diminution of the total volume of gas, as, for instance, when the ratio of the mixture was 1 to 2 the contraction amounted to about 15 per cent. of the total yield calculated from the sum of the oil gas and the hydrogen added; (3) there was a diminution of the amount of tar formed; (4) the coke produced diminished by 1.5 to 3 per cent. when compared with the production in the simple gasification of the oil; and (5) the gas showed an average gain in energy of 15 per cent. of the heat of combustion of the simple oil gas.

It will be seen that when gasification takes place in a current of hydrogen the calorific valuation number is appreciably increased. But it appears also that the relative values of the oils, as ascertained by simple gasification, are substantially maintained when the gasification is conducted in a current of hydrogen. The valuation number deduced from the simple gasification of the oil therefore affords a certain criterion of the carburetting power of the oil. Consequently, also the proportion of elementary hydrogen in the oils serves as an indication of their probable relative value as carburetting agents.

(To be continued.)

HIGH-PRESSURE GAS IN THE UNITED STATES.

ACCORDING to some particulars in "Progressive Age," there are at present more than 1500 miles of high-pressure gas-mains in use. They are distributed among the various States as follows:—

State.	Miles of Mains.	Average Pressure. Pounds.
Alabama	38 00	10.7
California	275.18	21.0
Colorado	4.00	20.0
Connecticut	30.00	12.5
Delaware	1.40	5.0
District of Columbia	6.00	3.0
Florida	1.60	30.0
Illinois	191.50	16.4
Indiana	145.50	10.0
Iowa	44.60	10.0
Kansas	—	20.0
Louisiana	7.69	—
Maryland	3.00	23.0
Massachusetts	138.00	11.4
Michigan	81.75	11.5
Minnesota	16.50	5.0
Missouri	39.00	6.5
Nebraska	16.00	17.5
Nevada	25.00	2.0
New Hampshire	20.00	5.0
New Jersey	41.86	4.9
New York	26.70	13.0
North Carolina	6.00	6.0
Oklahoma	33.41	7.5
Oregon	31.80	13.5
Pennsylvania	159.50	47.5
South Dakota	7.50	3.0
Texas	4.00	5.0
Vermont	3.00	15.0
Virginia	33.25	18.0
Washington	28.00	22.0
Wisconsin	48.50	—
Vancouver (Canada)	2.50	—

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Dunfermline.

The Forty-Ninth Annual Meeting of the Association was held in Dunfermline on Thursday last. An exceedingly comfortable meeting-place was provided by the Town Council, who put the Council Chamber in the Municipal Buildings at the disposal of the Association; and there members assembled in large numbers about half-past ten o'clock. Provost HUSBAND took the chair, having beside him several members of the Town Council, including Mr. T. Stewart, the Convener of the Gas Committee, other members of the Committee, and the President of the Association (Mr. Alexander Waddell, of Dunfermline).

MUNICIPAL WELCOME.

The PRESIDENT said that at their forty-ninth annual meeting the Association were honoured by the presence of Provost Husband, and other members of the Town Council, and he had much pleasure in asking the Provost to say a few words.

Provost HUSBAND gave the Association a hearty welcome to the town of Dunfermline. They could not, he said, be better employed than in rubbing shoulders with one another, and discussing such questions as he saw on the programme of business. The majority of the Town Council of Dunfermline were convinced that it was a good thing for their officials to come together year after year to discuss questions which must be of interest to all of them. They were pleased indeed, a year ago, when the Association honoured them by electing their Gas Manager—Mr. Waddell—as their President. They showed their appreciation of Mr. Waddell's services a few days ago by unanimously voting him an increase of £50 in his salary. There were reasons why they, as an Association of Gas Managers, should meet in Dunfermline. He thought they were indebted to the "Kingdom of Fife" for the origin of the Association, though he had been told that morning that its origin was wrapt in mystery. He gathered, however, from a paper handed to him by their Gas Manager, that as far back as 1862 four gas managers met in Cupar-Fife and formed the Association. The gentlemen he named were Mr. Lowder, of Leven, Mr. Myers, of Broughty Ferry, Mr. Proctor, of Forfar, and Mr. Mackenzie, then of Cupar-Fife, and afterwards, for a very long time, their Manager at Dunfermline. Mr. Mackenzie very soon became Secretary of the Association, and continued to give good service for a period of seventeen years. He believed they afterwards elected as President Mr. Lowder, of Leven, and as Vice-President Mr. Gray, of Cupar—the man who was afterwards in Dunfermline, immediately before Mr. Mackenzie. The membership of the Association was now 273. There was, he believed, one Association in existence prior to the North British—viz., the Waverley Association, which was formed during 1862. When he brought the matter of the meeting of the Association before the Town Council, they willingly placed the Municipal Buildings at their disposal. He welcomed the members to Dunfermline, and hoped their visit would be a pleasurable and a profitable one in every respect.

Mr. J. W. NAPIER (Alloa) said he was sure they all appreciated very much the hearty welcome accorded to the Association by the Provost. He had given them some memoirs in connection with the Association; and these, he was sure, were particularly interesting to the city of Dunfermline because its Manager had occupied a very important place in the affairs of the Association. They, as technical men, would like to say to the legislators of the burgh of Dunfermline that while they took an interest in the Association that interest extended to a very much larger sphere. They had not only an interest in the practical business of gas manufacture, but they recognized their responsibilities outside the gas-works gate—to the consumers and to the public; and while they had their duties, as gas manufacturers, in supplying the public with cheap and good gas, local legislators had their duties, in giving them such facilities as would make it possible for them to provide for their communities the advantages that undoubtedly lay in the use of gas. To his mind, Dunfermline occupied a somewhat unique position, inasmuch as, having what might be called a treasury without any bottom, it was to be expected that, so far as the use of gas was concerned, they would take a step forward, and in some measure increase its use for heating purposes. They all knew the possibilities there were with coal gas; and he was sure they might look to the Corporation of Dunfermline to do their utmost for their gas undertaking, and for helping forward the desire of their own Manager, by giving him all the facilities possible in his work. As gas managers, and as members of the Association, they were delighted to know that their President occupied so satisfactory and so happy a position with his Town Council. It was twenty-one years since the last meeting of the Association took place in Dunfermline; and he had a personal recollection of it. There had been many changes since then; and to-day the town was in a somewhat different atmosphere. It was a seat of technical instruction; and he was sure that it would be looked upon as a place for the Association to meet in more frequently in the future than it had been.

Provost HUSBAND acknowledged the vote, and vacated the chair, which was taken by Mr. WADDELL.

PRESIDENT'S ADDRESS.

The PRESIDENT expressed the pleasure they had in having with them that day Mr. J. D. Smith, of Stirling, who had been appointed to the important position of Gas Engineer to the Corporation of Belfast. It was, he thought, a great honour to the Association that a Past-President should be asked to fill so exalted a situation. They all knew Mr. Smith's qualities, as a gentleman and as a gas engineer. He was sure Mr. Smith did not wish that this should be expatiated upon; but they were all pleased at his success. They had letters of apology for absence from, among others, Mr. W. Doig Gibb, of the South Metropolitan Gas Company; Mr. J. W. Helps, Past-President of the Institution of Gas Engineers; Mr. Thomas H. Duxbury, Past-President of the North of England Gas Managers' Association; Mr. R. G. Shadbolt, of Grantham; Mr. David Terrace, of Middlesbrough; Mr. W. R. Herring, of Edinburgh; Mr. Joseph Hepworth, of Edinburgh; and Mr. T. Wilson, of Coatbridge. He had almost overlooked the fact that they had also with them that day Mr. Alexander Wilson, of Glasgow, who they were all proud to think occupied the position of President of the Institution of Gas Engineers. Mr. Wilson was one of those who had given the Association a great deal of attention; and they were indebted to him for his assistance and support. The President then proceeded to deliver the following

PRESIDENTIAL ADDRESS.

Gentlemen, my first duty is to thank you most heartily for the honour you have conferred on me by electing me as your President for this year. I appreciate the honour most highly; while at the same time I am conscious of my inability to discharge the important duties which will devolve upon me. I trust, however, I may have your indulgence and assistance in making this year's meeting a success.

NATIONAL AND OTHER LOSSES.

The first place in our thoughts to-day in opening our annual meeting is naturally given to the shadow which still lies heavy on our hearts through the national, and may I say, personal, loss occasioned by the death of our late beloved King. Well may he be called "Edward the Peacemaker."

Death, whose scythe is never at rest, has been at work in our ranks, and removed at intervals during the past year from our list of members Messrs. John Ireland, of Tayport, James Baxter, of Forfar, James Manwell, of Glasgow, Robert Sharpe, of Belfast, and Alexander Bell, late of Dalkeith. Mr. Sharpe was not only a gas engineer, but a civil engineer of considerable experience, and had, especially during later days, great responsibilities. Those who attended the early meetings of the North British Association, while it was still in its infancy, will remember with pleasure the regular presence of Mr. Ireland, of Tayport; and to them, his absence from among us to-day must emphasize the passing away of another old associate.

Only a few weeks ago, the gas profession was startled by the intimation that Mr. Alexander Bell was no more. The stages of Mr. Bell's working career have no doubt been read by all in the Gas Journals; and I would refer more particularly to-day to those ties which bound him to this Association. I am sure there are few here now, young or old, who did not know Mr. Bell. As a man, he was lovable and loved by all who knew him. His reputation as a gas manager was great; and he was always willing to give a helping hand to those who required it. Along with a few others, Mr. Bell met in Edinburgh, in 1861 or 1862, to form an Association, which afterwards combined with the present one. Of the present Association he was an honoured member; contributing from time to time valuable papers to the meetings. In 1897, he was elected President; and last year, on his retirement from Dalkeith, was appointed an honorary member. Mr. Bell was a life-long friend of the late William Young; and in his early days he attended science classes held by William Young's father. He was a keen and interested worker, seeking to learn in the hard school of experience something new—a man of strong character and active mind. To those who knew him well, Mr. Bell stands out as one who tarried not with trifles, but ever pushed forward in search of something real and lasting. It was the wish of many that Mr. Bell might have, after his strenuous life, some years of peace and retirement by the side of his beloved Tweed. But it was not to be; for his mind was too active to permit complete rest while here. His character and life are engraven on the annals of the gas industry in deep, bold letters, which even time will find it hard to rub out. I am sure I express the feelings of all here when I say that our sympathies go out to-day to the bereaved friends of our late members.

THE WILLIAM YOUNG MEMORIAL FUND.

At last year's meeting, it was remitted to the Council to decide what could be done to commemorate the life of the late Mr. William Young. The Council's proposal is a very satisfactory one, as is also the amount contributed. To-day it amounts to about £460—outside of what it is proposed that this Association is to give. This is a very satisfactory sum. Mr. Young's membership, and his contribution of a series of brilliant papers dealing

with matters lying at the very heart of our interests, added much to the status of this Association. We looked to him for papers which, I believe, no other man could give. He was a man who had an opportunity in a new industry; and he the man. His natural gifts were rare, and he developed and polished these gifts to a wonderful degree—constantly bringing the products before this Association. Apart from our great feeling of appreciation of him, it was an urgent matter on our part to have the man and his work emblazoned on our transactions as a watchword—a great example. At the same time, the proposal made and carried by us to-day is a rare opportunity for our Research Fund producing, so to speak, immensely more light than ever before, and thereby make up, as far as possible, for the loss of the great man to our Association, to the gas industry, and to the world. As one who served under his almost equally clever father, and shared Mr. Young's friendship and acquaintance—and although in my regards for the deceased I would not care to take second place to anyone—I have to confess utter inability to do justice to his memory or his life's work to-day. The occasion is great; and I am unequal to it.

Mr. Young was singularly fortunate as regards the breadth of his experience, which embraced both the gas industry and the shale-oil industry. He was born at Selkirk 69 years ago; and was the son of Mr. John Young, the manager of the gas-works there. Mr. Young, senior, had considerable practice as a consulting gas engineer, and was in great demand as a lecturer on physical and chemical subjects. His lectures were usually illustrated by experiments, in the preparation of which William Young frequently aided his father; so that he early absorbed the elements of chemistry. Breathing the air of a gas-works from his earliest days and during all the receptive period of youth, his nature was amid surroundings that tended to give his mind that bent towards the study of problems relating to gas supply which he manifested to the last. He was placed by his father as apprentice to the plumbing and gas-fitting trade in Dalkeith; and the journeyman with whom he worked was the late Mr. Alexander Bell. From then until the time of his death these two men were firm friends; and the fortunes of the Young and Bell families have since been linked together in a way which makes it impossible to treat of the one without bringing in the other.

In 1863, Mr. Young was appointed as manager of the Lasswade Gas-Works—here succeeding his friend Mr. Bell. His restless genius soon led to the termination of his career as a gas manager, and turned him on to the oil industry, in which he did long and distinguished service. While still at Lasswade, he made the acquaintance of shale, which was being brought from one of the neighbouring coal pits and tipped away as waste. He was not long in getting oil and gas from this shale; and he became in time the saviour of the oil industry. Some 40 years ago, the first of the long series of patents associated with the name of Mr. Young was taken out in connection with the distillation of shale; and soon after he joined the firm of the Straiton Oil-Works, Edinburgh, where he erected distilling and refining plant. In 1873, he transferred his services to the Clippens Oil Company, near Paisley. All this time he was busy making improvements and discoveries, and taking out a large number of patents.

Mr. Young's name is largely associated with the introduction of vertical retorts, which were used at the Scottish shale-oil works with great success; and a year before his death he contributed to the pages of the "JOURNAL OF GAS LIGHTING" a series of able articles on these retorts. At the time of his death, a detailed history of his life and work appeared in the pages of the "JOURNAL OF GAS LIGHTING" and "Gas World"; and to these able articles and their writers I wish to express my indebtedness. In 1885, Mr. Young retired from active management, and became a consulting chemical engineer, resident in Peebles, and latterly also at his estate at Harehope.

Technically, it might be said that Mr. Young throughout the greater part of his active life was a shale-oil engineer and not a gas engineer; but he never ceased to regard himself as a gas engineer, nor did the gas profession in Scotland cease to look upon him as one of themselves. On the contrary, his advice was continually sought in regard to questions of gas manufacture; and he continually, in turn, made gas experience throw light upon the shale-oil manufacture, and shale-oil experience throw light on gas manufacture. Perhaps never will the gas industry or the oil industry, or both combined, give scope to any one man to work out such a consecutive series of problems as those to which Mr. Young devoted his life energies. Details may remain to be filled in; but the principles are established, and whatever alterations and modifications the future may see, the part that was taken by William Young can never be forgotten in the annals of these branches of technology, nor can the example of the man and his work be forgotten. It will be for him an imperishable memorial in the ages to come; for by his own work he left the world better than he found it. And the glory of that cannot fade away.

Mr. Young as a personality was great. The man in the street could see that he was no common-place individual, and no one could speak to him without feeling that his way through life was off the beaten track—that Nature was his guide, his friend, and he with a simple directness was following with all the power of purpose which was strong within him. This manner was his to the last, despite his health, which during the later years of his life was much impaired. Those who had the fortune to know Mr. Young in the early eighties, will perhaps recall his striking figure—tall, erect, and full of purpose, with fingers combing his massive steel

grey uprising hair to secure a momentary opportunity to complete a thought; his square brow; long, dark brown beard; and sharp but kindly eyes, capable of keen scrutiny but a friendly willingness to see all the good within the observed. He gave a careful hearing to ideas for improvement from the youngest of truth seekers, talked freely and encouragingly with them, and when a new and interesting topic arose, it was a pleasure to hear him expound his thoughts, and note the way in which he became animated and absorbed in the conversation, and set forth the point under discussion, while his eyes flashed, and at times lost themselves in his abstract thoughtfulness, which made a listener remember well the occasion. He did not please for the sake of pleasing; he did not patronize. He sought for truth, gave you a firm hand grip, made you welcome, and was unsparing in practical kindness. A visit to him made the day one to be remembered in your life. He was fond of the open air, fishing on the banks of the Tweed. He loved to watch the fish in the stream and think out his problems.

Mr. Young never posed as a theorist. His mind was charged with practical knowledge. He had an unusual faculty of observation; and these he used, together with his experience, to solve the problems which were ever occupying his mind. He did not make wild guesses at just everything that came in his way, but marshalled his existing knowledge, thought it well out, weighed it in the balance, and applied it to his particular problem. He lived among his atoms and hydrocarbon molecules, knew them as personal friends, and just how they would behave in certain circumstances—indeed, so well that his scientific imagination could suggest to him their behaviour in given circumstances and enable him to head them off from what would have meant disaster. It was his actual assimilated knowledge of the realities of things which had developed to an extraordinary degree this scientific imagination which Mr. Young possessed, and which, in his case, grew riper and more abundant with time. He was never content with what was, but whatever he touched he tried to improve, seeking for the foundation truths underlying all phenomena, and welcoming the newer conceptions of the nature of matter with unmeasured satisfaction.

Modest as he was about recording his observations and his thoughts, his earlier papers were simple to almost a fault. But in them lay the germ of his future work—they were but the forerunners of more brilliant ones which followed. He favoured this Association with many valuable papers; and from the storehouse of his wisdom, the Gas Journals have succeeded in rescuing much that has adorned their pages and enhanced our knowledge. Surely, when he came among us as a friend, as one of ourselves, and benefited so greatly this Association, unworthy would we be did we not in some way commemorate his name. And in what more suitable way could we do it than that proposed?

THE VITALITY OF THE GAS INDUSTRY.

Mr. J. W. Helps, in his able address to the Institution of Gas Engineers in June, felt it was impossible to say anything new on matters connected with the engineering side of our industry, on account of all that had been said and written in our Gas Journals from time to time, as records of the ever increasing number of Gas Associations and gas interests throughout the world. Surely we could have no better indication of the vitality of our industry. He confined his address principally to consideration of certain points upon the true appreciation of which depends the extent to which there are to be engineering matters to interest our profession in the future. These points he brought forward so well and so fully that they, in turn, are consequently no longer new.

CARBONIZATION QUESTIONS.

Carbonization of coal in completely filled retorts, in contradistinction to free space retorts, is almost universally admitted to have brought us the opportunity to secure great improvement in gaseous and solid products. Whether the retorts to be used should be verticals, chambers, or present retorts is not altogether such an easy matter to decide, because circumstances in this, as in many other things, considerably affect the question—viz., having found coal capable of yielding the most suitable products, what form of retort will most improve these—whether the improvement in products with lessened cost of labour will justify the throwing aside of present plant and the cost of erecting new? When, however, new or additional carbonizing plant is required, the well-established claims of vertical retorts as yielding such important improvements, both in products and labour costs, also the almost entire avoidance of the smoke and dust nuisance and of gas lost during the charges, demand serious consideration for the adoption of verticals.

The intermittent type of verticals, carbonizing about one ton of coal per day, necessitates comparatively frequent charging and discharging; and the men's work is not quite so pleasant as with continuous carbonizing types.

The continuous or the continuous-intermittent type of verticals, carbonizing about $2\frac{1}{2}$ tons of coal per day, require fewer retorts and fittings per ton of coal than the intermittent type. They are thus simpler; while the labour of charging and discharging is easier. Some of these are very like the shale-oil retorts, differing only in the means of feeding the coal into, and the demission of the coke from, them. The portion of the coal in these retorts where coalescence reaches a certain stage is subject to form arches from side to side of the retort, which uphold the superimposed coal. The feeding door is comparatively simple, and, not

being subject to great heat, should be easily kept in good working order. The door of the bottom opening, if made of machine-faced iron, is subject to be warped, twisted, or broken by the heat to which it is exposed. When the opening is closed by a water-seal, this is constantly being evaporated into the retort, with doubtful results, and when unsealed loss of gas takes place. These are minor defects which are receiving consideration.

It is noteworthy that no conclusive explanation of chemical or physical changes within the retort have been given to explain the improved results. Dr. Colman put forward that the steam formed from the coal in carbonization is decomposed to a greater extent with the full charge than when a large, free space is left in the retort. The theory, on first blush, seems feasible, till Mr. Charles Hunt points out that, with a full retort, a larger quantity of virgin liquor is obtained. Under these circumstances, what becomes of Dr. Colman's theory? Mr. Hunt rather thinks the increased yield of calorific power gas, and gas without its power seriously if at all degraded, is due to the fact that the bulk of gas, through the reduction of temperature in the retorts brought about by heavy or full charges and the considerable or entire elimination of the free space, meets with a lower temperature, and so is not decomposed. The reduced carbon on the retorts in which heavy charges are used, indicates that Mr. Hunt is on the right track. Weight of opinion is therefore rather against the theory of Dr. Colman, although no one except Mr. Hunt has ventured to deny the accuracy of his deduction from mental consideration rather than actual working. It is surely possible to determine the cause of the increased results under present circumstances; and no doubt men of research will have this seen to.

It is interesting, in view of the improved gaseous results being now obtained from vertical retorts, to recall previous repeated trials over 35 years, on a comparatively large scale with similar retorts, when the results were disappointing and unremunerative; further, that the shale-oil works, up to 20 years ago, used horizontals, but then tried verticals. Since then the yield of gas has been greatly diminished, and that of oil increased. These results have, no doubt, unfavourably influenced the adoption of verticals for gas making, and prove that they have to be worked under certain conditions to meet our requirements; and no doubt our conditions of gas supply, in Scotland at least, are more favourable now for the use of these retorts than when cannel or shaley coal was employed for gas-making purposes.

COAL AND COKE PLANT, INCLUDING OVERHEAD HOPPERS.

Eight years ago, when Dunfermline put down coal and coke handling plant, it was believed difficult to do so in such a way as would pay in our works, because the erection of plant to convey coal from the trucks to hoppers over the retorts and throughout the coal-store, also to lift the coal from store to overhead coal-hoppers, and, again, to deliver coke in the yard and from the yard over screens into waggons or carts, and to deliver the breeze into the yard or in front of steam-boilers, would be too great a cost for the work we had to do. This was on the assumption that bucket, push-plate, or other mechanical conveyors would be used. Instead of these, a light underground and overhead railway, with hydraulic hoist system, was put down, and has been doing all the above work since then in a most satisfactory way. It was designed to handle the coal and coke from retorting plant which might afterwards be erected; and this it is capable of doing for any of the present systems of retorts. Without going into the many sides of the question, I may state, as an instance, that with our plant one man can with ease take from the waggons and put into the hopper above the retorts, day after day, and weeks on end, 80 tons during his shift.

The coke-hopper (to hold 250 tons) erected over our railway siding [see "JOURNAL" for April 12, p. 113] is capable of delivering coke into waggons standing on either of two different lines of rails. The reason for erecting this was that the railway siding accommodation was limited, and the service in railway waggons irregular. Yet with short notice, large quantities had to be filled from store and sent away for shipment. In designing this hopper, it had to be made next to impossible for a fire to occur in it; and the danger of this occurring through imperfect quenching is removed by the coke first falling into cylindrical quenching vessels with an opening in the side placed directly under the retorts. The opening is turned up to receive the hot coke from the retorts. While the coke is falling into the vessel, water is sprayed on it, and thereafter is evaporated by the partially quenched coke. The coke is therefore mostly quenched by dense steam, and the atmosphere is kept from entering the only opening at the top by the outgoing vapour. This atmosphere of steam or vapour has proved itself a thoroughly reliable quencher, if given reasonable time. Rekindling within the vessel never does occur, and rarely afterwards.

The coke is dropped from this into a small truck underneath. Thence it is taken by hoist and passed over the screen so as to remove breeze. The screen at the same time would separate any red-hot pieces that might come from any particular portion of the truck—thus lessening their chance of re-igniting. After this, however, when dropped from the tail of the screen, the coke falls alternately into vessels, where the exhaust steam from the engine driving the screen passes through, full of coke, while it is being filled, and *vice versa*—ensuring complete quenching. Since there is a distance of 36 feet from the vessels to the floor of the hopper, means of letting the screened coke down gently is obviously necessary, and is arranged for.

This form of shoot was previously designed to bring about the same conditions as exist on a bing—say, of coke—where each quantity deposited at the top does not run down at such a rapid rate as in a metal shoot, and is not, therefore, subject to be so suddenly stopped and broken. The shoot, however, improves these conditions, because the small heaps formed on each ledge, so to speak, are not subject to rushes of large and heavy quantities as on a large bing with corresponding friction; and the drop of so many inches from the one small heap to another causes the coke to stop, as it were, on each small heap, and it avoids the tendency for it to increase in velocity in its downward passage, such as takes place in an iron shoot. The small drop also allows for any difference of the angle of repose of the coke on the small heaps, owing to increased or decreased size or the condition of the coke from time to time.

We will be able to run the 250 tons of coke from this hopper into waggons in three hours. The screenings from the coke as made from day to day will be run into small trucks and delivered in front of the steam-boilers. The use of this hopper will, therefore, avoid the carrying of the coke from the yard to the screen, as the coke will be taken direct from the retorts and screened into the overhead dish. This will give a regular daily supply of breeze to raise steam, and avoid laying large quantities of it aside and then returning it to the boilers.

The cost of the extension of the hoist and overhead railway, the hopper screen, &c., was £1000. Interest on this at 4 per cent., and sinking fund at $2\frac{1}{2}$ per cent., amount to £59—equal to 2'36d. per ton of coke on the 6000 tons to be shipped per annum.

For shipping traffic like ours, the hopper offers the following advantages: It avoids one handling of (say) 5000 tons of coke per annum. It avoids two handlings of (say) 360 tons of breeze per annum. It also saves the cost of extending the railway siding. It will save the calling of men from other work to fill a cargo of coke for vessels—indeed, it will frequently enable us to wait till the vessels are berthed before loading waggons, thereby avoiding both waggon and vessel demurrage.

HIGH-PRESSURE GAS SUPPLY.

The increasing tendency to centralize the manufacture of gas in large works and absorb outlying districts and villages has involved sending gas much greater distances than formerly. Moreover, incandescent lighting demands generally higher pressures being carried throughout lighting areas; and where the carrying capacity of the original trunk mains has, through increased consumption, become inadequate, boosting in varying degrees has been widely adopted. Gas transmission by the high-pressure system has proved a valuable and economical supplement to the ordinary transmission from the holder; the distinct features being elasticity of output, greater control over the amount and constancy of pressure, and substantial reduction in outlay. While local conditions must be studied closely before deciding as to what degree and form the high-pressure transmission or boosting shall take, it may be agreed that the system commends itself for the following conditions:

- 1.—Where it is required to couple-up gas-works whose areas of supply adjoin; making one manufacturing and one distributing station respectively.
- 2.—For sending a supply of gas to outlying villages or distant holders.
- 3.—Raising pressure in distributing mains in a district.

The various forms of high-pressure systems to meet the above conditions may be:

- 1.—A high-pressure pipe-line, with reducing governors on the inlet to the low-pressure pipe.
- 2.—A high-pressure pipe-line with return type method of regulating the rate of compressor to give a constant pressure of gas at any predetermined point independent of the consumption, thereby avoiding excess pumping.

The different types of compressors may be taken as: Rotary type, suited to pump up to 10 lbs. per square inch at medium cost. Positive type, suitable for the highest range of pressure, but costing overmuch for pressures under 10 lbs. per square inch. Fan type, suitable for low pressures.

SUFFICIENT AND UNIFORM PRESSURE.

Having laid a high-pressure supply pipe to one village two miles distant, and another one mile immediately beyond this, independent supplies were taken off this pipe for the various streets through which it passed—the supplies being governed to $4\frac{1}{2}$ -inch pressures in each street. The consumers adopted the inverted burners suited for these pressures; and the result has been exceedingly satisfactory to all concerned. Tests made show that, with the usual meters, pipes, and fittings, a wonderfully uniform and sufficient pressure is maintained at the inlet of all burners; and I need not mention the advantage this is to consumers.

Gas suppliers have always known that their consumers suffer much through want of pressure at their burners; and the question may be asked: Have they done what they could to rectify this? I am inclined to think, at least since the advent of incandescent burners, they have not given the matter the consideration it demands, and have excused themselves by saying that they are not responsible for consumers' fittings. While I cannot recommend that suppliers should accept this responsibility, I have no hesitation in saying they should look to maintaining a sufficient and, as near as possible, uniform pressure of about $4\frac{1}{2}$ inches within their street mains; and I am satisfied this would remove at least 90 per cent. of the complaints.

AUTOMATIC LIGHTING.

I am sure we feel indebted to those who have made, and are making, and improving, automatic lighting apparatus, whether for inside or street lighting. Such apparatus has already been made which justifies its adoption in certain circumstances; and I venture to say that it will not be very long before street lamps generally will be lighted and extinguished without having to send a man round to do it—and this without bye-passes burning during the day. The feasibility now being proved in a practical way, the proportionate improvement being great, and the work to be done sufficient to make a good trade, under these circumstances no doubt this will be accomplished. To light street lamps automatically will have a pleasing effect on the lighting authorities, apart from the saving and convenience it will bring.

PROGRESS ALL ALONG THE LINE.

Progress with improvement is an absolute necessity which, as time advances, gas engineers feel pressing more and more upon them. We are fortunate that in the past this work has been done, according to the times, perhaps a little slowly, yet in a way which has left to us a steadily increasing business. Within more recent years, the rate has been accelerated; and now, with the Livesey Memorial Fund, the Research Funds of the various Gas Associations, together with the work done by gas companies, corporations, and their staffs, also the very determined efforts made in this direction by manufacturers, apart from individual effort—which is perhaps the greatest element in the struggle—and considering the progress made, it may be said that the industry never had better prospects of rendering greater service to the public. I venture to say we feel that we are in the hum of it.

The makers and suppliers of gas to the public are the parties who are brought most closely into contact with the need for improvement in the various departments. The workers in each works should be encouraged to seek for what should be improved; and this need will "stimulate the doing of it." Let a few engineers and managers of neighbouring works meet to discuss such needs, and how to meet them. From such meetings it may be assumed that valuable results would flow, as they would prompt and develop the mind in its constructive or rock-bottom, truth-seeking faculties. It does not follow, however, that a number of men, even of an inventive turn of mind, could always be expected to work together to reason out a problem to an extent leading at the moment to any real invention, as each mind finds its own way to the solution of a problem to solve which one is often at least unaware of any known laws. He has to be content with seeking for a truth which almost always appears at first in an indistinct and misty way in his mind, and the clearing up of the mistiness and the strengthening of his hold on the truth frequently reveal the tit-bit of the invention.

Mr. G. KEILLOR (Broughty Ferry) proposed a vote of thanks to the President for his address. As a member of the Council, he said he could assure those present that Mr. Waddell had devoted himself with zeal and assiduity to the varied, interesting, and important work of the Association. He was sure the other members of the Council would agree with him when he said that during his year of office Mr. Waddell had directed their business affairs with uncommon skill and general acceptance. The interesting and informative address he had delivered was characteristic of the man and his methods.

The vote having been heartily accorded,
The PRESIDENT briefly returned thanks.

REPORT OF THE COUNCIL.

The report of the Council was then presented, as follows:—

The Council presented a report on the work and progress of the Association for the year 1909-10. In the course of it they pointed out that the membership of the Association at the end of last year was 273, as compared with 248 at the close of the previous year—an increase of 25. The membership is made up as follows:—

Ordinary members	173
Associate members	13
Extraordinary members	81
Honorary members	6

273

The Council recorded that the following members have ceased, by resignation or otherwise, to be connected with the Association:—

Baxter, James, Forfar, deceased.
Bell, Alexander, Dalkeith, deceased.
Cuthbertson, Thomas, Neilston, resigned.
Galbraith, William, Ardrossan, resigned.
Gibson, John, Kirkcudbright, resigned.
Ireland, John, Tayport, deceased.
Irvine, David, Fauldhouse, resigned.
Manwell, James, Glasgow, deceased.
Marshall, William, Largs, resigned.
Sharp, Robert, Belfast, deceased.

In accordance with the rules, the Council recommended the following for membership:—

Ordinary Members.

Chalmers, Robert B., Gas-Works, Alva.
Grafton, Walter, Assistant Gas Engineer, Glasgow.
*Leckie, Robert B., Manager, Gas-Works, Holytown.
*Rule, Henry, Manager, Gas-Works, Kelty.
Scott, Walter C., Manager, Gas-Works, Markinch.
Winton, Charles, Manager, Gas-Works, Grangemouth.

[*Transferred from Associate Membership.]

Associate Member.

Robertson, Robert D., Gas-Works, Airdrie.

COMMERCIAL SECTIONS.

The Council have received reports from the Western and North-Eastern Sections recording the success of the past year's work. Numerous meetings have been held in various parts of the country, and such varied subjects as coal and residual products prices, income-tax depreciation, demurrage charges on railway waggons, the price of gas-meters, insurance, &c., have been discussed with advantageous results. It is admitted that the Commercial Sections have fully justified their existence, although much still remains to be done to link-up various outstanding technical and commercial interests.

WILLIAM YOUNG MEMORIAL.

Last year an attempt was made to publish, in book form, all the technical papers and articles contributed to various Societies by the late William Young; but the scheme had to be abandoned owing to the prohibitive cost of such an undertaking. The members of the Association, however, being desirous of doing something to perpetuate the memory of his life and work, remitted the matter to the Council for further consideration. A meeting was duly convened; and a Special Committee was appointed to deal with the matter. The Committee ultimately resolved to invite subscriptions to a fund, to be called "The William Young Memorial Lectureship Fund," having for its object the provision of annual or biennial lectures at the meetings of this Association. The following is the report of this Special Committee:—

Report of Special Committee.

The Committee have devoted much time and attention to the consideration of this matter; and they are pleased to report that they have now arranged a scheme which, in their opinion, will admirably perpetuate the memory of the late Mr. Young. Several suggestions were made to the Committee, and these having been carefully considered, it was unanimously decided that the memorial would take the form of a fund to be called "The William Young Memorial Lectureship Fund," the income of which should be devoted to providing a biennial lecture to be delivered at the general meeting of the Association. For this purpose it was estimated that a capital sum of £600 would be required. A circular inviting subscriptions was accordingly issued to every member of the Association and to their respective companies or corporations, and also to a few of Mr. Young's personal friends, and met with a generous response. Up to this date, the sum of £425 has been subscribed. The Committee have given instructions to have a Deed of Trust prepared, under which the fund will be permanently settled for the purpose for which it has been raised; and the subscribers will have an opportunity of considering the terms of that deed before it is executed.

The Council are of opinion that the proposed specially arranged lectures will be of inestimable value to the profession and to the gas consuming public; and they unanimously recommend that 100 guineas should be contributed from the research fund in aid of the scheme.

CHANGE OF DATE OF THE ANNUAL GENERAL MEETING.

From reports which reach us, the Committee conclude, it is evident that the month of July is not now an altogether suitable time for the annual general meeting of the Association. We are well aware that July is a regular holiday month; and many experienced members, on holiday at the time, find it inconvenient to break into their well-earned period of repose for the purpose of attending the annual general meeting. It is further suggested that our July meeting comes too soon after the Institution meeting in June, and the Informal Meeting held earlier in the year. Besides, in between, there are now the frequent meetings of the various Commercial Sections, which give members so much additional opportunity for note-comparing, and for the personal interchange of ideas. This proposal has received the attention of the Council for some considerable time; and they strongly recommend the members to agree to the date of the annual general meeting being changed from July to early in September.

The PRESIDENT said the matter relating to the William Young Memorial was rather interesting; and the Council would be very pleased to hear what the members might have to say on the subject.

Mr. J. NAPIER MYERS (Saltcoats) said that there was one slight alteration that might be made in the report. It must, he thought, be an omission that the name of Mr. Bell, of Peebles, was not mentioned. It should have been stated that Mr. Bell had been authorized to receive subscriptions. He had no doubt that the personality of Mr. Bell had a great deal to do with the success which had been attained in raising the required money.

The PRESIDENT said Mr. Myers quite expressed the opinion of the Council. He considered that Mr. Bell had been the right man in the right place; and there would be no objection to his name being inserted in the report as suggested. As to the proposal to change the date of the meeting, he thought they should at any rate give it a trial. It did not follow that the alteration would be a permanent one. The Council were of opinion that it would be a wise thing to change the date. He moved that the report be adopted.

Mr. J. W. NAPIER proposed that it be an instruction to the Council to arrange for the annual meetings being in future held in September.

Mr. A. MACKAY (Montrose) seconded; and the proposition was agreed to.

The report was then adopted.

FINANCES OF THE ASSOCIATION.

In the statement of accounts prepared by the Auditor (Mr. David Spalding, F.S.A.A., of Glasgow), it was shown that the General Fund amounted to £266, and that there was £136 on hand; that the Benevolent Fund had been drawn upon during

the year to the amount of £40, and that there remained a balance of £500; and that the Research Fund amounted to £156.

Mr. ALLAN REID (Brechtin) moved the adoption of the statement of accounts. He said it was a very satisfactory one, as they were in the position of having more money at the credit of the Association than ever before.

Mr. A. WILSON seconded the motion. He said he considered the Secretary and Treasurer and the Council deserved the greatest thanks from all the members for the excellent way in which they had managed the financial affairs of the Association. The accounts were about the most satisfactory he had ever seen presented to any Association. Mr. Hislop had put their finances into such a condition that they were not only a credit to him, but would enable the Association to pay over £100 from the Research Fund for the Young Memorial Lecture. This would be really good work. It would be putting the money to a purpose where it would be of the utmost service, not only to the members but also to the gas industry.

The motion was agreed to.

Mr. S. MILNE (Aberdeen) moved that the Association vote 100 guineas from the Research Fund to the Young Memorial Fund. He said he was not aware of much having been done with the fund by way of research, except in connection with the Livesey Memorial; and he considered this was an opportune moment for disbursing as proposed.

Mr. G. KEILLOR seconded; and the motion was agreed to.

READING OF PAPERS.

The two papers on the programme—one by Mr. J. W. Napier, of Alloa, on "Gaseous Fuel: The Duty of Gas Supply Authorities to the Public;" and the other by Mr. J. Dickson, of Forfar, on "The Checking of Working Costs in Small Gas-Works"—were then read. The former is given, with the report of the discussion upon it, to-day; the latter is unavoidably held over till next week.

LUNCHEON BY THE CORPORATION.

At the mid-day interval, the members and their lady friends were entertained at luncheon in the Burgh Court Room. Mr. T. STEWART presided, and extended a cordial welcome to the Association, whose work he highly commended.

Mr. A. WILSON (Glasgow) proposed a vote of thanks to the Corporation for their kindness and hospitality; and it was cordially agreed to.

ELECTION OF OFFICE-BEARERS.

As the result of the ballot, the following were elected office-bearers for the year:—

President.—Mr. G. Keillor, of Broughty Ferry.

Vice-President.—Mr. J. McLeod, of Greenock.*

Members of Committee.—Mr. A. Bell, of Peebles, and Mr. A. Smith, of Tradeston, Glasgow.

Auditor.—Mr. D. Spalding, F.S.A.A., of Glasgow.

Mr. KEILLOR returned thanks for his election as President—an honour which, he said, had come to him a good deal before his time.

PLACE OF NEXT MEETING.

The PRESIDENT moved that the meeting next year be held in Glasgow; and this was agreed to.

Mr. KEILLOR said he would certainly have liked very much if the Association could have gone to Broughty Ferry. It was a long time since they had been in the neighbourhood; but he felt that, there being an exhibition in Glasgow next year, this fact must weigh with the members in deciding as to the place of meeting.

CONCLUDING PROCEEDINGS.

Mr. J. D. SMITH presented the President's Medal to Mr. Waddell, who accepted it and briefly returned thanks.

On the motion of Mr. J. D. SMITH, the readers of papers were thanked for their contributions.

This completed the business; and the meeting came to a close before four o'clock.

VISIT TO PITTENCRIEFF GLEN, ANNUAL DINNER, AND EXCURSION.

The members and lady friends were photographed in the Abbey grounds, and then passed into Pittencreeff Glen, the gift to the town of Mr. Andrew Carnegie, where they were entertained at tea, with music for an hour. A ramble in the romantic glen was somewhat spoiled by showery weather.

In the evening the annual dinner was held in the City Hotel.

On Friday a large party of ladies and gentlemen went upon an excursion in brakes from Dunfermline to Kinross, driving round Loch Leven. Lunch was served in the Green Hotel at Kinross.

* Mr. McLeod and Mr. A. Reid, of Forfar, received equal votes. In terms of the rules of the Association, the President drew lots; and the lot fell upon Mr. McLeod, who was declared elected.

Japan-British Exhibition Awards.—In the "JOURNAL" for the 19th ult. (p. 177), we mentioned some of the recipients of awards at the Japan-British Exhibition. The following are additions to the list: A grand prize to the Thames Ironworks, Shipbuilding, and Engineering Company, Limited; a gold medal to Messrs. Clayton, Son, and Co., Limited; silver medals to Messrs. Head, Wrightson, and Co., Limited, and Messrs. W. C. Holmes and Co., Limited; and a diploma of honour to the Brentford Gas Company, for their installation of high-pressure gas.

GASEOUS FUEL: THE DUTY OF GAS SUPPLY AUTHORITIES TO THE PUBLIC.

By J. W. NAPIER, of Alloa.

[A Paper read before the North British Association, July 28.]

It is not the purpose of this contribution to discuss the efficiency of gas-fires as a heating agency. Much good work is already being actively engaged in by experts in our own profession, as also by the firms manufacturing the apparatus—the latter deserving grateful praise for introducing scientific investigation in the designing of their goods. Nor do I desire to touch upon the question of low-grade gas for heating. This is a technical matter which the public will be content to leave to the expert; and we, as responsible officials, will not fail to meet the case.

The necessity for a higher standard of efficiency of gas-fire, and also for improvement of design, we recognize as urgent. But while efficiency of the fire—*i.e.*, minimum consumption of gas consistent with satisfactory heating power—is required, and is a direct factor towards decreasing the cost to the consumer, the duty to the public is to provide apparatus under easy conditions of purchase or hire, and the supply of fuel at low rates. We must recognize that the public are quick to grasp opportunities of advantage and betterment. They are the judges; and it is they who decide.

If one is able to contemplate, far less to endeavour to measure-up, the vast possibilities of a fuel-gas scheme for domestic requirements in our cities and towns, we begin to realize that herein there exists a commercial asset of such practical value to gas undertakings, and of benefit to the public, that should at once stir up within us an immediate endeavour to win it. We become doubly conscious of how great the effort required must be in order to obtain the huge business of distributors of heat.

My anxiety, therefore, is (and it is the burden of my discourse) to discuss, and in some measure to indicate, the line of policy to be followed in giving to the public coal gas as the fuel that should be cheapest and best.

As distributors of gas for lighting purposes, the possibilities of adding to our business are becoming less year by year, as ground hitherto unappropriated has been gained; and the accustomed upward line of increase must needs be influenced by the agency of competition. The use of gas for cooking has been advanced to such an extent that in a number of towns it can be said that business has been almost fully absorbed; and, speaking generally, with the past years of education and facilities given to the public, this field also is fast being taken up.

Gas for power requirements has had to meet the stress of competition—for small power the electric motor, and for large power producer gas; and, while the demand must always be very great, it is only where low rates are offered that a satisfactory load-factor can be got and retained.

What I have here stated has been set forth as a calm, deliberate statement of our position as gas suppliers. The duty to ourselves is to keep the business we have by practical efficiency in the use of gas by the public, and, further, to endeavour to widen the field of our business, which, I feel assured, is not limited by any near margin of demand.

I have been led to make these observations, having in view my own circumstances at Alloa. When I find that nearly every householder cooks by gas, and that the average annual consumption per ordinary meter is 30,300 cubic feet, and the slot meter gives an average of 16,100 cubic feet per consumer, that we have no competition from suction gas with selling rates from 1s. 4d. to 1s. 10d. per 1000 cubic feet, and that we sell 16½ million cubic feet per annum for power and industrial purposes to 76 consumers, giving an average of 219,000 cubic feet per consumer, I find myself brought near to the critical point of saturation.

FIXING FREE.

To fix gas-fires and heating appliances free of cost to the consumer is a *desideratum*. We are aware that at the early stage, when gas cooking appliances were being introduced, this duty was the elementary guide to increase of business, and not to do so an error that short experience enabled us to eliminate.

The cost of the fixing is merely an outlay of a similar kind as in the case of a service-pipe for a new consumer, except that the lighting meter already fixed does double duty. Further, any single instance where the cost of fixing is excessive must not be used to condemn the policy; for it is necessary to consider the average cost of fixing over a large number.

The claim of the gas-fire should be recognized in the schedule of the architect; and, while this matter has been long spoken of, no general result has been arrived at. Once we have brought about the fixing of gas-pipes in new buildings during erection, a valuable concession will have been obtained in the way of gas-heating being given its just position. Is it not, therefore, clearly a duty of our Commercial Sections to collaborate with architects and builders?

Over a period of two years, I find the average cost of fixing of fires to be 7s. to 8s., which includes all time and material. This sum cannot be considered excessive; and, having regard to what is a possible average consumption of gas per fire fixed, it should establish the policy of fixing free. The cost of fixing as an item of expenditure should, in my opinion, be a charge against revenue, and not be included in the capital value of gas-fires as appearing in,

our books where the apparatus is hired out. The capital account would represent value of fires only, and would be written-off by the sum received for rentals or sale, as the practice may be.

I have thus referred to this important feature of my subject, because it is the prime essential; and I invite anyone to show cause or reason why this work should not be done or only carried out up to a predetermined cost—the consumer to meet the additional expense. I am aware that several large corporations are lamentably in the background in this matter; but then small movements of this kind are of curiously slow growth and issue. Necessity will, however, undoubtedly compel.

We recollect in the far-back annals of our industry the light-some duty of gas departments in helping consumers of gas; the diligent individual in his anxiety to have "light without a wick" had to provide his own service-pipe and buy a meter for measurement. At the present moment, and as regards the fixing of heating apparatus, there is room for suspicion that the history of these past times is being practised once more. Let us try and be serious in being up-to-date in our methods.

A commercial business is generally found to be built up of units of different capacity and value; and we speak of the success or failure of a scheme of business by the result produced. Therefore, let the duty of supplying heating gas be administered while having in view a large volume of sale in the aggregate, but yielding, nevertheless, a satisfactory result.

HIRING-OUT OF HEATING APPLIANCES.

The resolve to fix free having been arrived at, we have next to consider the ways and means whereby the consumer is to be further encouraged. We immediately discern that the different classes of the general public are of varying moods in their ideas and of separate ability as to spending money on heating appliances. We have those who, having once resolved to use fires, buy the article outright; and they receive our encouragement. Generally speaking, however, the vast majority of the public are wishful of help in matters of finance; and the process of adding to our heating consumers will be greatly advanced by gas departments acting as lenders of money. Shortly stated, I am satisfied that when the policy pursued is that of supplying the consumer with the article wanted at a nominal rent, or on simple hire-purchase, a forward step has been taken. We do know from experience with cooking apparatus that any attempt to ask the consumer to buy the stove is like trying to do business but getting next to no result. It may be concluded, therefore, that to take up the attitude throughout of asking consumers to buy their heating apparatus is not likely to promote rapid progress—the pace will be much too slow. This, I am satisfied, has been the general experience.

But having considered the policy of hiring-out in its logical aspect, and determined its possibilities, and more particularly perhaps from the vantage point of the consumer, it is necessary to consider the position of the gas department in meeting the outlay incurred.

The question resolves itself into a matter of simple finance. Having incurred the outlay, the gas department desire a satisfactory return, and hence a system of rentals is instituted. The amount of rental charged should be based on a five years' (or, say, seven years') purchase of the article—the appliance to become the property of the consumer at the end of the period. The other method of simple hire could be based on a certain number of years' purchase of the fire; the consumer being entitled to return the article at any time desired. In this latter system, there exists undoubtedly a possible effect that is highly undesirable. A consumer—tired, it may be, of his experience, or wishful of having another design of fire—requests removal. Unwillingly we assent; but, if we are progressive, the returned article very soon finds another customer. Looking backward, and remembering our experience at Alloa of hired-out cookers, and the number returned during the out-of-season part of the year, the question instantly prompts itself: To what extent will this result with fires, &c.? If fires lent out on simple hire without conditions are returned to re-stock our show-rooms, then we must devise a system to prevent, or at least minimize, the trouble and loss. I am anxious to debate the subject in its practical aspect, and, having referred to this phase of the business, am willing to leave it at this stage. Actual experience may show results.

In deciding to put gas appliances on hire, we have to carefully consider how far it is advisable to go in the cost of the article hired. The policy at the outset would be the cautious one of putting on the hire-list only fires up to a certain net cost. What this might be precisely can very well be left to the individual concerned to determine. To adopt only a limited number of fires of different design will also be found desirable—thus eliminating the trouble of requiring to keep a large stock; and at the same time, having only a few different kinds, they are more easily disposed of if sent back by the consumer. As regards apparatus of high-class design and finish, that are costly, these are generally wanted by consumers who can afford to buy outright; and this arrangement is the best for the gas department.

Broadly speaking, therefore, it may be taken that the hiring-out of appliances under reasonable yet protective conditions provides a means of outlet for additional business, and on the hire-purchase system is financially sound. But, as I hope to show later, this method will still leave gas behind on the royal road to its ultimate general use for heating.

The policy of fixing free and supplying apparatus on hire at

present rates, if persevered in, will enable us, in due course, to measure not only the progress made, but, be it now noted, its limiting effect also.

I have referred to the urgent necessity of affording to the consumer of gas for heating facilities for fixing free, and the acquirement of apparatus on easy terms, knowing that this has been the policy of a very large number of gas authorities throughout the country. But I desire to know something of the result, first, as to the extent the apparatus has been made use of and the number of fires returned, and to what extent the consumption of gas has been increased, and whether the fires can be termed intermittent consumers only.

I now come to discuss another phase of the business of selling gaseous fuel, and it is desired to take the opinion of the public. We shall be told that gas as a heating agent is too dear at present rates to permit of free and constant use. We make no complaint with the statement, knowing how well-founded it is. It is not sufficient to emphasize the advantages of gas heating as to cleanliness, convenience, adaptability, and so on, because the public will not thereby be prompted to the general use of gas to the exclusion of other fuels, when the actual result is found to be an increased fuel bill compared with what formerly obtained. It must be admitted at the same time that in very many instances, as a labour-saving appliance, the gas-fire will be adopted on its merits, and cost allowed to be of secondary consideration.

The facilities so afforded, as already described, are sufficient to justify gas authorities in stating that, for intermittent or occasional use, the gas-fire amply fulfils its duty in meeting the wants of the public. But we must not rest satisfied at this stage, because only a very small percentage amount of the present-day demand for heating requirements has been absorbed. Nor must we be unmindful of our competitors in the field. To have succeeded in introducing gas-fires that can only be used for short-hour periods is like picking up single straws when a whole field lies before us ungarnered.

At what price, therefore, must gas be supplied in order to compete with other fuels? Referring to the detailed and valuable report of the experts appointed by the Glasgow Corporation, Mr. F. W. Harris, Mr. Peter Fyfe, and Mr. Alexander Wilson,* it is stated that the total expenditure for a six-hours' trial was: For gas, 4'2912d.; for coal, 2'9062d.—equivalent to 1'385d. in favour of coal. "If the price of gas was 1s. 4d. per 1000 cubic feet, instead of 2s., the cost of the two fires would have been identical, with a manifest advantage for the gas-fire in rapid, even, and progressive heating power to the maximum, and instantaneous extinction when no longer required. But even with the extra 1'3d., gas can claim, as we have already indicated, a convenience and simplicity of regulation impossible with coal; a rapidity of effect which coal-fires cannot attain to; and an absence of dirt and dust and ashes, which we think may easily compensate every cleanly housewife for the fractional saving she can make in money by burning coal." The report further states: "We are, therefore, of opinion that, even where fires are required for continuous daily use . . . the cost of heating by gas compares very favourably with the cost of heating by coal."

The data obtained are valuable; and, personally, I feel satisfied that the ratio of difference in price between gas and coal is most fairly stated. But it is this difference in cost that largely concerns the consumer; and he will not feel justified in using gas freely despite the many conveniences. Likewise, it is this difference in cost that concerns gas suppliers also.

It is to be noted that 1s. 4d. per 1000 cubic feet is the price at which it is necessary for gas to be supplied in order to compare with coal, taking simple cost only as the basis of calculation. If it is impossible at the present time—as undoubtedly it must be admitted to be the case with the large majority of gas supply concerns—that gas can be sold at anything approaching the price mentioned, then we must be content to provide every other possible facility to the consumer. Hence low rentals and fixing free can be persevered with.

The question has been put that, If we must differentiate between the prices of lighting, heating, and power gas, why not do so by providing the appliances free? This, I reply, is not enough. You may provide a magnificent system of railways and luxurious travelling compartments; but if the fares are high, the public will not travel in their crowds. Likewise you may provide the public with fires free of cost and fixed free; but if the running cost—viz., the price of fuel—is high, then the business done will be limited.

The possibility of a low price, however, is not exhausted. There are towns where a lighting rate of approximately 2s. is in force, and a rate of from 6d. to 8d. per 1000 cubic feet less is charged for gas for power and industrial purposes.

A FLAT-RATE OR DIFFERENTIAL CHARGE?

I have now arrived at the crucial point of my subject, and an aspect of the whole matter which requires our careful deliberation. I refer to instituting a separate flat-rate, or charges on a differential scale, for gas used for heating purposes. The supply of gas at a special rate for heating requires that gas for cooking should be considered as coming within the compass of heating gas, and both demand treatment alike. Regarding gas used for cooking, let me remind you that the gas-cooker is the factor at work in providing gas-works with a summer load; and many of

* See "JOURNAL" for Jan. 4 last, p. 39.

us can instance in our own experience cases where the day-load from 6 a.m. to 6 p.m. is 50, 60, and at times 70 per cent. of the total twenty-four hours output. To what then, in similar direction of use can we look, whereby a winter load for heating gas can be secured? Here, unquestionably, the gas-fire presents itself. We are aware, of course (and I do not overlook the fact), that a summer day-load is something of different value compared with a winter day-load, and that the time-period of the use of fires trespasses upon the hours of maximum demand for lighting during winter months.

The hour of maximum demand has been the bogey of electric engineers. A too closely practical and overstrained conception, in my opinion, has been given to it, though doubtless with our competitors it is a factor of much greater import than with gas suppliers. If we wish to place a watch upon users of gas-fires, and introduce conditions that may prove onerous, then we are placing a check upon our business. I believe, therefore, that this element of the case should be dropped. There are surely ways and means in our capacity as practical men whereby sudden overloads, so to speak, can be handled with success.

Are we, then, to leave the rate for gas for cooking alone, and consider that free fixing and free rentals abundantly satisfy the consumer, and that we as gas suppliers have practically a monopoly of the business? There is no serious competitor in the field; and, therefore, I am content to accept this dictum for the present time at least, but feeling certain, nevertheless, as to the ultimate result. There are aspects of our business that, having regard to the different uses of gas, and the necessity for special rates due to competition, and competition alone, are found difficult to deal with on a rational basis, and the present instance is an example. But I am disposed to believe that, while equitable treatment is highly desirable, the exigency of the case demands a departure from the guiding rule of simple principle. I, therefore, desire to state quite simply and openly that gas, if it is to be brought within the reach of the public as a fuel—to the general exclusion of all other competitors in the field, to be used freely and constantly—must be supplied at a special rate, and that this rate will meet with the approval of the public if charged at or about 1s. 6d. per 1000 cubic feet. We must modify our charges to suit our consumers; and no amount of strenuous endeavour in any other direction can meet the case.

SEPARATE DEPARTMENTS NEEDED.

The course of events, therefore, may impel us to set up two different departments of sale of gas—viz., lighting gas and fuel gas—with separate rates and meters. The practicability of such a scheme, as affecting the working of our departments, demands further and closer examination. I am conscious that to do so with diligent regard to the importance of the matter, and to submit an analysis of the cost of gas production, is much more than can be expected of me on this occasion.

I have referred to a separate meter being necessary. It may here be stated that in the case of electricity a separate rate is in force for power and heat in almost every area of supply, and a second meter is used. An interesting aspect of the situation is that as loans are not usually granted to electricity companies for meters, the expense must be met from revenue. Our policy in fixing a separate meter will be justified if the business resulting is of satisfactory return in ratio to the expense incurred.

It is the presence of the coal-fire in the kitchen during the winter months that prevents the full use of the gas-cooker at that period. The public will not be a party to spend money in two directions at the same moment to serve one purpose only. Therefore, with gas at an economical price for heating, its use will be taken advantage of at all times and seasons, for cooking and heating both. In this regard we may remind ourselves that the volume of gas required per hour for heating appliances is very large, and generally from six to ten times more than is necessary for one single appliance for lighting. Surely this simple statement is sufficient to convince us in an elementary way of how much the consumption per meter can be "boosted-up," and of the enormous field at our command.

What will help us is, say, a three-light size of meter made equal to passing double the volume it is at present capable of, even if charged at only a slightly less price. I do not wish to labour this point; but what I do wish to say (and that merely in one word) is that a meter, correct in registration at the maximum and minimum demand, and less costly than the present instrument, is urgently wanted by the gas industry.

As an advocate of differential rates, I am strongly of opinion that, at the initial stage of our attempt to supply cheap heating gas, a scale of charges should be instituted based on consumption of gas. I find, in the case of my own town, that for the past year, with rates from 1s. 6d. to 2s. per 1000 cubic feet for power and industrial purposes, 16½ millions were sold; the average price obtained being 1s. 8½d. For the coming year, the rates have been reduced by 2d. per 1000 cubic feet; so that the average price to be received will probably be 1s. 6d.—the ordinary rate for lighting being 2s. 1d. The above-mentioned rates, however, only apply to large consumption, such as cannot be obtained from domestic use for heating. In the case of engines, we have to meet the expense of the service-pipe and the meter; with heating apparatus, the outlay for fixing and supply of meter has also to be incurred if a scheme of differential rates for heating is brought into practice. The essential difference, therefore, is the volume of business done.

If my own case is taken as typical, it will be noted that there

is a difference between the lighting and power rates of 7d.—being 28 per cent. of a reduction. From the short study I have given to the matter, I would not be averse to attempting rates for heating of 1s. 9d. and 1s. 6d. per 1000 cubic feet, according to the quantity of gas consumed—the gas department to provide a second meter, fix all heating apparatus free, and give the consumer the choice of obtaining the latter on a hire-purchase scheme, or, if bought outright, at an absolute net cost.

I have endeavoured to summarize the subject in its general aspects; it is for each one to consider the matter according to his individual circumstances, and to determine what possibilities exist for increasing the sale of gas for heating in the area of supply. Whatever the future may hold in store for the gas industry, I feel satisfied that gaseous fuel will in very large measure be the medium of heat supply to the domestic public of the future, if we at this present stage of time exhibit a liberal spirit in the supply of our product.

Discussion.

The PRESIDENT said they had had a paper on one of the most important subjects relating to the supply of gas. Mr. Napier had treated it broadly, avoiding technicalities; and it would be useful to have a discussion upon the matter. They had with them Mr. Wilson, of Glasgow, who had had a great deal to do with the subject lately; and he would be pleased if Mr. Wilson would open the discussion.

MR. ALEX. WILSON (Glasgow) thought that the Association were greatly indebted to Mr. Napier for bringing the subject before them at this time. It was getting to be one of the most pressing points in connection with their industry—the question of the supply of gas for domestic purposes. There was no doubt that there was an immense field before their industry in this line. The difficulty was to so arrange matters that they could take full advantage of the demand, and get the business before it was gathered up by some competitor. Mr. Napier had dealt with the subject fully. As the manager of a fairly large corporation gas undertaking, he might say corporations generally laboured under an immense disadvantage in competing for this kind of business, as compared with gas companies. However anxious managers of corporation gas undertakings might be to extend business in this direction, they met with many difficulties and discouragements. Councillors were only human beings after all; and when pressure was brought to bear on them by traders—plumbers, ironmongers, and others—he could quite well appreciate the difficulties of their position. They had no wish at all to hurt in any way traders who, without doubt, contributed largely to the success of a city or town by their energy in business; but those who were connected with the gas industry felt that traders did not give the same attention to their business which they could give themselves. If they had the full sympathy of their councillors and corporations at their back, in the same way that managers of gas companies had, and they were allowed a free hand, he had not the slightest doubt most of them could make this business boom in a short time. They had now come to the stage when they had apparatus that furnished very good results for the amount of gas consumed. Mr. Napier gave credit to makers of gas appliances for the interest they had taken in giving them good apparatus. He would like to add his voice to this. He thought they were indebted to the makers for the increasing interest they were taking in making their apparatus better and more efficient in every way. They might say it was their business to do so; but they felt that the interest of the makers in this way was not only to their own benefit, but also much to the benefit of every gas undertaking. Mr. Napier dealt with a great many points in his paper; but he (Mr. Wilson) would only touch upon a few of them. He dealt with the free fixing of apparatus. There was a good deal to be said for the free fixing of gas-fires. Consumers asked the price of a gas-fire, and very often were quite willing to pay it; but when they were told that fixing would cost so much extra, in many cases this was enough to scare them altogether away, which was a great pity. They had no hesitation whatever in putting in new services for all lighting consumers; and he thought that Mr. Napier was on the right lines when he suggested the free fixing of all gas apparatus. Perhaps they might not go the full length; but he believed that in the near future free fixing would be the rule, and not the exception. Most of them were desirous of getting extended power for the fixing of pipes in buildings. Glasgow was recently in Parliament, and had their powers extended in this respect; and he hoped that, by bringing pressure to bear on architects and others, they would be able to do much better in this respect than they had done. The difficulty in most buildings was to get a service suitable for gas-fires carried through in an efficient manner; the pipes often being small. When this was the case, a service had to be run from the meter to give an efficient supply. If the piping of buildings were done efficiently at first, this difficulty would not be met with; and the mere fact of having a connection at each fire-place, would do much to extend this business. Mr. Napier mentioned the figure of 7s. to 8s. for connecting each fire. He wished they could get down to this figure in Glasgow with safety. Then he said that all these charges were revenue charges, and only the fires were put to capital. This also, he thought, was on the right lines. They should not go on building up more capital than they could really help. The competition between gas and other methods of lighting and heating was getting keener every day; and the lower they could keep their capital charges, the better would they be

able to compete. The cost of the gas was a most important part of the problem. He must confess he was a little bit in doubt as to the advisability of reducing the price for heating—domestic heating especially. So far as gas for manufacturing purposes was concerned, the question was simple, because they could make gas for manufacturing, which was used practically regularly throughout the year, at a much lower rate than they could for (say) lighting purposes, which gas was only used for a short time in the winter. Gas for fires was much on the same lines as that for lighting—it was used only for a short time in winter. Therefore, it helped to build up what electricians called the peak-load. Gas for manufacturing only required about one-third of the plant in their works which gas for lighting did; and therefore the standing charges were borne much more easily in the case of gas for engines or manufacturing purposes than in that of gas for lighting or for fires. Consequently, he had not yet gone the length of Mr. Napier, in advocating a special price for this. He believed it might be good, as a matter of policy; but as a matter of equity, he had not been able to convince himself that it was the right thing to do. The subject was so interesting that one felt it ought to be dealt with as fully as possible.

Mr. A. YUILL (Dundee) heard Mr. Napier's paper with interest. He felt that they were all passing through what he might term the spirit of evolution. In the past, most of their time at these meetings was taken up with matters pertaining to the manufacture of gas. But a change had taken place; and they were more concerned now as to the amount of business they could possibly do by paying attention to the little details which were essential in every well-balanced organization. As they were aware, he had, to some extent, gone on the lines advocated by Mr. Napier; and they had every reason to feel and experience the benefit of the change. The financial position of the undertaking bore out the fact—so much so, that he would not like to go back to the old order of things. He considered that anyone who did not place before consumers all the advantages they possibly could, were standing not only in their own light, but also in the interests of the consumers. In looking at this matter, he had always had before him the fact that when they considered the commercial management of gas-works, and asked who they belonged to, the answer must be that they belonged to the people; and if any of them were guaranteed a sum equal to pay all working charges, interest, and sinking fund, they would require nothing more. If they got this from the gas, they would have all they required; and if they gave cookers and fires free, they would require to compensate themselves by the price they charged for gas. In considering the question, they were confronted by the fact that they must differentiate between their consumers, and in the way the gas was consumed. They would admit that if they were able to get consumers paying them a large sum for gas for other purposes than lighting, they ought, in all fairness, to have some consideration, and more especially when the sum was taken at a period when the lighting made no demand upon them—in other words, a day-load. This also referred not only to cookers and fires, but to gas-engines. He fixed cooking stoves and fires free; but in the case of fires, he made a charge of 10 per cent. on the net cost, as hire. This was done advisedly, because, as they knew, if a party gave up a cooker, it could be cleaned and sent out again; but in the case of a fire, it was so much a matter of taste that this could not be done. Therefore, they should be content, so long as their consumers were content to pay the 10 per cent. Engine users should pay a differential rate. They were large consumers; and the corporation were put to very little expense in the fitting of them up. This was a consideration which was very often forgotten. Mr. Napier mentioned about the fitting in of pipes in new houses, or rather that architects should recognize the claims of gas-fires. When corporations did their own fixing, architects naturally said they were not going to put in gas-pipes, because the corporation would do it free of charge. They ought to endeavour to go hand-in-hand with architects; and if the architects were able to determine the class of tenants, and whether the tenants would be at all likely to consume gas, then they would be well advised to collaborate, and have all the piping done during the erection of the buildings. When they looked back and recollected that one day's consumption of gas in winter was seven times more than a day's consumption in summer, and considered the present position of matters—70 per cent. of the gas being sent out between 6 a.m. and 6 p.m., and only 30 per cent. during lighting hours—this was a very great factor in the question before them. They all knew the benefits that a day-load gave them, when they came to consider the question from the point of view not only of interest and sinking fund but of other standing charges. Mr. Napier had mentioned the relative price of gas in comparison with coal. The figure that was given them, of 1s. 4d. per 1000 cubic feet, he presumed was the price Mr. Wilson would require to sell his gas at in Glasgow to compete with coal. But this could not be a fixed sum, applicable to all, because they were aware that the price of house coal, delivered locally, varied in different towns, depending upon their proximity or otherwise to the coalfields. While it was 1s. 4d. in Glasgow, possibly he might be able to meet the matter with 1s. 6d. He tried to meet consumers as far as possible. The ordinary lighting rate was 2s. 3d. per 1000 cubic feet, and for other purposes than lighting from 2s. to 1s. 7d.—all less 5 per cent. In fixing these rates, he was merely following equity, because they were charging practically the same price for gas consumed in cooking-stoves, and giving a concession to engine users, and also to users of gas for industrial purposes.

Mr. Wilson raised the question of charging piping to revenue. He believed that in every well-balanced concern the more they could carry to revenue the better it was for the undertaking. But they must admit that there was a limit; and the limit was forced upon them now by the Secretary for Scotland. He did not know whether any of them there had had reason to interview the Secretary for Scotland or his assistants, as he had the previous week. He found that they now imposed very stringent measures on those who were seeking borrowing powers. A Committee of the Department sat some time ago, and a scheme was passed through Parliament providing for the number of years which would be given for the sinking fund, applicable to various classes of expenditure. In the case of gas-works, thirty years had been allowed; for purifying plant, twenty years; and for fires and cooking-stoves, they only gave ten years. If they had to redeem them in ten years, it became a serious matter; but, on the other hand, if they paid the expenditure out of revenue, they did not require to borrow, and therefore the outlay did not become a charge upon the sinking fund. He mentioned this to show the stringent measures which were required by the Secretary for Scotland, and which required them to consider the financial matters in a different spirit from what they did formerly.

Mr. A. B. LANGLANDS (Glasgow) thought that all gas managers must face this question, and face it now, because their competitors were not asleep. He had a hobby for the fixing of apparatus free. He would fix free, and take the chance, because the benefit was not to be a present-day one, but a continuing one. The question of working with architects and builders was vital. A good deal more could be done in the direction of getting architects and builders to come to them for advice and assistance, and the mutual adjusting of pipes, and so on. In the old days, his chief—Mr. McGilchrist—handed a scale of conditions to architects and builders; and he took up the position that he would not supply gas unless there was a certain size of pipe. The hiring of gas-fires was growing every day; and in this connection, they should not be afraid to scrap. People who had gas-fires fifteen or twenty years old would say, "Gas-fires are horrid things." Therefore, scrap freely.

Mr. G. R. HISLOP (Paisley) remarked that the question was put as to whether they were to leave the rate for gas cooking alone and consider free fixing and free rentals abundantly satisfied the consumer, because they, as gas suppliers, had practically a monopoly of the business. He said "No." He maintained this in the granting of free stoves. Everyone should consider the propriety of giving stoves free; and fitting them up as well. As to the reduction in the rate, equal to about 4½d. per 1000 cubic feet, this was exactly the rate given in Paisley for power and commercial purposes, to all who made application for gas for such uses. They required only to be assured that the article they were employing gas for was one which was being manufactured to be sold. This constituted a commercial purpose; and therefore the users were entitled to a reduction. For commercial purposes, if they consumed 150,000 cubic feet per annum, they had a meter free; but those who consumed less had to pay for the meter to measure the gas. He was not quite in agreement with those who advocated the hiring of gas-fires. He had never seen his way to give out gas-fires, as the difficulty arose that consumers never were satisfied with the article, and became careless in its management. But he believed that the hire-purchase system would largely meet the difficulty, because consumers would then be interested in keeping their fires in condition, being part purchasers of them. Mr. Napier gave some important facts in connection with distribution and rates—facts which were worth attention. He commended the paper to their careful consideration. They should follow up the lines Mr. Napier had laid down, or the suggestions he had made. The paper would be of great value, as raising many important questions.

Mr. J. NAPIER MYERS (Saltcoats) was prompted to rise at this stage to give voice to what might be termed the old-fashioned view of these matters. He must confess himself to be wholly against the ironmongery business. He had the honour to serve a gas company; and the ideas that floated about the gas world generally were brought to their notice by people in adjoining places like Glasgow, Coatbridge, &c. They came to them with stories about what they could get for nothing. His directors often had this brought before them; and he had always felt it to be his duty to counsel them to give nothing for nothing. This free policy was not a wise one; but they ought to address themselves to the supplying of gas as cheaply as possible. Consumers would find out the appliances that best suited them, and would be able to adapt them to their genuine uses. He had also found it to be his duty to counsel his directors in the same way with regard to differential rates being charged for gas—that they ought not to follow the gas beyond the meter; that it was no concern of theirs what use a consumer made of his gas; and that they should not be irritated by finding that the initial price of gas was so much, but that if he used it for washing himself he would get 5 per cent. reduction, if he used it for cooking he would get 7 per cent., and if he used it in a gas-engine he would get 12 per cent. All these differential rates were odd. Then they ought to sell gas at the lowest possible price. He had put it to his directors that, if they looked upon him as a hypothetical tenant, they would expect 5 or 7 per cent. return upon their money; and the consumer, on the other side, would look for a reduction in price for large business. Certainly there was room for discount for cash to a good consumer; but he did not think their business would warrant giving

rebates up to 28 per cent. Evidently somebody was paying all such. He must confess himself as being against these whole-hoggers altogether. Such large rebates ought not to be possible to any class of consumer; and if they, as gas suppliers, were undertaking the distribution of free ironmongery, evidently the price of it must be put upon the gas. He would be in favour of reducing the gas to as low a charge as possible, and letting the consuming public find out the appliances they wanted. By raising the technical knowledge and skill of the consumer, they would be able to supply the raw material of cheap gas in a way that would best suit them, and with the least irritation to gas managers.

Mr. W. B. M'LUSKY (Perth) said they were much indebted to Mr. Napier for his paper. The remarks of Mr. Myers were reminiscent of their early youth, when the gas manager was seldom seen beyond the gate of the gas-works. There were two ways of providing facilities for the different uses to which gas was put; and these had been very well placed before them. One speaker had said it was necessary to provide the same facilities for the use of gas for cooking and heating that were provided for its use for power and industrial purposes; and Mr. Napier stated that 4½d. per 1000 cubic feet was the figure that represented the difference in his case. In Perth, it was found that this was about the difference between the value of gas used for power and for other purposes. They gave, however, a scale of differential rates, which was peculiar to Perth in that no consumer got a rate which was not available to the other. Each consumer paid the same for every 1000 cubic feet burned. For power or industrial purposes, they charged 2s. 6d. per 1000 cubic feet, which was 4½d. less than the ordinary rate; and they provided such facilities for cooking and heating as were equivalent to the 4½d. They did not supply free cookers, although he was in full agreement with all that had been said regarding them. They fixed free and maintained free. In reference to the power rate, for every 100,000 cubic feet after the first 100,000 feet, there was 2d. reduction, until the tenth 100,000 was reached, when the charge was 1s. per 1000 cubic feet. They had only one consumer of this quantity. He was a glass blower; and he found that, for annealing purposes, gas was cheaper than coke or coal. When this particular consumer applied for gas, they had no trader who asked for the special rate. They had simply adopted the special rates in the hope that they might attract customers. This particular glass blower found that one gas-fire did the work of five coke-furnaces, and that fewer men were required to do the work. He found that gas at 1s. 4½d. per 1000 cubic feet was cheaper than coke. In the same way, gas at 1s. 4½d. was cheaper than suction-gas in Perth. He did not wait till a consumer returned a gas-fire. They had a system of inspection, under which people were called upon twice a year; and if a fire were found to be not satisfactory, they scrapped it and put in a new one. The fire business was more profitable than the cooker business, because in every house, while they had only one kitchen, they had several bedrooms, and a public room, or more. They commenced to hire gas appliances in 1896. They had now 1375 gas-fires, out of 10,798 gas appliances in use. There were 2978 gas-cookers, 2320 gas-boiling rings, 3012 gas-irons, 496 hot plates, 27 baking plates, and 60 miscellaneous articles. It was thirteen years since the Corporation commenced to hire these articles. Ten years ago, after three years' effort, there were 1100 articles in use, representing a value of £9000. To-day there were 10,798 articles in use; and the capital account involved was less now than it was then. It had been written down by the use of these articles. It had not been done by the use of gas for lighting, because the hiring business did not exist till the users of the apparatus came to employ the gas. The same consumer was also using gas for lighting; and no more plant was required to supply him. The plant he used he paid for—both fitting up and maintenance. He agreed thoroughly with a progressive policy in the matter of cooking and heating.

Mr. NAPIER, in closing the discussion, said he thought it to be his duty to bring this particular matter before them, because, to a Technical Association, it was a question of great moment, and one that was pregnant with great possibilities, so far as the gas industry was concerned. What he wished particularly to impress upon them was that, in the field of gas heating, they had such possibilities as were extremely difficult to measure. They knew that, at the advent of cooking by gas, they had to feel their way cautiously and slowly; but they were now satisfied that the fitting up of gas-cooking appliances free—hiring them out, and in some instances giving them free—was an apparently correct policy. Mr. Wilson seemingly had some fear hanging over him in regard to ironmongers and traders. He (Mr. Napier) thought, however, it ought to go out from the meeting that gas companies and corporations were not single individuals looking to their own interest, who ought not to take up the business of fixing gas appliances, and that if plumbers and gas-fitters were willing to co-operate with them, on proper lines, and to keep in view their interests, they would welcome their help. Mr. Myers he should like to treat generously, and with great sympathy. He felt that Mr. Myers was just, as it were, ferrying over a very deep stream, with great danger to himself, and with very little hope of getting to the other side; and he should not like to say that Mr. Myers, after a careful study of the whole subject, would advise his own Company to do what he apparently, at that moment, thought to be the safe policy. They must remember that they lived in changing times, and that the public were to be served and satisfied, not according to any mere financial requirements of a dividend-paying concern. It was not simply to gratify a demand for money, but to promote

the interests of the gas department, and the interests of the public, in a broad-minded way. The question of a less rate for heating purposes had been opposed on the ground that they were not observing equity; but, as he had stated before, a simple principle in equity could not hold force when they had to recognize that unless they put before the public certain advantages, and gave them fuel at a cheap rate, it was impossible to do business with them. No business man stood still and saw the volume of trade passing his door, without making an endeavour to gather it in; and while it was true that both classes of consumers were using the same gas, they must recognize that, as regarded the lighting consumer, their present rates, taking into account the efficiency of the incandescent burner, were in every way satisfactory. Another reason why they should not tie themselves to the principle of equity was simply that competition was with them; and he was satisfied, at this moment, that if they carried on their business on good, commercial lines, they were on the threshold of increasing it to an enormous extent.

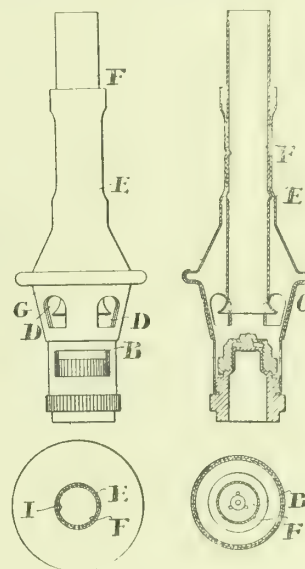
REGISTER OF PATENTS.

Incandescent Gas-Burners.

BLOCK LIGHT COMPANY, LIMITED, and WEBBER, J., of Manchester.

No. 16,998; July 21, 1909.

These inverted incandescent gas-burners have the usual bunsen gas inlet apertures and an internally screwed and perforated cap supported over the apertures, for regulating the flow of gas. The ports in the cap serve to direct the gas in several jets into the air-chamber D.



An Improved "Block" Burner.

Within this chamber and the extension E (upon which the bent arm of the inverted burner rests) is a tube F, having a bell-mouthed or funnel-shaped end adjacent to the gas inlet apertures. The gas from the latter is directed in several jets into the funnel-shaped end, and draws in air—the gas and air being concentrated and intimately mixed as they pass through the funnel and the tube. The air-chamber is provided with a sleeve G for regulating the inflow of air. In this way, it is possible to obtain a greater velocity of flow of gas and air to the burner-head than with the form of air-chamber at present employed—of great advantage in preventing back-firing where the gas and air mixture has to travel through a bent conduit or pipe from the bunsen to the burner-head.

Discharging and Charging Machines for Gas-Retorts.

WEST, J., of Southport.

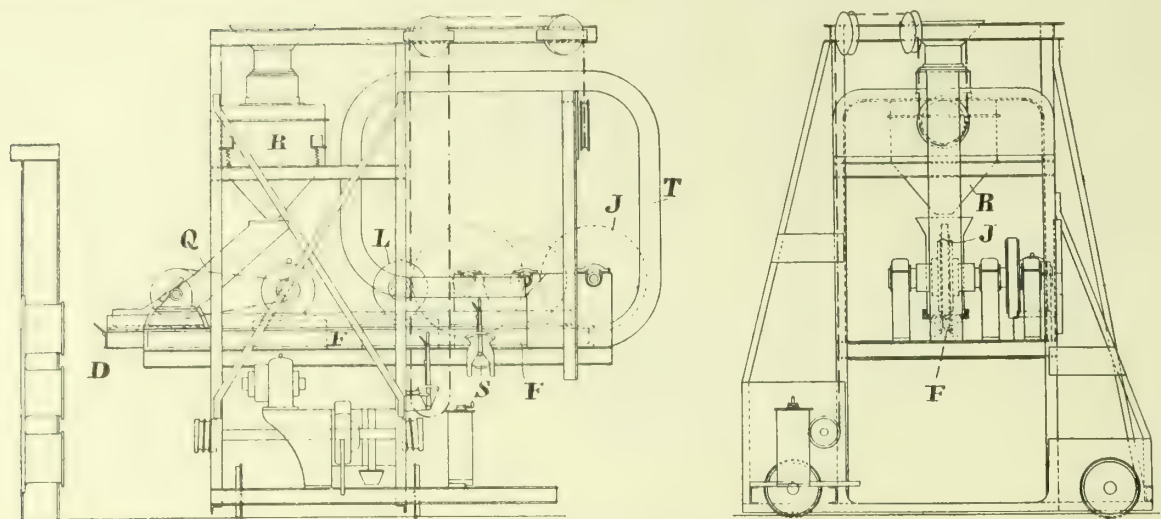
No. 20,653; Sept. 9, 1909.

This invention has for its object the discharging of a retort during the outward stroke of the discharging ram and charging it during the return stroke of the ram into the framework of the machine.

The machine (mounted on wheels in a framework and provided with gearing for adjusting it to the tier of retorts to be operated upon, and for travelling it along the front of the retort-stack) consists of the combination of a ram discharging machine and a charging machine of the projector type in conjunction with a telescopic plate or shoot fixed at the discharging ram head end to the telescopic ram and free to extend or close up, with discharging rams for the purpose of directing the charge of coal from the projector over the ram head on to the floor of the retort as the discharging ram is being withdrawn from the retort.

A general description of the arrangement, with a series of illustrations, appeared in the "JOURNAL" for April 5, p. 24; and to-day we reproduce (p. 336) one sheet of drawings from the specification showing a side elevation of the discharging and charging machine with the discharging rams and telescopic plate or shoot closed up in the framework of the machine; also an end elevation of the machine looking towards the retort-stack.

F is the stationary outer tube or casing of the discharger, in which the telescopic rams work—being driven into the retort and closed up in the framework of the machine by means of the sprocket wheel J



West's Combined Retort Charger-Discharger.

operated by the motor. A chain is attached to the back end of one ram, and, when the rams are both extended in the retort, is partly enveloped in the telescopic ram or casing; the portion of the chain between the sprocket wheel L and the ram being provided with slipper links, which slide in a path in the casing F for the purpose of keeping the chain rigid. The back portion of the ram is also provided with a slipper block, which slides in the path in the casing F. The chain for operating the discharger is stored in the casing T when the telescopic ram and shoot are closed up in the machine.

D is a fixed discharging or pusher head attached to one of the telescopic rams, and is provided with a hinged plate kept in the position shown in full lines by means of stops resting against the fixed head. The hinged door, on coming into contact with the coke on the discharging or outward stroke, closes up so as to cover the mouth of the telescopic plate or shoot until the whole of the coke is discharged, when the hinged door again falls. Q is the rotary or projector charger driven by a motor and supported on brackets clear of the telescopic shoot or plates, leaving them free to extend or close up in the framework of the machine. This charger Q is provided with the necessary coal-hopper R, and mechanism for operating it. The motors are controlled by the controller S.

The method of operation is as follows: The discharging rams, together with the telescopic shoot or plates, are driven into the retort by the motor and gear L and J operated by the controller S. The direction of travel of the telescopic rams and the telescopic shoot or plates is subsequently reversed, and at a suitable time during the return stroke the rotary projector charger Q is set in operation; the coal being directed along the telescopic shoot or plates over the hinged plate on to the floor of the retort—the two operations of charging the retort and returning the discharging ram together with the telescopic plate or shoot into the framework of the machine being so controlled that the coal is laid regularly in the clear retort on the discharging side of the ram-head as the discharging ram and telescopic plate or shoot are leaving the retort.

Coin-Prepayment Mechanism Operating from a Distance.

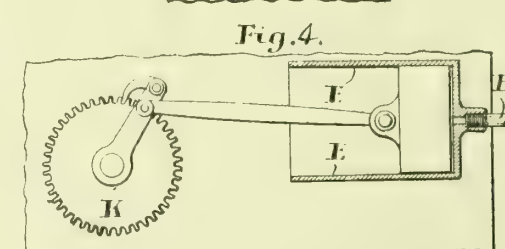
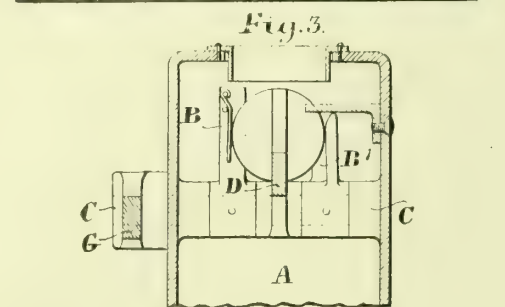
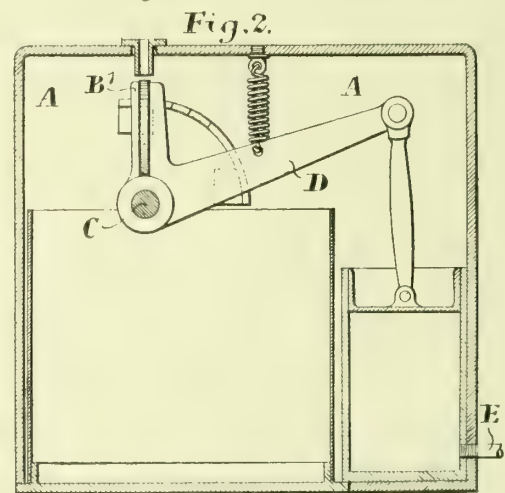
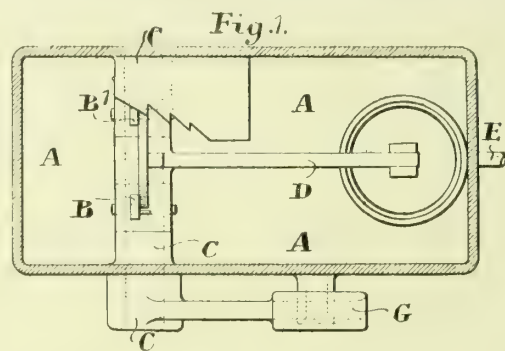
PEEBLES, W. C., of Bonnington, Edinburgh.
No. 19,489; Aug. 25, 1909.

This invention relates to coin-prepayment mechanism intended to be used in connection with fluid meters, and has for its object to provide means whereby such meters may be operated from a distance—thus permitting of the money-box and its mechanism for receiving the coin being placed in any position readily accessible to, and under the observation of, the parties responsible for its safe custody; while the meter may be in the position most suitable to the arrangement of the supply and delivery connections—such, for instance, as in a comparatively inaccessible cupboard, or even outside the building. The mechanism for receiving the coin (on being operated) transmits a corresponding movement to the delivery-determining mechanism of the meter, through the medium of a fluid (air or water) within a tube extending between the points of transmission and reception, or the movement may be effected by other equivalent means—for example, a flexible wire or cord.

Figs. 1, 2, and 3 are horizontal, vertical, and transverse vertical sections of the coin receiving and motion transmitting part of the mechanism of one example of the present invention—a sufficient part of the receiving and delivery-determining mechanism of a meter for this example being shown in sectional elevation in fig. 4.

In coin-prepayment meters such as are described in patent No. 2615 of 1902, there is provided a money box A separate from the meter. A coin is passed into the box through a slot in its upper surface, and drops into a coin pocket consisting of two projections B B¹ on bosses fixed to a spindle C passing through bearings on opposite sides of the box. A third projection on a boss is loosely pivoted on the spindle between the two fixed bosses, so that a coin falling between the projections B B¹ and the movable projection locks them together—the parts being shown in this position in figs. 1, 2, and 3. The central boss also carries a lever D controlled by a spring or equivalent, and connected by a rod with a piston in either a pneumatic or hydraulic cylinder, which is, in turn, connected by a tube E with one end of a corresponding receiving cylinder E¹, in which is a piston connected by a rod with a pawl-carrying lever or equivalent mechanical device, acting on the delivery-determining mechanism of the meter. Only one (K) of the pinions of

this mechanism is shown; the remainder of the mechanism being similar to that described in the earlier patent referred to. A handle G is fixed on one end of the coin pocket spindle C outside the money box.



Peebles' Prepayment Meter Mechanism.

When the handle is depressed until it bears on the stop shown, the spindle is rotated and causes the fixed projections B B¹ to act on the coin, and, through the latter, move the loose projection and the

lever D. The movement of the lever causes the piston within the transmitting cylinder to force the fluid through the tube E to the receiving cylinder, so that the piston therein is also moved on end, and, acting through a rod and pawl lever, gives the desired movement to the delivery-determining mechanism of the meter to open the supply valve, the movement of which in the reverse direction (to shut the valve) being effected by the meter-setting mechanism described in the earlier patent, or by other equivalent mechanism.

When the coin pocket is being rotated as described to open the valve, one edge of the coin encounters a notched inclined bar, which moves the coin edgewise against a light spring blade secured at one end on the projection B until the coin is freed from the other projection fixed to the spindle. Then the lever projection, through the action of the spring, throws the coin out into the cash receptacle. The notches in the inclined bar catch the coin, so that it cannot travel back with the pocket—thereby ensuring that the user cannot effect what is known as "pumping."

When the spring-controlled lever D rises, the piston in the transmitting cylinder is also raised, tending to produce a vacuum in the cylinder and in the connecting tube E, the piston in which latter therefore also moves on end to return the pawl lever to its original position ready to again act on the delivery-determining mechanism of the meter when the handle lever is again depressed.

The receiving cylinder is preferably placed horizontally, to prevent the weight of its piston tending to slowly actuate the mechanism when the meter is not in use. Where liquid is used as the power-conveying medium, to compensate for possible leakage of the fluid past the piston in one or either cylinder inlet check valves communicating with one or more reservoirs may be provided in the circuit.

As stated, a flexible diaphragm may be substituted for the cylinder and piston of both the transmitting and receiving mechanism.

Incandescent Mantles.

VISSEUX, J., of Lyons, France.

No. 23,434; Oct. 13, 1909.

The process of the present invention consists in burning a fibre or fabric on which is fixed not a salt but a hydrated peroxide obtained by the action of hypochlorites on the solution of illuminating salts. Commercial nitrate of thorium, having 48 per cent. of oxide, is, the patentee remarks, an indefinite and always acid composition; and the reaction of hypochlorites on rare earths is only made in an almost neutral solution. It is consequently necessary that the bath of the illuminating salts contains as little free acid as possible.

It is proposed to soak the threads or fabrics in a bath composed as follows: After having prepared a solution which contains (for example) 22 parts of commercial nitrate of thorium, 10 parts are incorporated of hydrate of thorium of the formula $\text{Th}(\text{OH})_4$, which dissolve by reason of the free acid contained in the solution. Then the filaments are rapidly passed (properly dried) through a bath of chemically pure hypochlorite of soda of about 25° measured on the chlorometer; and they are then washed in distilled water to completely remove the excess of hypochlorite and the alkaline salt formed. The filaments are next dried at a suitable temperature, when they are ready to be incinerated.

Other methods of carrying out the process are as follows: (1) By treating the nitrate of thorium only by the hypochlorite and, after washing and drying, in adding the nitrate of cerium in the form of a soluble salt. The small quantity of nitric acid which is disengaged during the incineration does not affect the strength of the mantle. (2) By adding to the solution of hypochlorites any mineral or organic salt or base which could facilitate the precipitation of the hydrated peroxides. (3) By employing any organic chlorated compound having the same oxidation properties.

As an example of bodies which can be added to the solution of hypochlorites to facilitate the reaction, the patentee says that acetate of soda can be used, which allows the complete precipitation of nitrate of cerium by the hypochlorite. This reaction is employed in chemical analysis to secure the separation of cerium from a solution of lanthane and of didium.

As an organic chlorated compound (for example), a solution of phenylid chloride in ether, ligroin, or sulphide of carbon can be used. This compound of the formula $\text{C}_6\text{H}_5\text{Cl}_2$ obtained by the action of chlorine on iodobenzol decomposes in presence of water into iodobenzene $\text{C}_6\text{H}_5\text{I}$, iodobenzene $\text{C}_6\text{H}_5\text{IO}$, hypochlorous acid HClO , and hydrochloric acid HCl . As a further example, acetate of chlorine of formula $\text{C}_2\text{H}_3\text{Cl}_3$, OCl decomposed by water into acetic acid and hypochlorous acid could be cited. As products of reaction, the hypochlorites give with the salts of rare earths the hydrates corresponding to peroxide of thorium Th_2O_5 and to peroxide of cerium CeO_2 .

The patentee admits that he is aware that it has been proposed in the manufacture of incandescent mantles to use hypochlorites for mercerizing the thread before the impregnation with the illuminating salts, but such use has nothing in common with his improved process; and he lays no claim to it.

Composition for Purifying Air Gas.

MOORES, W. G., of Bournemouth.

No. 28,054; Dec. 1, 1909.

This invention relates to a composition for use in purifying air gas, whether for use in lighting, heating, or for power purposes—consisting of asphaltum, bitumen, pitch, chloride of ammonium, and chloride of lime in certain proportions—viz., asphaltum 1 lb., bitumen 1 lb., pitch 1 lb., chloride of ammonium one-sixteenth part, or 1 oz., and chloride of lime one-third part, or 5½ oz. The constituents are thoroughly amalgamated while in a heated state, and then formed into a perforated or composite block, which is placed in the gas-making chamber or in a chamber between the gas-making chamber and the burners or apparatus, so that the air, after being impregnated in the oil or spirit chamber, and thereby turned into gas, will pass through the block and be purified by action against the surfaces of the block before being used.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

High Pressure Street and Shop Lighting.

SIR,—In your last issue, I notice an article, under the heading of "The Development of High-Pressure Gas Lighting." This particular article has an illustration showing a parade lighted by means of Keith's high-pressure inverted lamps. As there is nothing in the article to denote where this special example of parade lighting is to be seen, might I say that it is a scheme which has been carried out by my Company—the high-pressure main extending along the High Road and the Cranbrook Road, Ilford? The illustration shows the Cranbrook Road, which is one of the main thoroughfares leading from the Ilford Railway Station.

It might be of interest to your readers to know that this parade was first lighted on the high-pressure system in the year 1901—the so-called high-pressure at that time being about 8 inches. The lighting by this system was continued until about a year ago, when my Company installed this more up-to-date high-pressure inverted lighting.

I might add that this new lighting has given every satisfaction, not only to the shopkeepers themselves but also to the Gas Company, owing to its exceptional lighting qualities, and in its having proved itself so reliable and free from trouble. It has also been the means of retaining this parade solely for gas lighting. Some of the original lamps were getting rather the worse for wear; and if the new scheme had not been brought into operation, we would probably have lost a few of our customers.

This parade is quite close to Ilford Station; and I shall be only too pleased to show the compressing plant and give any particulars to any one contemplating high-pressure lighting.

Ilford, July 28, 1910.

W. B. FARQUHAR.

The Examinations in Gas Supply.

SIR,—With reference to the drawings supplied with Question 8 in the recent "Honours Gas Supply" examination, copies of which were reproduced on p. 250 of the current volume of the "JOURNAL," may I venture to point out the error which has been made in projecting the enlarged section (fig. 11) from the elevation (fig. 9)? In the latter the ground level is shown at the same level as the top of the cornice, while in the former it is shown a considerable distance below the bottom of same.

Plymouth, July 29, 1910.

A. E. BULLEN.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the third time and passed: Bradford Corporation Bill, Bristol Gas Bill, Fylde Water Board Bill, Middleton Corporation Bill, Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Slough Water Bill, Water Provisional Order Bill, Wemyss and District Water Order Confirmation Bill.

Bills Royal Assented: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill, Brighton and Hove Gas Bill, East Grinstead Gas and Water Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Exmouth Urban District Water Bill, Garrant Gas Bill, Gowerton Gas Bill, Great Grimsby Gas Bill, Mallow Urban District Gas Bill, Matlock Bath and Scarthin Nick Urban District Council Bill, South Hants Water Bill, South Lincolnshire Water Bill, Southend Water Bill, Thorne and District Water Bill, Worksop Urban District Council Bill.

The Pontypridd Water Bill has been withdrawn.

The Falkirk Corporation Gas Order Confirmation Bill and the Fraserburgh Water Order Confirmation Bill have been presented, read the first time, deemed to have been read a second time, and reported.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read a second time: Wemyss and District Water Order Confirmation Bill.

Bill reported, with amendments: Warrington Corporation Bill.

Bills read the third time and passed: Abertillery and District Water Board Bill, Falkirk Corporation Gas Order Confirmation Bill, Fraserburgh Water Order Confirmation Bill, Gas Orders Confirmation Bills Nos. 1 and 3 [Lords], Paisley Gas Order Confirmation Bill [Lords], Water Orders Confirmation Bill [Lords].

On Thursday, Lord Charles Beresford asked the President of the Local Government Board, in regard to the Gas Companies (Standard Burner) Bills, Nos. 1, 2, and 3, whether he was aware that, under the Acts and Orders relating to such companies, the local authorities were charged with the making of the official tests; whether he had any official information showing that if the Bills were passed the gas supplied would be of a considerably lower illuminating and calorific power; whether he was aware that the fact of grouping in one Bill the proposals of a large number of companies rendered it practically impossible for each local authority to put before the Committee the grounds of their objection to the Bill as affecting the particular

company supplying their locality; and whether any local authorities had lodged objection to the Bills. The questions were answered for Mr. Burns by Mr. Sydney Buxton as follows: "The testing of gas is in the hands of local authorities, subject to the provisions of the Gas-Works Clauses Act, 1871, and of the Local Acts and Orders relating to the respective companies. I have no official information as to what will be the effect of these Bills if they become law. I understand that various local authorities opposed the Bills before the Committee to which they were referred; and I have seen the reports from the Committee which state that, in the opinion of the Committee, 'the inclusion of several cases in the Bill did not present any difficulty in the submission separately of any of the cases in opposition.'"

Last Wednesday, a question was put to the Prime Minister by an honourable member, on behalf of Mr. J. G. Butcher, as to whether his attention had been called to the recent report from the Select Committee on the Water Supplies (Protection) Bill; and whether, in view of the grave difficulties arising in connection with the abstraction of underground water by water authorities and others, and of the demand for an alteration in the law as regards compensation for injury caused by such abstraction, he would favourably consider the recommendation of the Select Committee, to the effect that a comprehensive inquiry into the whole subject of surface and underground water supplies should be held. Mr. Asquith, in reply, said he understood that, prior to the appointment of the Joint Select Committee, his right honourable friend the President of the Local Government Board (Mr. Burns) had decided to introduce a Bill to give effect to the recommendations of the Royal Commission on Sewage Disposal, recently endorsed by the Joint Select Committee on Water Supply. The recommendations of the Committee would be carefully considered by the Government in connection with the Bill in question.

GAS COMPANIES (STANDARD BURNER) BILLS.

Consideration on Third Reading Postponed till November.

The Gas Companies (Standard Burner) Bills Nos. 1, 2, and 3, were again before the House of Commons at the time of private business, "for consideration by Order," on several days last week; but on each occasion objection was taken, and they were formally postponed. They will not now come on before the 15th of November, the date fixed on Friday last for the re-assembling of Parliament for the autumn session. There were several amendments on the paper for the rejection of the Bills, and also motions for the insertion of the following clause, noticed in the "JOURNAL" last week, for the protection of gas consumers:—

(1) As from Jan. 1, 1911, the price to be charged for the gas supplied by the promoting companies shall be such as will secure that the consumers of the company shall not be prejudiced by the provisions of this Act.

(2) The price to be so charged shall be such price as may from time to time be agreed upon between the company and the local authority or authorities of the district or districts within the limits of supply of the company, or as, failing agreement, may be determined by a single arbitrator to be agreed upon between such local authority or authorities and the company, or, failing agreement, appointed by the Board of Trade.

LEGAL INTELLIGENCE.

GAS WORKMAN'S COMPENSATION TERMINATED.

At the Croydon County Court, on Monday last week, Dr. W. B. Addison sat as Medical Assessor with the Judge, under the Workmen's Compensation Act, to hear the application of the Croydon Gas Company to terminate the weekly payment of 13s. to John Harvey, one of their employees. Dr. Newnham appeared for the applicants; Mr. A. H. Forbes represented the respondent.

According to Dr. Newnham's opening statement, on Nov. 18 last year Harvey fell backwards as the result of a rod breaking in connection with the elevating tackle, and sprained his back. The applicants sought determination of the agreement from the 27th of May last, on the ground that the disability arising from the accident had ceased.

Dr. H. W. Drew, who examined Harvey at the request of the Company, said he found the man could bend forward and touch his feet, bend sideways, and move his back round in all directions without hesitation. There was no evidence of any injury whatever. The man admitted having taken a good deal of beer in his time, but not so much lately. In cross-examination, Dr. Drew said he would swear that the pain the man complained of was due to lumbago, and not to a sprained muscle. Dr. Chapman, the Medical Officer to the Company, certified on the 26th of May that the man was able to resume work. He saw no reason to differ from what Dr. Drew had said.

Mr. Forbes submitted that there was no case. Applicants must show that since the 14th of May there had been a change of circumstances; and this they had not done. He called Dr. Morrison Orr, who said he first examined Harvey on the 13th of May. He complained of pain in the back and slight pain in the right groin. He had tenderness on pressure, and after bending forward to try to touch the floor he had difficulty in raising himself to an erect position again. He was suffering from sprained muscles. When witness examined him again on the 26th of May, there did not seem to be much improvement; and he was still suffering in June. At none of the interviews were there signs of alcohol having been taken. The present condition of the man's back was due to the accident; and he was not now able to resume his work.

Harvey was called and described the accident which resulted in his falling across a sleeper. It occurred just before dinner time; but he remained all day and practically did no work. Next day he went to see Dr. Chapman, who did not examine him at all, beyond feeling through his trousers. His back was very much swollen. On the 21st of April, Dr. Chapman gave him a certificate that he was unfit for work; the Company having previously expressed their intention not to continue the payments. From April 16 to May 5, when his Solicitor wrote to the Company, he did not receive any payments. The arrears were subsequently paid; but the Company intimated that they were not willing to take him back into their service, even if he was willing to return. He did not know why. He was not shamming, and still had pains in the back and stomach. He denied having been the worse for drink.

Counsel having addressed his Honour, the latter consulted with the Medical Assessor, and said he was satisfied that Harvey was now quite recovered. Dr. Drew had made a careful examination of him, and found he was able to move his body and back in every way, which was entirely inconsistent with what the man now stated. Under these circumstances, the payments must terminate from the 27th of May.

WATER SUPPLY FOR RAILWAY STATIONS.

In the Court of Appeal last Thursday, the Master of the Rolls and Lords Justices Farwell and Kennedy heard the concluding arguments in an appeal by the Metropolitan Water Board against a decision given by Justices Phillimore and Bucknill affirming an order made by the Judge at the Westminster County Court in an action brought by the Board against the London, Brighton, and South Coast Railway Company to recover the sum of £12, the amount of four quarters' water-rate alleged to be due from them in respect of their West Norwood Station. The contention on the part of the Company was that the water was supplied for other than domestic purposes; and this was upheld. The proceedings in the Court below were reported in the "JOURNAL" on March 1 and 22 last (pp. 598, 824). The Metropolitan Water Board (Charges) Act, 1907, provides by section 8 for a supply of water for "domestic purposes" at the request of the owner or occupier of any house or building occupied as a separate tenement within the limits of supply of the Board at a rate based on the rateable value of the house or building. Section 16 provides for a supply of water by measure for "purposes other than domestic" at rates varying with the quantity furnished. By section 25, "domestic purposes" are deemed to include water-closets and baths of a certain capacity, but not a supply of water for "railway purposes." At the defendants' station at West Norwood, which was separately rated, there is no station master's house, but there are waiting-rooms, a porters' room, and a booking office; on the up and down platforms are urinals and two water-closets—one for the passengers and the other for the staff—also on each platform a tap from which water was drawn for drinking and for cleansing the platform. For the appellants it was contended that the water was supplied to the station for "domestic purposes," and that they were entitled to charge at a rate per annum not exceeding 5 per cent. of the rateable value of the building in respect of which the water was furnished.

Mr. Danckwerts, K.C., and Mr. A. B. Shaw (instructed by Mr. Walter Moon, the Board's Solicitor) appeared for the appellants; Mr. Younger, K.C., and Mr. Clode (instructed by Mr. P. V. Rose) represented the respondents.

At the conclusion of the argument, their Lordships came to the unanimous conclusion that the decision of the Court below was right, and dismissed the appeal with costs. They expressed the opinion that the supply to the station came within the category of "railway purposes," which were especially excluded from "domestic purposes" in section 25 of the plaintiffs' Charges Act.

Affairs of the Ticehurst and District Water and Gas Company.

Last Tuesday, Mr. Justice Swinfen Eady had before him, in the Chancery Division of the High Court of Justice, a petition presented by Mr. Baker, trading as Messrs. Baker and Co., for the winding-up of the above-named Company. Mr. Greig, who appeared for the petitioner, said his firm were judgment creditors for £457 odd. The Company had, in reply, put in an affidavit which he had only just seen; and therefore he asked that the petition should stand over in order that he might answer it. Mr. Clayton, K.C., for the Company, opposed the application on the ground that the petitioner was acting in collusion with Mr. Preston, the promoter of the Company, against whom, since independent Directors were appointed in December last, the Company had commenced an action; and he suggested, as appeared by the affidavits, that the petition was presented on the eve of the Long Vacation for the purpose of embarrassing those proceedings. The judgment debt was between three and four years old; and the Company had a counter-claim against the petitioner for a larger amount. The judgment was obtained by consent when there were no independent Directors. There was a Receiver in possession on behalf of the debenture-holders; and if this petition were hanging over their heads for the whole of the vacation, the Directors would have great difficulty in carrying out their statutory obligations, making contracts, &c. After some discussion, his Lordship said he could not dismiss the petition until the petitioner had had an opportunity of answering the affidavits. He did not think any harm would be done by ordering it to stand over until the second petition day in the next sittings.

The Patent Appliances Company intimate that they have removed from No. 6, Holborn Viaduct, E.C., to larger and more commodious premises at No. 15 and 17, City Road, E.C.

Some days ago, a portion of Blackburn suffered in its electricity supply, owing to a cable fault; and a considerable time elapsed before the trouble was overcome, in consequence of difficulty experienced in locating its source.

MISCELLANEOUS NEWS.

THE GOOD WORK OF CO-PARTNERSHIP.

South London Schemes—A "Coming of Age."

Extraordinarily favoured, inasmuch as the sun shone, were those employees (and their wives) of the South Metropolitan and South Suburban Gas Companies who were lucky enough to be among the 450 guests who last Thursday assembled at the Crystal Palace on the occasion of the dinner, which is held annually, in connection with the co-partnership schemes of the two Companies. These guests, it may be remarked, were the Co-Partnership Committees, some of the foremen, and many of the other employees who had been a certain number of years in the service of one or other of the Companies, and who held not less than a stated amount of stock. The last-named were selected proportionally from all classes by ballot; and the wives were also invited in all cases. Of last week's function, the only thing that can be said—and it is the highest praise—is that it was as successful as its predecessors. After dinner in Lyons's Restaurant, there were some speeches, the spirit of which augured well for "the cause." Then there was a pleasant afternoon in the grounds, and a return to the restaurant for tea. Mr. Charles Hunt, the Chairman of the South Suburban Company, who presided at the dinner, explained that it had occurred to Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company—to whom the position rightly belonged on the ground of seniority—that as the two Companies had been associated in these gatherings ever since they were initiated, it would be as well if the Chairmen of both undertakings were to preside over the annual dinners alternately. In addition to Mr. Hunt and Mr. Carpenter, there were present some other members of both Boards, as well as the principal officials of the Companies.

The Loyal Toast having been duly honoured, Mr. Hunt said he would ask those present to fulfil a duty which he hoped, and felt sure, would never be neglected in an assembly of this kind. They all wished to honour the memory of Sir George Livesey, the founder of the feast—the founder of co-partnership as far as gas undertakings were concerned—and he would ask them to do so by rising in their places. After a brief interval of impressive silence among the standing company, Mr. Hunt went on to refer to the robust faith of the Directors in the permanence of co-partnership—a faith which he was sure was not misplaced. Those, he said, who had watched the growth of the movement had been very pleased to notice year by year the increasing stake which the employees held in the Companies. He had had some figures put before him with regard to the South Suburban Company; and these showed that the average holding of employees in the Company had reached £50; and that, while a few years ago there was a little difficulty in finding a sufficient number of co-partners qualified by their holding for the position of Employee-Director, at the present day there were upwards of 39 so qualified. But one feature of this movement which had appealed to him, he thought, with more strength than any other was the provision which it enabled employees to make for their old age or growing infirmities; and he was pleased to say that the present pensioners of the South Suburban Company held between them very nearly £3000 worth of stock. This spoke well for the system, and for the advantages it offered to the encouragement of thrift and the attainment of a modest independence in old age.

The toast of the day was given by Mr. Charles Carpenter, who remarked that it might seem an easy task to propose "Success and Prosperity to Co-Partnership." They were all so in the habit of realizing and recognizing what co-partnership had done for them, that it would appear to be a simple thing to speak on its behalf; but as a matter of fact, so much remained to be said with regard to it, that if one spoke for several hours, it would be impossible to bring out all the points that were of interest in connection with the subject. As they had been reminded, the South Metropolitan Company had now reached the 21st year of co-partnership. (Applause.) That was to say, co-partnership had attained its majority, because it was exactly 21 years ago—in 1889—that the co-partnership scheme, or, as it was then called, the bonus scheme, was launched by Sir George Livesey. Of course, Sir George himself had unlimited faith in its possibilities, as he had in so many engineering matters. He possessed very great foresight; and from his long connection and association with working men, he knew that difficulties which had been growing for many years were coming to a head, and that it was necessary to do something in order to stem and to alter the course of things. For this reason, he brought forward what was then known as the bonus scheme. He carried his Board of Directors with him in every possible way. His scheme was accepted in its entirety; and it was brought before the notice, not only of the employees of that Company, but of the world generally. Well, it was very curious to look back now, and think what happened when the scheme was launched. Many hundreds of men objected to it, and threw up their work with the Company. A large number cast aside the chances of a pension which, in some cases at least, they would have been soon entitled to. It was remarkable when one considered the change that had come over opinions since 21 years ago. Even in more recent years, the idea that co-partnership would not outlive Sir George was not altogether unprevalent. There were people who associated the system with their dear friend, and who were not slow to prophesy that when he was taken away, co-partnership would not remain the great force in the Company which it had been in the past. He need not tell the co-partners present how absolutely incorrect this view had turned out to be. He thought he might say truthfully—and he would not be misunderstood in saying so—that co-partnership had been stronger since Sir George's death than it was when he was alive. The reason was that when they had Sir George with them, he was linked up with the scheme in every way; and co-partnership and Sir George and Sir George and co-partnership were always associated together, and thought of together. Now all this had passed away. There was no more personal association with co-partnership now on the part of the Directors of the Company than in any other portion of its management. Co-

partnership stood on its own legs, just the same as any other department; and in doing so, it had proved that it had greater strength, greater force, and greater vitality, than anyone could have imagined to be the case before Sir George left them. In whatever direction they looked, they saw the advantages of the great scheme which had been formulated by their late Chairman with so much care. They had present with them that day good friends—men who had been associated with the working of these two Companies for many years, and who were now occupying seats at the Board-room table. This was one enormous good that co-partnership had done. These men sat as the representatives of the employees on the Board, and had a part in all the discussions which took place there. Another thing which co-partnership had brought about was the change in the continuity of the employment of the workers. Instead of them being engaged on a comparatively short tenure—hourly, or at most weekly—they were sure of their employment, and the wives were certain of their husbands being in good work practically from one year's end to another. In a very few cases, there were three-monthly agreements, but in the large majority there was a yearly one. It must be a great relief to wives to know that their husbands had agreements with the South Metropolitan or the South Suburban Company which ensured employment for a long time ahead; and this was another great good of co-partnership. A further benefit had been, as Mr. Hunt had so admirably expressed it, the provision for old age. It was not necessary now, when old age or infirmity came, to have to depend on the pension generally provided. There was no reason why a substantial sum should not be at a workmen's disposal when old age or infirmity overtook him. Of course, there was a "fly in the ointment," as in all these things. It had happened, in one or two instances, that, owing to the amount of money put by, not only the Company, but England, had lost good workmen, who, by means of money saved, had been able to leave and start a new life under much more favourable circumstances of independence in one or other of Great Britain's Colonies. He was not sorry for this. He was glad to know that people in every sphere of life, including working men, had an opportunity of starting a fresh life in another land, and helping to lay the foundation of a great future in countries beyond the seas. Nowadays co-partnership was more essential than it had ever yet been, certainly in the history of gas companies. Years ago, the most important work was carried out in the retort-house—in the carbonizing department; and supposing they made (say) 9500 or 10,000 cubic feet of gas to the ton of coal, it did not seriously matter at the end of the half year or the year. One scale of working was not so good as the other; but the difference to the company and the shareholders was practically immaterial. But all this had changed now. They had got into intimate touch with consumers in a very different manner from what was necessary ten, fifteen, or twenty years ago. Where the carbonizing department had not grown, the outdoor department had; and if they were to be a great undertaking in the future as in the past, they would have to rely more and more upon those whose business in life it was to get in touch with the consumers of gas. They wanted their goodwill and their faithful service in every way to promote the use of gas in quite a different manner from what was necessary even, let them say, when co-partnership was started. If co-partnership was necessary 21 years ago, he thought he might claim that it was 21 times more necessary to-day. He asked all co-partners to remember that their duties to co-partnership did not begin and end with themselves—that their duties were, if he might say so, to bring the importance of co-partnership—the bearing it had on the Company's work—to the knowledge of all those with whom they came in contact. Co-partnership should be the light which should illumine their daily life.

The toast of "Success and Prosperity to Co-Partnership" having been drunk with enthusiasm, Mr. J. Boraston, a Director of the South Suburban Company, followed with a speech the sentiments expressed in which were also heartily endorsed by his hearers. He said he was aware that he was called upon merely in the unexpected and regrettable absence of his good friend Sir Fortescue Flannery; but there were one or two things he should like to say. In particular, on an occasion like this, they all naturally must think and naturally must speak about the great man to whose genius, foresight, and courage they owed the economical system that they professed, and practised, as co-partners. They who were his devoted followers would do their best to carry on his great policy—seeking their inspiration in the memory of his achievements, and striving day by day to be still more worthy of his great example.

The next gentleman called upon was Mr. Frank Bush, formerly the Secretary, and now a Director of the South Metropolitan Company, who pointed out that in the 21 years since co-partnership was started, over £500,000 had been set aside for the employees—being an average of £24,000 a year. He was informed by his friend Mr. Sims that the value of the holding of stock, and in the withdrawable account and in the Building Society amounted to rather more than £450,000. This was a very good result; and it might be said, "Rest and be thankful." But they must still go on. They must be thankful, but not rest. Of course, a scheme of this kind had its detractors and enemies. Some of the more advanced Trade Union leaders would like to see it collapse. They said that the alleged share in the management in any scheme of this kind was a fiasco. Well, all he could say was he thought the employees would like another £450,000 fiasco—and the sooner the better. There were two ways of dealing with men. There was the road of sympathy and the road of indifference. They all knew how sympathetic Sir George was with the employees, and how earnestly he desired to see their position improved; and he was glad to say the present Chairman, Mr. Charles Carpenter, and his colleagues also had the same object in view. He would say, "Treat men kindly, and trust them; and in the course of time they will trust you." Among the great body of their workmen, he believed this was the feeling which existed. In his Presidential Address to the Institution of Gas Engineers last year, Mr. Thomas Glover said: "It may safely be assumed that Sir George Livesey would wish for no more suitable memorial than that his life's work should be remembered through the wide adoption of a co-partnership system by gas undertakings." He (Mr. Bush) heartily agreed with this observation. Since the last annual dinner, quite a number of gas companies had joined the ranks of co-partnership. On a day like

this especially, they were all remembering Sir George Livesey, and remembering him with gratitude and affection, as the man who fought so strenuously, so fearlessly, so triumphantly for co-partnership.

A South Suburban employee, Mr. W. T. Luther, on behalf of the guests, heartily thanked the Directors for their kind invitation that day. The employees of his Company, he added, cordially congratulated the South Metropolitan Company on the "coming-of-age" of co-partnership. They in the South Suburban Company were not quite so fortunate in regard to length of time—seventeen years, he believed, was their record. The employees were, however, very gratified this year to find that 6½ per cent. was credited to them. He thought this was the highest bonus ever declared by the Company. But if they determined to do even better than in the past, this amount would probably be still further increased. He wished prosperity to both Companies, as the prosperity of the undertakings was the gain of the employees. He would also like to thank the Trustees of the money that was left by Sir George Livesey to be distributed among both Companies for the old employees. It was very gratifying each week, when this money was paid over to the old servants, to see how bright and cheerful it made them.

For the South Metropolitan Company, Mr. F. Whitehead seconded the vote of thanks, remarking that co-partnership was growing very rapidly. During the last two years, a good number of gas companies had adopted the system—nine in 1908, and the same number in 1909. In 1904, there were three co-partnership gas companies; while to-day they had a record of about 26 companies. This progress augured well for co-partnership. They were pleased to see their Chief Engineer (Mr. Doig Gibb) with them that afternoon, and extended to him a right royal welcome.

Mr. Henry Austin, an Employee Director of the South Metropolitan Company, remarked that as this might possibly be his last speech to them in that capacity, he would like to take the opportunity of wishing the co-partners "Farewell, success, and double success." They were reminded that it was 21 years since profit-sharing was started. It had grown up into quite a healthy manhood. Events passed quickly; and change always seemed on the wing. The advent of profit-sharing—now co-partnership—would ever be a landmark in their history. Co-partnership was the gospel of encouragement, because it had enfranchised thousands of working men from labourers to capitalists—an achievement anyone might be proud of. Such a feat brought to their minds a sad reminder of him who, though he was no longer with them in body, was with them in spirit. So that day, in the midst of their beautiful surroundings, they lifted their grateful hearts to the memory of him who was their benefactor and friend—Sir George Livesey. The lapse of time strengthened their affections, and filled the mind with gratitude to him who no longer reminded them of their responsibilities on these welcome and pleasing occasions. Let the years that were gone still be the messenger of peace and goodwill, warning them of their duty to make their position as secure as they could against the intrusion of any element of discord. Let them prove to all that their scheme was the antidote to the hostilities that existed between Capital and Labour—that there was no room in their programme for any element which would arrest the progress made the last 21 years. Also let them continue to show an intelligent thrift, and prove that the Directors had not misplaced their confidence in them. Further let them prove, by continual self-restraint and thoughtful action, that there was not a more intelligent or more prosperous community of workmen in the United Kingdom than the employees of the two Companies who were fraternizing that day.

Next came another employee of the South Suburban Company, Mr. J. E. T. Wilkinson, who spoke of the improved spirit shown by the men under co-partnership. He was followed by Mr. H. Clouder, on behalf of the South Metropolitan Company, who said that, as a preventive of labour troubles, co-partnership still stood unequalled. As an incentive to the men to do their best, he knew of nothing better; as a disperser of the bad feeling which existed in some places between employer and employee (but did not in their case), it was perfect. As had already been remarked, their co-partnership scheme attained its majority this year. He sincerely hoped that most of them would be spared to see its jubilee.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Company, on being called upon, said that before he ever dreamt that he would be connected with the Company, he yet had sufficient affection for Sir George Livesey to travel specially from Newcastle to London to take some small part in the last sad ceremony. Now he was with them; and he might say that he had no reason whatever to regret his change. He thanked Mr. Whitehead for his welcome to the dinner, and wished also generally to express his appreciation of the very warm welcome he had received from the workmen and officials of the South Metropolitan Company. He had heard quite a lot that day about co-partnership, and he was reminded that it had now come of age. Most of those in the room were perhaps as old in co-partnership as the scheme itself; and therefore, comparing himself with them, he was but an infant in long clothes. Under these circumstances, remembering that "Little children should be seen and not heard," he would not attempt to say anything about co-partnership.

On the proposition of Mr. F. M'Leod, the Secretary of the South Metropolitan Company, seconded by Mr. Butcher, Mr. Hunt was heartily thanked for occupying the chair; and the party then rose, and betook themselves to the grounds.

Port Dairen (Manchuria) Gas Supply.—It is stated in the British Consular report on the Port of Dairen (Manchuria) that, in order to supply the town with gas for cooking, heating, and lighting purposes, plant was laid down in 1909, and was almost completed by the end of the year. It has a capacity of 280,000 cubic feet, which will be sufficient to supply 3000 houses. The number of applications for gas so far is 700. Pipes made in the United Kingdom are to be put down for a length of 23 miles. Cooking ranges, stoves, and mantles have been secured from Germany, from which country the plant was obtained. The retorts are horizontal. Fushun coal is used, and is said to have produced satisfactory results. The residual products will find a market locally or in Japan.

MR. W. R. HERRING AND EDINBURGH.

Appointment as Consulting Engineer.

A Special Meeting of the Edinburgh and Leith Gas Commissioners was held on Thursday last, to consider the report of the Committee appointed a month previously to confer with Mr. W. R. Herring upon the question of his agreeing to continue his services to the Commissioners in the capacity of Engineer.

Lord Provost BROWN, who presided, moved the adoption of the report of the Committee. He said they all seemed to be of opinion that, in the interests of the gas-works, seeing that Mr. Herring did not see his way to withdraw his resignation, he should be appointed their Consulting Engineer. It was the view that, having regard to the fact that the new works at Granton were erected by Mr. Herring, and conducted on principles somewhat different from those carried out at other gas-works, it was very desirable to have Mr. Herring's advice at all times when it was desired. Mr. Herring told them frankly that he was willing to give such services; and there would be presented to them the heads of an agreement under which the works would still have Mr. Herring's supervision, and be continued with very little change. Under this agreement, the first assistant, Mr. A. Masterton, would have charge, and have from time to time the advice of Mr. Herring when it was desired. The report generally recommended: (1) That Mr. Herring should be retained as Consulting Engineer, visiting the works at Granton once a month at least, keeping in touch with the business, and advising the Commissioners generally, at a fee of £500 a year; and that he should also be retained as Consulting Constructional Engineer, at a fee of 5 per cent. on the value of the work executed. (2) That Mr. Masterton should be appointed Engineer for a year at a salary of £600; on the expiry of the year the matter to be reconsidered.

Mr. R. BRYSON, Convener of the Works Committee, seconded. His long connection with Mr. Herring, and his knowledge of the value of his services, made him say without hesitation that, in agreeing to this motion, they were doing the best they could for the Commission. The clause appointing Mr. Herring as engineer for any future constructional work would leave it in the option of the Commission to employ him or not in that capacity as they pleased. The first work that would have to be undertaken would be a new gasholder, to replace one at Cannon-mills; but this need not be for a year or two yet.

Mr. PENNELL thought that, in appointing Mr. Herring as engineer for constructional work, they were tying up in a way they had no right to do the hands of future Commissioners.

The LORD PROVOST said Mr. Pennell was quite wrong in thinking so. Future Commissioners had complete freedom under the agreement to give to, or to withhold from, Mr. Herring all such work.

Mr. PENNELL argued that an arrangement such as they wished to make to appoint Mr. Herring as supervising engineer was not likely to work well. If the first assistant was not strong enough to have entire charge, they should advertise for an engineer who would have full responsibility. He moved that they receive the report and remit to the Works Committee to advertise for an engineer to take Mr. Herring's place. No one would smile more than perhaps Mr. Herring himself at the idea that this body of Commissioners thought it necessary that he should inspect the gas-works twelve times a year. He understood that the Engineer of the Glasgow Commissioners, with five gas-works to look after, had a salary of only £1000 a year; and there were not anything like the complaints from consumers that they had in Edinburgh and Leith.

The amendment not being seconded, the motion was carried.

The LORD PROVOST then submitted *seriatim* the heads of the agreement with Mr. Herring. The first of these was as follows: "In consideration of the payment of the sum of £500 per annum by the first parties to the second party, the second party agrees to render service to the first parties as Consulting Engineer of their gas undertaking. For this sum, he agrees to place his knowledge and experience at the disposal of the Commissioners in connection with the working operations at the manufacturing station and elsewhere, and also in connection with the repair or renewal of the plant and appliances comprising the undertaking, paying such visits as he may deem necessary at not less intervals than monthly, and attending such meetings as he may be called to by the first parties." It was further set forth that the consulting engineer is not to be entitled to any expenses he may incur in travelling from and to London to carry out his duties in Edinburgh. Another clause read: "If the second party be appointed Consulting Engineer to the Commissioners, he shall have charge of all additional constructional work, and the extensions of the undertaking. . . . For these services, the second party shall be paid by the first parties at the rate of 5 per cent. on the ascertained cost of the respective work," &c. The Lord Provost moved that this should be altered to read that he shall have charge of such additional constructional works and extensions "as the Commissioners may entrust to him."

Bailie CULLEN raised the point whether the wording made it plain Mr. Herring was bound to take up such work as the Commissioners entrusted to him, or whether he had the option of refusing it.

After some conversation, the clause was finally adjusted: "The second party shall take charge of all constructional work and the extensions of the undertaking as the Commissioners may entrust to him."

The LORD PROVOST then formally moved the approval of the agreement. What, he asked, was its financial aspect? Now that the Granton works were completed, they did not require a man of such knowledge and experience as Mr. Herring to give his whole time to them; and they knew, as a matter of fact, that, with the consent of the Commissioners, Mr. Herring had been giving his services outside. Under the agreement, they would get all the supervision that was absolutely required for the works for £500 a year. Mr. Herring's salary at present was £1500. He had a house which was assessed at £150; the upkeep of the grounds cost £110; the taxes were £40—which in all came to £1800. Now Mr. Herring was to get, as he had said, £500 a year; and Mr. Masterton's salary was to be increased £200. This made £700; so that there would be a saving to the Commission of

£1100 a year. They would have this substantial saving without in the slightest degree sacrificing the efficiency of the works.

The motion was then passed; and it was further agreed that the agreement should come into effect on Nov. 1.

RETIREMENT OF TREASURER AND COLLECTOR.

In connection with the retirement of Mr. John S. Gibb, the Treasurer, and Mr. R. Cockburn, the Collector, which takes place at the end of August, the Commissioners placed on record a minute of their appreciation of the long and faithful services of these officials, and their hope that they might long enjoy well-earned retirement.

At a luncheon held afterwards, illuminated and framed copies of the minute were presented to Mr. Gibb and to Mr. Cockburn.

The LORD PROVOST said that, in parting from Mr. Gibb and Mr. Cockburn, the Commissioners wished to convey to them an expression of their sincere regard, and their appreciation of the faithful work both had done for the Gas Commission. When the Edinburgh and Leith Gas Commissioners took over the undertaking of the Edinburgh Gas Company in 1888, Mr. Gibb was Treasurer of the Company, and had been so for the preceding 14½ years. On Aug. 13, 1888, the Commissioners appointed Mr. Gibb their Treasurer; and he had continued to act as such until now—for 22 years. He had thus had 36½ years' service with the Company and the Commissioners. Mr. Cockburn at that same meeting in August, 1888, was appointed Collector. He had been for the 23 years preceding in the service of the Gas Company; so that with the Company and the Commissioners he had a record of 45 years. He proposed the health of Mr. Gibb and of Mr. Cockburn, a toast which was cordially pledged.

Mr. GIBB, in reply, said that during the 36 years he had been with the Gas Company and the Gas Commission, he had never had any serious differences with either his superiors or his colleagues. He thanked the Commissioners for the confidence they had ever reposed in him.

Mr. COCKBURN, in the course of a few words, said it was a very pleasing thing to find that their services had been appreciated by the Commissioners. He trusted the future prosperity of the Commission would be even greater than it had been.

It was stated that Mr. Williams, the new Treasurer and Collector, would begin his duties on Aug. 15, so as to get into harness before Mr. Gibb and Mr. Cockburn left.

GLASGOW CORPORATION GAS DEPARTMENT.

Gas Committee's Report and Accounts.

A Special Meeting of the Glasgow Corporation was held on Monday last week—Lord Provost M'INNES SHAW presiding—for the purpose of dealing with the Gas Committee minutes, their annual report and the accounts from June 1, 1909, to May 31, 1910, and with recommendations as to the disposal of the surplus profit standing at the credit of the gas undertaking. The table of the proposed rates to be charged for gas for the year 1910-11 within the city supply district was also submitted; but, after discussion, it was agreed to defer its consideration until the next meeting of the Corporation. In the course of the meeting, the Lord Provost announced, amid applause, the receipt of the following telegram from London: "Gas Bill—Lords' amendments agreed to; no opposition." In their report, the Committee stated:

The gross revenue amounts to	£879,434
The gross expenditure to	£664,439
To this is added depreciation written off capital assets	64,103
	<u>728,542</u>
Balance carried to the profit and loss account	£150,892
The Committee had to meet the following requirements during the year:—	
(1) Annuities on stocks	£21,690
(2) Contribution to Glasgow Corporation loans fund, in respect of Glasgow Corporation 3 per cent. stock redeemable in 1921, issued in lieu of converted gas annuities	7,866
(3) Interest on borrowed money and redeemed loans, &c.	60,185
(4) Sinking fund	45,375
	<u>135,116</u>
Leaving a surplus on the year's operations of	£15,776
The credit balance as carried forward last year amounted to	£21,471
Adding the surplus shown above of	15,776
leaves to be carried to the credit of next year's profit and loss account the sum of	£37,247

The decreased revenue from the sale of gas is wholly accounted for by the reduction in price of 1d. per 1000 cubic feet made last year.

The amount carried to the sinking fund for the redemption of loans and the redemption or conversion of annuities was £45,375; and the accumulations and interest during the year amounted to £18,051—making the total addition to the sinking fund for the year £63,426. The sinking fund, with its accumulations, now stands at £858,645, of which there has been already applied in the redemption of borrowed money £750,202 of 3 per cent. stock and annuities; leaving still available for either of these purposes the sum of £108,443.

The Committee have pleasure in stating that the market for residuals was more favourable to the Corporation during the past year. The consequent increase of income from this source amounts to £16,185, and is to be attributed to a better price having been obtained per ton, and a greater quantity of coal carbonized. The quantity carbonized during the past year was 686,311 tons, compared with 681,071 tons for the preceding year—an increase of 5240 tons. The average price received per ton of coal carbonized this year was 3s. 10 7/12d., compared with 3s. 4 8/12d. the previous year—an increase of 5 8/12d.

The net sum realized from the sale of coke this year amounts to £101,148; being £845 more than that of the preceding year. It is due to the greater quantity sold per ton of coal carbonized. The total quantity of coke sold last year was 305,120 tons, compared with 280,116 tons for the previous year—an increase of 25,004 tons. The average price received was 7s. 3 0/12d. per ton, compared with 7s. 8 3/12d. for the previous year—a decrease of 5 2/12d. per ton.

The Committee again observe with pleasure a still greater quantity of gas made per ton of coal carbonized, which last year was 10,167 cubic feet, compared with 10,015 cubic feet for the preceding twelve months (an increase of 152 cubic feet per ton). The unaccounted-for gas this year is 8 6/12 per cent., compared with 9 2/12 per cent. for the preceding year, or a decrease of 0 6/12 per cent.—a substantial improvement very gratifying to report.

The following is an analysis of the sale of gas for the past year as compared with the sale for the previous year:—

	Year 1909-10.		Year 1908-9.	
	Rate per 1000 C. Ft.	Consumption.	Rate per 1000 C. Ft.	Consumption.
	s. d.	Cubic Feet.	s. d.	Cubic Feet.
Within city and suburbs—				
Lighting	2 1	20,077,100	2 4	21,266,800
Do.	2 0	4,768,670,100	2 1	4,663,552,000
Gas-engines	1 9	9,162,700	2 0	7,473,900
Do.	1 8	331,978,900	1 9	316,823,000
Manufacturing	1 9	234,800	..	..
Do.	1 8	225,273,900	1 9	221,698,300
Contract gas	2 0	562,857,700	2 1	563,883,870
Within Milngavie area—				
Lighting	3 1	37,300	3 4	33,700
Do.	3 0	18,682,100	3 1	17,144,600
Gas-engines	2 8	376,400	2 9	460,500
Manufacturing	2 8	839,200	2 9	1,058,200
Contract gas	3 0	1,715,550	3 1	1,673,750
Prepayment supply	2 8	14,590,000	2 11	16,487,221
Do.	2 7	339,408,300	2 8	281,111,400
		<u>6,296,904,050</u>		<u>6,112,667,241</u>
Used at works		78,045,800		74,346,200
		<u>6,374,949,850</u>		<u>6,187,013,441</u>

Increase in 1909-10, 184,236,809 cubic feet = 3 0/12 per cent.

It is very gratifying indeed to observe the substantial increase in the sale of gas recorded above, which is largely due to its extended use for domestic purposes, and also to the rapidly increasing demand for gas on the prepayment system; the increased consumption from this source alone amounting to no less than 56,399,679 cubic feet. The greatest quantity of gas sent out in 24 hours was 38,894,000 cubic feet. The maximum daily make was 34,295,000 cubic feet.

The number of ordinary meters in use on the 31st of May last was 223,889, compared with 225,422 for the preceding year, a decrease of 1533. The number of prepayment meters in use on the same date was 49,957, compared with 43,900, or an increase of 6057. During the year, 32,821 meters were repaired. The number of gas-stoves on hire on the 31st of May last was 52,696, compared with 48,548 for the preceding year—an increase of 4148. At the same date there were also 15,106 small stoves and grills let out free of charge, compared with 10,380 before, or an increase of 4726. The number of gas heating and cooking appliances sold during the year was 3206. The number of gas-engines in use, and the total horse power for last and the preceding year are as follows: Year 1908-9, 1690 engines, 19,003½ B.H.P.; year 1909-10, 1596 engines, 19,027½ B.H.P.—being a decrease of 94 engines, or 5 5/12 per cent., and an increase of 23½ B.H.P., or 0 1/12 per cent. Upwards of 17 miles of new mains were laid during the year.

Referring to the Glasgow Gas Act, 1910, which will shortly receive the Royal Assent; the Committee said: "The Act consolidates and amends the Glasgow Gas Acts, 1869 to 1909, and any other Acts relating to the gas undertaking of the Corporation. It confers upon the Corporation some important new powers in connection with the carrying on of the gas undertaking; and the following may be mentioned: The city supply area and supplementary supply area are definitely defined. The equality clause as regards price has been repealed, and an equal-treatment clause under like circumstances substituted therefor, which enables the Corporation to make contracts with large consumers and to grant rebates or discounts to them, to make rebates for prompt payments, and to differentiate between gas for lighting purposes and gas supplied for manufacturing and industrial purposes; to charge for gas for public lamps a lower rate than the price charged to consumers generally; to charge in the supplementary supply district an increased price (the maximum price not to exceed by 50 per cent. the charge for the time being in force for lighting purposes in the city supply district); and to make a charge for meters which the Corporation formerly had to supply free of charge. An equated sinking fund of 2½ per cent. on borrowed money and on the capitalized value of gas annuities in lieu of varying rates under the earlier Gas Acts. The power to establish a reserve fund at a rate not exceeding ½ per cent. on the amount of capital outstanding until the fund is equal to 10 per cent. of the outstanding capital. The reduction of the candle power from 16 to 14 candles."

The accounts for the past financial year show that the expenditure on capital account was £30,073; the largest items being £5946 for pipes and the cost of laying them, £12,471 for gas-meters, and £10,615 for stoves, &c. The total was, however, reduced to £27,861 by deductions in respect of property sold. The balance at the credit of the capital account on the 31st of May was £50,184. The revenue account shows that the sale of gas produced £628,064; residuals yielded £236,988 (being £101,149 for coke and £135,839 for ammoniacal liquor and tar, &c.); the hire of stoves brought in £9069; rent of house

properties and chemical works, £2868; incandescent stair lighting, £1507. The total receipts were £879,434. On the expenditure side, the principal items are: Manufacture of gas, £511,721 (including £339,676 for coal and carriage and £65,136 for repair and maintenance of plant); distribution, £68,345; rents, rates, and taxes, £53,141; management, £15,386—the total expenditure being £664,439. Adding the amount written off for depreciation—£64,103—makes up the total of £728,542. The balance carried to the profit and loss account is therefore £150,892. After meeting sinking-fund charges and the payment of interest and annuities, there is left a balance of £15,776 carried to the surplus profits account (raising the total to £37,247), compared with a deficit of £14,017 before.

The statement of gas made, sold, &c., shows that the total make was 6,977,904,000 cubic feet, divided as follows between the different works: Provan, 2,394,874,000 cubic feet; Dawsholm, 2,544,259,000 cubic feet; Tradeston, 2,038,771,000 cubic feet. Of the total production of gas, 6,374,949,850 cubic feet were sold or accounted for. The make was 10,167 and the sale 9289 cubic feet per ton of coal carbonized.

Debate in the Council.

Mr. M. W. MONTGOMERY, the Convener of the Gas Committee, in submitting their report, remarked that under the Consolidation Bill the old order of things had passed away, and the new had taken its place. Dealing with the accounts, he said the revenue had been £879,434; and after meeting all expenditure, including working costs, interest, depreciation, sinking fund, &c., there remained a surplus of £15,776 on the year's operations. This result was extremely satisfactory, especially when they remembered that in reducing the price of gas last year they anticipated a deficit on this account. This was accounted for by two things—first, an increased revenue from the sale of residual products (the addition from this source alone was £16,000); and, secondly, the larger quantity of gas made per ton of coal carbonized. In the year 1908-9, they made 10,015 cubic feet per ton; last year, 10,167 cubic feet—an increase of 152 cubic feet. As they carbonized 686,000 tons of coal, the Council would see what an extra 152 cubic feet per ton meant. Having referred to the rapid development of the penny-in-the-slot meter, the speaker proceeded to deal with the hiring of gas-stoves, and said there were now 52,696 in use; being an increase of 4148 during the year. It had been a matter of controversy—in their Corporation, at least—as to the wisdom of pushing the sale or hire of these stoves. It had been proved by the experience of other gas undertakings that an extensive use of these appliances was good business. So convinced were some corporations and gas companies of this, that, as an inducement to people to use them, they fitted them up free of expense and free of hire-charge. Glasgow, however, did not go this length. The revenue from gas-stoves amounted last year to upwards of £9000. He was quite convinced that the future progress and development of the gas undertaking would be along the line of other uses for gas besides lighting—uses for which it was a convenient, economical, and efficient agent—he meant heating, cooking, and motive power. In this connection, he mentioned that they had opened extensive show-rooms in Sauchiehall Street, where the latest appliances might be seen. They were also taking part in an exhibition for the promotion of smoke abatement, which would be held in September. Referring to the proceedings in connection with the promotion of the Consolidation Bill, Mr. Montgomery said it came before a Committee of the House of Commons in May last. The treatment of the Bill by the Committee was not sympathetic. Possibly they were influenced by the opposition offered by the surrounding burghs and counties. The attitude of these authorities was a great revelation to him. During the last forty years, Glasgow had supplied most of them on exactly the same terms as themselves. They undertook all the risks, and gave them all the benefits of the skill, management, and energy which were necessary to build up a great and successful undertaking. Under these circumstances, they expected their co-operation and assistance. Instead of this, they received from them the most bitter and unreasonable opposition. Their whole attitude was one of distrust and suspicion of Glasgow, although there was nothing in the proposals under the Bill to warrant such feelings. He believed this opposition was largely official, and was not supported by the people themselves. In the petition which was subsequently presented to the House of Lords in favour of the price clause, a great many signatures of manufacturers outside the city boundary were found; and these firms would reap the benefit attached to the proposals he was about to name. They now knew exactly what was the official attitude of these outside places towards Glasgow; and that was something gained. He referred particularly to Partick and Govan and to the county of Lanark. The House of Commons Committee decided against the Corporation on most points; but notwithstanding this, they took the Bill to the House of Lords, where they got practically everything for which they had contended in the House of Commons. The only thing they did not get was a continuation of the power they had enjoyed for the last forty years—to apply the surplus in reduction of the rates. Though they did not exercise this power, he regretted that it had not been continued. Some of the advantages gained by the Bill were these: (1) The city supply area and the supplementary area were definitely defined. (2) The equality clause as regards price had been repealed, and an equal-treatment clause under like circumstances substituted. (3) Gas for public lamps at a lower rate than that charged to consumers generally. (4) To charge in the supplementary district an increased price up to 50 per cent. over the city price. (5) To charge for meters where the Corporation thought it desirable to do so. (6) An equated sinking fund on borrowed money and on the capitalized value of the annuities. (7) Power to establish a reserve fund. (8) Reduction of the illuminating power from 16 to 14 candles. In conclusion, he said the Corporation had a very satisfactory Bill, harmonizing with the most modern legislation on the subject. Under sufficient control and wise management, and supported by a loyal Corporation, he ventured to predict for the Gas Department a new career, carrying with it prosperity to the undertaking and increased advantage to the citizens.

Mr. NELSON, in seconding the motion, said the prospect for the domestic consumer of gas was very hopeful indeed; and he thought in the course of a few years they might possibly get quite a diminished

price as regarded the general lighting of the city, especially for small consumers.

Treasurer GRAHAM said he hoped the Gas Committee would be able to make such an exhibition of gas stoves and appliances as would compel the people of Glasgow to go and purchase them and get them put in for themselves.

Mr. P. G. STEWART, referring to the Consolidation Bill, said he thought the Gas Committee were now in a fair position to get along and to reap benefits from the undertaking, instead of making experiments and extending their wings in the outside districts in the way they had been doing. With reference to the question of gas-stoves, he said there was a cry for a purer atmosphere; and they could only get it by encouraging people to use these stoves.

Baillie ALSTON also thought that, as a means of procuring a purer atmosphere, they should encourage the use of gas-stoves. In his opinion, the time had come when they should consider the question of giving greater facilities for the use of gas.

Mr. MONTGOMERY replied to the remarks which had been made, and the report and accounts were adopted.

The Council then proceeded to consider the recommendations of the Committee in regard to the disposal of the surplus.

Mr. MONTGOMERY said the minutes of that day's Committee meeting stated that it appeared from the annual accounts of the Gas Department for the year ended May 31 last that there was a surplus profit of £37,247 standing at the credit of the department; and it was pointed out that, in terms of section 86 of the Glasgow Corporation Gas Act, 1869, the balance might be carried to the credit of the Corporation for their general purposes. After consideration, it was agreed to recommend that the balance be disposed of as follows: (1) That the sum of £20,000 be paid over to the Corporation for their general purposes, with the recommendation that the deficit on the telephone undertaking, which at present amounts to between £16,000 and £17,000, be recouped to the Common Good therefrom; and (2) that the balance of £17,247 be carried forward to the credit of the current year's accounts of the Gas Department. Mr. Montgomery pointed out that the Corporation had no longer the power, provided the Consolidation Bill was passed, to carry their surplus towards the relief of rates. They considered, in view of the position of the undertaking, that it was now desirable to transfer a portion of the surplus to the common purposes of the Corporation. He would not be in favour of this policy year after year, as it was not a policy which really commended itself to the majority. But they were now in exceptional circumstances; and it was desirable to try to square their accounts in view of the new era upon which the department had entered. The proposal was to transfer £20,000 to general purposes, and carry forward £17,000 to the credit of this year's gas account. He was disposed to make this suggestion, because on the figures on which they were now reckoning they anticipated for this year a deficit of some £18,000. If, therefore, they carried forward the proposed balance, it would provide the department with a sum quite sufficient to meet the anticipated deficiency should it arise. As to the telephone proposal, he thought it was one to which no party, either in the Council or in the city, could take exception. He moved the adoption of the Committee's recommendations.

Mr. NELSON seconded the motion.

Mr. BATTERSBY moved, as an amendment, that the entire sum of £37,247 should be paid over to the Corporation for general purposes. If it were true—and there was no doubt of it now, in view of the telegram from London—that they were coming under the Consolidation Act, and that the table of rates would require to be rearranged at some subsequent meeting, he failed to see why they should not adjust the table to meet the expenditure for the current year. This was the last opportunity they would have of disposing of the surplus; and he failed to see why they should give £17,000 to meet this year's probable deficiency, because there would be outlying districts to participate. There was an important clause in connection with the Bill, to the effect that if there were any deficiency the citizens of Glasgow alone would be held responsible for the payment. He thought, therefore, that the fairest way to deal with the surplus was to put it into the Common Good.

Baillie GUEST, in seconding the amendment, pointed out that as they had not decided on the charges for the year, and as there might be a deficiency of £18,000, he thought this could be quite well put right in considering the proposed charges.

Mr. COSH moved a further amendment, to the effect that the whole surplus should be carried to the reserve fund. He said he thought a good many of them could remember that from time to time sums had been taken from the Common Good for other purposes; and he did not know that there was anything to prevent them taking from the Common Good fund a sufficient amount to liquidate the telephone debt.

Mr. PRATT seconded Mr. Cosh's amendment.

After some discussion,

The LORD PROVOST pointed out that the finding of the Committee was arrived at unanimously; and he said it seemed to him to be a most reasonable recommendation. It was a question of compromise between the proposals of Mr. Battersby and Mr. Cosh; and, in these circumstances, he would appeal to them to withdraw their amendment, and allow the Council to come to a unanimous decision.

The amendments were withdrawn, and the recommendation of the Committee was unanimously adopted.

EXTENSIONS AT THE AMMANFORD GAS-WORKS.

Extensions and alterations of some importance are being carried out in connection with the Ammanford Gas-Works, which, after undergoing considerable vicissitudes, have been remodelled by a new Company; the old works being "scrapped" or improved out of existence. A contract has been entered into with Messrs. Willey and Co., of Exeter, to put in new beds of retorts, purifiers, washers, exhausters, condensers, and a larger gasholder, 60 feet in diameter. The present 6-inch main from the works to the centre of Ammanford—a distance of at least half-a-mile—is being replaced by one 10 inches diameter; and from that point to the boundary of the urban district an 8-inch main

will be continued. Farther on, to a total distance of four miles—in fact, to the top end of Garnant, in the next parish—a 6-inch main will be laid. The different streets of Garnant will have 3-inch or 4-inch pipes laid in them as may be found necessary. A range of artistic gas-standards will light the roads the whole of the distance from the urban boundary to the top of Garnant. These works are to be completed within two years. All the tubes will be of the Mannesmann kind, made at Landore, near Swansea; and all the machinery and appliances will be of the latest types. It is anticipated that there will be a greatly increased demand for gas-stoves, of which about 200 are already in use in the town, and are much appreciated by the colliers, who are able to get a cup of hot tea or cocoa before going out to their work in the pits in early morning. The slot-meter system will be developed, and the maximum price of gas (4s. 3d. per 1000 cubic feet) will, it is calculated, be half that of electricity, with which the urban district is supplied, for the same candle power. As consumption increases, the price is to be reduced; and then gas will become an active competitor against the electric light in the district. During the autumn a gas exhibition is to be held, when the advantages of gas will be fully demonstrated.

LISBURN GAS-WORKS PURCHASE.

The Umpire's Award.

At the Meeting of the Finance Committee of the Lisburn Urban District Council last Thursday, the Town Solicitor submitted the award in the arbitration in connection with the purchase of the gas-works by the Council which he had received that morning from London. Owing to a question as to whether the Gas Company are a statutory or a non-statutory corporation, it was decided that, for the present, it would be inadvisable to hand the award to the Press for publication. The "Lisburn Herald," however, is in a position to enlighten readers as to the figures named in the award. In the event of the Company being declared "statutory," the amount they will be entitled to receive is £31,445; whereas if proved that they are "non-statutory," they will get £34,227. The price originally offered by the Council for the concern (except the property acquired by the Company for extending the works, if necessary) was £28,000. The Editor of the "Herald" says: "Even if the Council should have to give the £34,227, the bargain may be regarded as a not unsatisfactory one." He adds that the foregoing figures were not supplied from an official source, but that they can be relied upon as accurate. It may be remembered that the arbitration proceedings were held in London not long ago, and were reported in the last volume of the "JOURNAL" (pp. 570, 706); Mr. Corbet Woodall and Mr. H. E. Jones being Arbitrators, and Mr. Ram, K.C., Umpire.

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 316.]

The accounts of the Company for the six months ended June 30, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £10,264,980; added on conversion, £12,697,710—total amount authorized, £22,962,690. Deducting the amount redeemed, £120,880, the total amount of the Company's existing capital powers is £22,841,810. The statement of loan capital stands thus: Total paid up, £3,097,300; added on conversion, £1,564,405; unissued, £750,000—total amount authorized, £5,411,705.

The capital account shows receipts (with premiums, £1,669,476 8s. 5d.) to the amount of £29,172,991 8s. 5d. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1909—	
Gaslight and Coke Company	£13,562,245 7 6
West Ham Gas Company	1,093,855 19 8
Expenditure during the half year to June 30, 1910—viz.,	
Buildings and machinery in extension of works	£2,915 8 8
New and additional mains and service-pipes	17,801 8 7
Do. do. meters	19,024 15 7
Do. do. stoves	13,318 18 2
	53,060 11 0
By depreciation of plant	£13,677 11 4
By depreciation of meters and stoves	49,368 5 1
	63,045 15 5
Total expenditure	£14,620,116 2 9
Nominal amount added on conversion	14,262,115 0 0
	£28,882,231 2 9
Deduct amount of capital redeemed under Gaslight and Coke Com-	
pany's Act of 1903—	
Per previous account	£101,651 0 0
This half year	19,225 0 0
	120,880 0 0
	£28,761,351 2 9
Balance of capital account	411,640 5 8
	£29,172,991 8 5

The balance applicable to the redemption fund and to dividend on the ordinary stock is £929,890 11s. 6d.; and the following statement shows how it is proposed to appropriate it:—

June, 1909.		
£444,779 ..	Net balance brought from last account	£489,739 17 9
375,212 ..	Net revenue for the half year	440,150 13 9
		£929,890 11 6
£819,991 ..	Contribution to redemption fund	10,000 0 0
10,000 ..	Dividend on the ordinary stock—	
(£4 13s. 4d. p. ct.)	£4 13s. 4d. per cent. per annum on £16,179,445	377,520 7 8
£377,379 ..		
£432,612 ..	Balance carried to next account	£542,370 3 10

The following is the revenue account:—

Expenditure.

June Half Year, 1909.		£	s.	d.	£	s.	d.
£624,238	Manufacture of gas—						
97,333	Coal, including all expenses thereon	562,192	18	6			
38,071	Oil less value of oil tar	19,107	3	4			
16,190	Coke and breeze used in the manufac-	31,760	5	1			
100,872	ture of carburetted water gas						
12,593	Salaries of Engineers and other officers	15,887	2	11			
	at works	97,872	18	6			
	Wages	7,991	14	8			
	Purification						
	Repair and maintenance of works and						
	plant, materials and labour, less re-						
	ceived for old materials, £8231 18s. 5d.	184,298	15	6			
190,083	Distribution of gas—				962,110	18	6
	Salaries and wages of officers (in-						
49,745	cluding rental clerks).	52,032	4	3			
58,911	Repair and maintenance of mains and						
65,035	service-pipes, &c.	82,866	0	2			
6,308	Repair and renewal of meters	74,210	15	2			
	stoves	68,291	0	10			
	Gas fittings, including labour (auto-						
	matic meter supplies)	35,201	8	10			
37,003					313,534	9	8
22,593	Public lamps—lighting and repairing				22,216	19	1
6,141	Rents, rates, and taxes—						
148,264	Rents payable	6,500	19	10			
	Rates and taxes	148,550	5	11			
	Management—				155,057	5	9
3,750	Directors' allowance	3,750	0	0			
307	Company's Auditors and Assistant	204	4	0			
	Salaries of General Manager, Secre-						
	tary, Accountant, and clerks	9,452	1	10			
9,302	Collectors and cashiers	25,413	15	10			
24,907	Stationery and printing	7,162	2	6			
7,761	General charges	4,373	17	1			
8,306					50,356	1	3
	Co-partnership, for 12 months to 30th						
	June, 1910 Less On Account	25,798	17	3			
11,605		13,000	0	0			
1,97	Parliamentary charges				12,798	17	3
14,3	Law charges				4	6	4
	Charges re Quinquennial Re-valuations				2,582	2	10
10,100	Bad debts				1,387	10	0
	Depreciation fund for works on leasehold				8,542	4	4
500	lands						
	Annuities to officers and workmen, in-				500	0	0
	cluding contribution to officers' super-						
25,098	annuation fund				26,583	19	2
	Retiring allowances under the Company's						
	Act of 1909				10,507	9	0
1,890	Workmen's compensation account				2,314	11	6
	Stamp and conveyance duties under the						
	Company's Act of 1909				285	15	0
	Public officers—						
1,244	Gas Referees and Official Auditor	1,220	17	9			
664	Public testing-stations	633	0	4			
					1,853	18	1
£1,639,594					1,571,048	15	11
607,877	Balance carried to net revenue account				673,219	14	6
£2,247,471					2,244,268	10	5

Receipts.

June Half Year, 1909.		£	s.	d.	£	s.	d.
£1,567,552	Sale of gas—						
81,984	Per meter, at 2s. 8d. and 2s. 2d. per	1,553,947	10	2			
	1000 cubic feet	64,696	19	6			
	Public lighting and under contracts				1,623,644	9	8
£1,619,536							
35,215	Rental of meters				64,110	4	2
51,464	Rental of stoves				52,314	10	8
76,364	Rental of fittings				49,891	0	5
	Residual products—						
£264,607	Coke, less £36,717 7s. 3d. for labour, &c.	269,347	13	0			
17,024	Breeze, less £7535 1s. 9d.	19,036	15	1			
50,575	Tar and tar products	55,140	2	6			
	Ammoniacal liquor and sulphate of						
	ammonia	105,245	12	8			
97,640					448,776	3	3
£429,846							
£4,680	Rents receivable				4,905	19	9
366	Transfer fees				326	2	6
£2,247,471					2,244,268	10	5

The three statements relating to the reserve, insurance, and depreciation funds stood as follows on June 30: Reserve fund, £94,567; insurance fund, £169,095; depreciation fund, £73,911. The first-named fund consists of the Company's balance on Dec. 31, 1909, £67,902; the West Ham Company's, £15,869; brought from the net revenue account, £10,000; and interest, £796. On the other side, the value of stock allotted to the ordinary stockholders of the West Ham Gas Company is £27,600; a sum of £10,000 is written off on account of depreciation of investments; and the balance is £56,967. The insurance fund is made up as follows: Gaslight and Coke Company, £126,900; West Ham Gas Company, £20,284; amount brought from net revenue account, £20,000; and interest, £1911.

The following statements relate to the working:—

Statement of Coal Used, &c.

Description of Coal.	In Store Dec. 31, 1909.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1910.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	292,558	705,523	922,694	2,177	133,210
Cannel	3,599	..	85	..	3,514
Total	296,157	705,523	922,779*	2,177	136,724

* In addition to this quantity of coal, 6,510,354 gallons of oil and 42 gallons of spirit were used during the half year.

Statement of Residual Products.

Description.	In Store, Dec. 31, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1910.
Coke—tons	7,298	585,226	120,151	153,134	19,230
Breeze—tons	1,599	79,344	10,364	79,034	545
Tar, from coal only—galls. .	1,032,851	8,820,775	8,082,018	607,763	1,163,845
Ammoniacal liquor—butts .	21,714	288,555	292,323	..	20,946

Statement of Gas Made, Sold, &c.

QUANTITY SOLD.				Number of Public Lamps.
Quantity Made.	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Accounted for.	
Thousands. *13,521,085	Thousands. 454,229	Thousands. 11,921,145	Thousands. 12,528,098	49,526
†13,318,818	482,452	11,680,496	12,318,620	52,161

* Including 2,915,567,000 cubic feet of carburetted water gas. † June half year, 1909.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £85,309; oil and petroleum spirit, £29,500; coke, £10,875; tar and ammoniacal liquor and products, £76,647; and sundries, £249,586. The figures this time last year were: Coal, £94,065; oil and petroleum spirit, £47,371; coke, £16,027; tar and ammoniacal liquor and products, £72,111; and sundries, £240,674.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 316.]

The following are the principal portions of the accounts of this Company for the six months ending the 30th of June

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to Dec. 31, 1909.	£5,062,627	8	5
Expenditure during half year to June 30, 1910, viz.—			
New and additional mains and services	£1,771	3	1
New and additional meters	1,262	19	5
New and additional stoves	1,347	2	4
		4,381	4 10
Total expenditure	£5,067,008	13	3
Balance	261,811	6	9
	£5,328,820	0	0
Nominal amount added by conversion, less premium	2,996,520	0	0
Total	£8,325,340	0	0

The following is the revenue account:—

Expenditure.			
Manufacture of gas—			
Coal into store	£321,959	0	3
Purification	13,345	2	6
Salaries of Engineer and Officers at works	14,799	12	4
Wages (carbonizing)	44,480	2	7
Repairs and maintenance of works and plant, less £6666 gs. 6d. received for old materials	123,904	12	1
Co-partnership for twelve months to 30th June, 1910. Less on account	£41,133	14	6
	16,000	0	0
		25,133	14 6
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes	£37,303	10	6
Salaries and wages of officers, including rental clerks	20,223	10	2
Repairing and renewals of meters	25,083	18	4
Repairing and renewals of stoves	40,747	16	8
Repairing and renewals of gas-fittings	37,997	16	10
Public lamps, labour and materials £20,081 16s. 6d., less £15,021 gs. received for the same			5,060 7 6
Rents, rates, and taxes—			
Rents payable	£1,039	13	7
Rates and taxes	46,788	16	10
		47,828	10 5
Management—			
Directors' allowance	£3,092	16	10
Salaries of Secretary, Accountant, and clerks	3,681	9	6
Collectors: { Ordinary	6,169	16	5
{ Slot meter	9,279	4	11
Stationery and printing	3,162	13	9
General charges	9,118	7	10
Company's Auditors	112	10	0
Law charges	£1,928	7	7
Parliamentary charges	111	9	0
		2,039	16 7
Bad debts		1,520	15 1
Stolen from 4435 slot meters broken open		569	5 2
Pensions and officers' and workmen's superannua- tion, sick, and accident funds		8,116	18 7
Gas Referees and Official Auditor		343	7 9
Leasehold renewal fund		300	0 0
		£805,424	17 1
Total expenditure		219,884	3 6
Balance carried to net revenue account			£1,025,319 0 7

Receipts

Sale of gas—			
Lady-day at 2s. 2d. per 1000 feet	£377,025	6	4
Midsummer, at 2s. 2d. per 1000 feet	27,433	14	5
	£652,459	0	9
Public lighting	16,738	11	2
		£(669),197	11 11
Meters in use (349,970)—			
Company's meters at rent: Ordinary, 96,674; slot, 245,166	£38,873	9	7
Company's stoves at rent: Ordinary, 78,515; slot, 199,329; fires, 25,950	30,521	13	4
		69,395	2 11
Residual products—			
Coke, less labour and cartage	£145,122	13	2
Breeze, less labour and cartage	4,778	15	0
Tar and tar products, less labour	31,007	5	6
Sulphate of ammonia	60,905	17	5
		244,814	11 1
Rents receivable		1,436	7 6
Transfer fees		88	5 0
Fittings		40,387	2 2
		£1,025,319	0 7
Total receipts			
Total amount paid in salaries for half year, £38,551 ss. od., " " " wages " £260,068 gs. 11d.			

The net revenue account shows a sum of £268,309 15s. 6d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £184,021; renewal fund, £30,619; insurance fund, £99,049. The following statements relate to the manufacturing operations of the Company:—

Statement of Coal.

In Store Dec. 31, 1909.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1910.
Tons. 248,029	Tons. 402,471	Tons. 544,962	Tons. 1,015	Tons. 104,523

Statement of Residual Products.

Description.	In Store Dec. 31, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1910.
Coke—cwt.	172,620	6,743,622	1,681,836	5,097,826	136,580
Breeze—yards	11,197	122,903	51,613	75,710	6,777
Tar—gallons	419,308	5,251,510	5,265,379	32,031	373,408
Ammoniacal liquor—butts .	12,195	202,845	208,236	..	6,804

Statement of Gas Made, Sold, &c.

Quantity Made.	QUANTITY SOLD.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,441,516	Thousands. 166,284	Thousands. 6,124,448	Thousands. 6,366,799	23,899 incandes- 11 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £63,636; coke and breeze, £4514; tar, sulphate, and ammoniacal liquor, £31,964; and sundries, £298,473. The figures this time last year were: Coal, £77,211; coke and breeze, £14,083; tar, sulphate, and ammoniacal liquor, £36,778; and sundries, £288,911. A sum of £37,419, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £53,705. The figures last year were £45,232 and £50,659.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of the Company for the six months ended June 30, which, with the accounts for this period, will be presented at the half-yearly general meeting next Friday.

The accounts show that, after providing for the debenture interest and including the amount brought forward from last half year, the balance available for distribution is £30,284 7s.; and the Directors recommend payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock, carrying forward to next half year £11,642 13s. 8d.

The comparatively mild and open weather which prevailed at the beginning of the year was attended by a falling-off in the consumption of gas; but this was followed by a substantial recovery during the later months of the half year. The return for the whole period shows the small reduction of 0.88 per cent., compared with that for the corresponding period of last year.

There was an increase in the number of consumers during the half year, and a continuance in the demand for domestic gas-heating appliances suitable to the season; while improved high-power lamps fitted with inverted incandescent burners are finding considerable favour for outside shop and other lighting.

Improved returns for residuals and a substantial reduction in the cost of coal have more than counterbalanced the loss of revenue, due to a slight extent to less consumption, but chiefly to the reduction in price (of 1d. per 1000 cubic feet) which took effect on the 1st of July last year, and benefited consumers during the year to the extent of £5492.

A further improvement in carbonizing results forms a gratifying feature of the half-year's working. The average production of gas per

ton of coal carbonized exceeds all previous records of the Company; and the cost of carbonizing labour now ranks among the lowest in the kingdom.

The unrest among the miners caused by the operation of the Coal Mines Regulation (Eight Hours) Act has affected the price of coal; and the current year's supplies have had to be contracted for at an advance upon last year's rates.

The bonus paid to employees under the Co-Partnership Scheme is regulated by the selling price of gas, and now amounts to $6\frac{1}{2}$ per cent. upon the earnings of each co-partner, or a total of £3,462 for the complete year ended on the 30th of June last. This is the largest amount yet divided; and the Directors are of opinion that it is money well and judiciously expended—being fully convinced of the great co-operative value of co-partnership, and that to it is attributable in no small degree the continued success of the operations of the Company.

The accounts accompanying the report show that the total expenditure on capital account at the close of the half year (including a nominal amount of £202,500 added by conversion) was £801,555, or £29,808 less than the receipts, inclusive of £49,305 premium capital—£831,363 in all. Only £776 was expended on capital account in the half year; being £359 on new mains and service-pipes, £105 on new and additional meters, and £312 on new and additional gas-stoves. The revenue from the sale of gas was £83,844; the rental of meters and stoves produced £6766; the sale of residuals, £29,449; and the total receipts were £120,183. The following were the principal items of expenditure: Manufacture of gas (including £42,606 for coal and £18,121 for maintenance of works and plant), £66,765; distribution, £17,142; management, £4820; rents, rates, and taxes (£5084) and miscellaneous items bringing up the total to £97,541. Among these items is a sum of £1839 charged on account of the Co-Partnership Scheme. The balance carried to the net revenue account is £22,642; and the amount applicable for dividend, as stated in the report, is £30,284.

The statements as to working show that 59,300 tons of coal were carbonized in the half year. The quantity of gas made was 711,494,000 cubic feet, of which 696,654,000 cubic feet were sold and 706,258,000 cubic feet were accounted for. The residuals were: Coke, 711,600 cwt., of which 137,419 cwt. (estimated) was used in manufacture; breeze, 16,073 yards; tar, 547,652 gallons; ammoniacal liquor, 15,999 butts—the make of sulphate of ammonia being 650 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

At the Half-Yearly Ordinary General Meeting of the Company on Saturday, the Directors will report an increase of 5.5 per cent. in the sales of gas in the six months ended the 30th of June, compared with the corresponding period of 1909. There was an addition during the twelve months of 3346 consumers, and an increase of 2397 in the number of cooking and heating stoves. The accounts accompanying the report show that £7374 was expended on capital account in the half year; £2000 being for new buildings and manufacturing plant, £3134 for new mains and service-pipes, including laying and other work connected with distribution, £808 for meters, and £1431 for new cooking-stoves. A sum of £1000 was written off on account of a demolished gasholder. The sale of gas produced £89,491; the rental of meters, stoves, and fittings and the maintenance of incandescent mantles, £17,243; residuals brought in £20,547; and the total revenue was £127,315. The expenditure on the manufacture of gas was £65,405, including £35,460 for coal, £8519 for oil and coke used in making water gas, and £14,511 for the repair and maintenance of works and plant; on distribution, £21,974; on management, £4354; and for the co-partnership scheme, £1499—the total expenses being £104,099, leaving £23,216 to be carried to the profit and loss account. The amount available for distribution, with £20,681 brought forward, is £39,320; and, as mentioned in the "JOURNAL" last week, the Directors recommend the payment of the full statutory dividends of 7 and $5\frac{1}{2}$ per cent. per annum on the "A" and "B" stocks, compared with $6\frac{1}{2}$ and $5\frac{1}{2}$ per cent. respectively a year ago—the increased dividends being due to the reduction of 1d. per 1000 cubic feet in the price of gas which took place on Jan. 1 last. The dividend will absorb £16,166 and leave £23,154 to be carried forward. In view of the necessity for providing large sums from time to time for the renewal of costly plant, the Directors have commenced a renewal fund, and place £3000 to its credit.

The working statements in the account show that 47,460 tons of coal and 528,731 gallons of enriching oil were used in the production of 798,713,000 cubic feet of gas, of which 764,931,000 cubic feet were sold and 779,977,000 cubic feet accounted for. The residual products were: Coke, 28,476 tons, of which 6594 tons were used for making coal gas, and 4100 tons 17 cwt. for producing carburetted water gas; breeze, 5584 chaldrons; tar, 504,382 gallons; ammoniacal liquor, 13,183 butts. The quantity of sulphate made in the half year was 442 tons 14 lbs.

North Pembrokehire Water and Gas Company.—The ordinary general meeting of this Company was held on Monday last week—Mr. R. Barnes in the chair. In moving the adoption of the report, he said there was a profit of £543, against £190 the previous year. After paying the debenture interest, there was a balance of £170 carried forward to the profit and loss account. The Directors were hopeful that at the end of the present year the balance would be considerably increased. Their difficulty had always been that they had no working capital. This had been pointed out to the shareholders on previous occasions; but no further capital was subscribed. The position of the Directors had thus been rendered difficult, more particularly in respect of making extensions. So far as the water supply was concerned, arrangements had been made with some consumers on buildings to supply sufficient money to enable the Company to lay the mains; and this money was paid out of the rental for the water afterwards supplied. The gas position was difficult, as gas cost a considerable amount to make. Without working capital, it was really impossible for them to go on with any large extensions. The report was adopted.

MANCHESTER CORPORATION AND THEIR OFFICIALS.

Committee's Report on Salaries and Conditions of Service.

At the Monthly Meeting of the Manchester City Council to-morrow (Wednesday), the Conditions of Service Report will be submitted for discussion. The general impression is that the report (a summary of which as affecting the Gas Department appeared in last week's issue) will be referred to the various Committees for consideration, and a day set apart for the Council to finally deal with the matter. The changes proposed are of so far-reaching a character that it is felt ample time should be given the Committees chiefly concerned to deal with the recommendations of the Special Committee as they affect their separate departments.

The views of the officials affected by the report are voiced through the columns of the "Journal of the Municipal Officers' Guild"—an organization which must not be confounded with the Municipal Employees' Union, the leaders of which suggest that candidates be put forward at the next municipal elections in opposition to those members of the Council who have been concerned in the preparation of the report. The Municipal Officers' Guild dissociate themselves from this suggestion. An impression prevails in certain quarters that the report deals with the workmen in the employ of the Corporation as well as the Town Hall officials. This is not so. The Committee dealing with the workman's side have not completed their labours. The Municipal Officials' Guild regard it as unfortunate that the information as to civil service conditions and the methods adopted in cities similar to Manchester could not be utilized. In their report, the Special Committee expressed regret that "a common basis hardly existed for comparative purposes." The Officials' Guild welcome the recommendation as to competitive examinations for those who desire to enter the service of the Corporation, as it will compel all to enter through the same door, and prevent that gentle pressure which is still exercised by some members of the Council and friends in favour of particular candidates. A compulsory retiring age, with a pension, would be welcomed by the officials; and the Guild, having secured a considerable amount of information regarding the various superannuation schemes in operation in other municipalities, railway companies, banks, &c., are prepared to lay the same before the Committee with their views. It is contended that a report dealing with revision of salaries and conditions of service is incomplete if not containing a retiring allowance scheme, and leaves the question in a state where a just decision is impossible. It is argued that the new system will check initiative and damp all enthusiasm that a man may have in his own particular sphere. There are men in the service of the Corporation with two years' increases overdue; and resignations are already beginning to appear from persons who, the chairmen and chief officials know, cannot be replaced until the newcomers have been established for at least a couple of years. The Officials' Guild suggest that the Council should allow the recommendations to be referred to the different Committees concerned, since they alone know the value of the services rendered.

Councillor Pinder has given notice that he will move at the Council meeting that the report be referred to the various Committees concerned, with instructions to consider such portions as deal with their respective departments, and to report thereon to the Council.

In January last the Gas Committee's recommendations for increases in salary were, along with all the others, deferred by resolution of the Council, pending the report of the Special Committee on Conditions of Service. It was recommended that the salary of Mr. J. G. Newbigging, the Chief Engineer, be advanced from £1100 to £1200; that of Mr. J. R. Hill, Manager at the Bradford Road Station, from £450 to £475, with a maximum of £500; that of Mr. F. P. Smith, Accountant, from £400 to £425, with a maximum of £500; that of Mr. G. W. Tooley, Manager at the Rochdale Road Station, from £375 to £400, with a maximum of £450; that of Mr. T. Williams, Chief Cashier, from £375 to £400, with a maximum of £500; and that of Mr. F. J. Caldecott, Chief Rentals Clerk, from £350 to £375, with a maximum of £400.

ACCRINGTON GAS AND WATER SUPPLY.

We have received from Mr. W. B. Rhodes, the Accountant of the Accrington District Gas and Water Board, the report of the General Manager (Mr. Charles Harrison) on the working of the two undertakings of which he has the supervision, together with the accounts for the year ended the 31st of March. They furnish the following particulars.

The quantity of gas made in the period covered by the report was only 316,000 cubic feet more than in the preceding year; but the production of 426,619,000 cubic feet was achieved with a carbonization of 2095 tons of coal less. The working expenses were also lower—as to the extent of manufacture, £752, of which £328 was saved in wages, and distribution by £201. This, Mr. Harrison remarks, is evidence not only of the care exercised by the Board in the purchase of coal, but also of the great care of the works managers, both at Accrington and Great Harwood, and of the superintendent of the distribution department (Mr. Roberts). The unaccounted-for gas was 2,722,350 cubic feet less last year than in 1908-9. The gross profit on the gas undertaking was £18,656; and the surplus, after meeting all obligations, was £2081. The consumers of gas number 20,070—an increase of 398 for the year. The number of prepayment meters is 7016, or 652 more. There are 5235 cookers, 1473 gas-fires, and 695 gas-boilers in the district—a total of 7403, and an increase of 523 for the year.

The working statement in connection with the gas undertaking contains the following particulars: Coal carbonized, 38,335 tons; gas made, 426,619,000 cubic feet, or 11,129 cubic feet per ton; gas sold, 384,995,400 cubic feet, or 10,043 cubic feet per ton of coal; coke or breeze saleable 8.75 cwt. per ton; tar made, 10.53 gallons per ton; ammoniacal liquor made, 30.31 gallons per ton. The outstanding loans amount to £339,755 8s. 4d., or at the rate of £8 17s. 3.07d. per

ton of coal, 15s. 11¹/₃d. per 1000 cubic feet of gas made, and 17s. 7¹/₈d. per 1000 feet sold. The capital value of the works and plant is £406,188; and the gross profit (£18,656) averages £5 9s. 9¹/₈d. per cent. upon it.

The revenue from water amounted to £23,435—an increase of only £33 over the previous year, accounted for by the reduced quantity used for trade purposes. The increased revenue for water supplied for domestic purposes was £376. The gross profits amounted to £15,541; and the deficiency is £5280. The number of consumers added during the year was 241. The total quantity of water sent into the district during the year was 756,025,000 gallons, equal to a supply of 22 gallons per head per day for 90,000 people.

LEYDEN MUNICIPAL GAS UNDERTAKING.

Report for the Year 1909.

We are indebted to the courtesy of Heer N. W. van Doesburgh, the Manager of the Leyden Municipal Gas and Electricity Works, for a copy of the report of the working of these undertakings for the year 1909. We have abstracted from it the following particulars relating to the gas undertaking.

In consequence of the death of the former Assistant-Manager, Heer F. A. Holleman, jun., the Gas and Electricity Committee appointed Heer H. A. Blom as Assistant-Manager of the electricity works, and Heer E. J. F. Thierens as Assistant-Manager of the gas-works. Land was purchased in the course of the year for the extension of the two works. A contract was made and ratified on Jan. 27 last for the supply of gas to the suburb of Leiderdorp. Contracts were made conjointly with the Hague municipal gas-works for the supply in the year ending March 31 last of 21,600 tons of Westphalian and 4000 tons of English gas coal. A contract for three years from April 1 last was made for the delivery annually of 600 tons of Texas gas oil, and another contract for the delivery of 100 tons of Java oil per annum. The prices at which these raw materials were purchased were considerably below the estimates of July, 1908; and as a result of the saving thereby effected, the Municipal Council determined, in June last, to pay off from the profits of the gas undertaking 5 per cent. of the loan capital instead of the usual 2½ per cent. The accounts of the gas undertaking show a gross profit for the year of 130,208.82 florins (£10,850), and after paying interest and redemption charges, a net profit of 42,524.07 florins (£3544). The profit realized shows a considerable increase on that of the preceding year.

The carbonizing plant remains the same as in the previous year (*vide* "JOURNAL," Vol. CVII., p. 196). A new exhauster and a new "Standard" washer-scrubber have been installed during the year, and various other additions have been made to the works' plant. The mains laid during the year had a length of 3666 yards; making the total length of pipes in the distributing system about 48 miles. The make of gas per ton of coal was 11,116 cubic feet, which is slightly lower than the make the previous year. The coke produced amounted to 70.12 per cent., the tar to 3.982 per cent., and the ammonia to 0.2277 per cent. by weight, of the coal carbonized. The coke consumed in the retort-furnaces amounted to 18.12 per cent.; while 6.48 per cent. was used in the water-gas plant. The materials employed to produce 1000 cubic feet of carburetted water gas averaged 22 lbs. of oil and 54 lbs. of coke and breeze, inclusive of the boiler fuel.

The total make of gas during the year was 9,575,621 cubic metres (338,172,631 cubic feet), of which 264,944,940 cubic feet, or 78.35 per cent., was coal gas, and the remaining 21.65 per cent. carburetted water gas. The total make is 1.7 per cent. less than in 1908. The amount of gas sold, however, is slightly higher than in the previous year; the unaccounted-for gas having been reduced from 5.39 per cent. in 1908 to 3.55 per cent. in 1909. The maximum day's make of gas amounted to 1,420,833 cubic feet, of which 1,075,196 cubic feet was coal gas. The minimum make of gas in a day amounted to 452,857 cubic feet. No change was made during the year in the price of gas, which was equivalent to about 2s. 7d. per 1000 cubic feet by ordinary meters and 3s. 1d. per 1000 cubic feet by prepayment meters. In the outlying district, a higher price was charged. The consumption through ordinary meters shows a reduction of 2.9 per cent. as compared with the previous year; but the consumption through prepayment meters has increased by 10.63 per cent. The number of ordinary meters in use at the end of the year was 6296, and the number of prepayment meters 3997. The average consumption of gas, exclusive of public lighting, was 4788 cubic feet per head of the population. Public lighting absorbed 5.22 per cent. of the output of gas. The high-pressure supply of gas to Sassenheim and Voorschoten accounted for 3.11 per cent. of the quantity made, compared with 2.12 per cent. last year. The mean calorific power of the gas distributed was 580 B.Th.U. per cubic foot; while its specific gravity averaged 0.480, and ranged from 0.392 to 0.545. The proportion of sulphur in the gas averaged 29 grains per 100 cubic feet; the maximum being 35 grains. The ammonia amounted, on the average, to 0.142 grain per 100 cubic feet of gas, and the carbonic acid in the gas to 2.6 per cent. by volume. A slight increase was made during the year in the number of lamps employed for public lighting.

Projected Amalgamation of Southport and Birkdale.—For the first time in its history, there was a few days ago a majority of the General Purposes Committee of the Birkdale Urban District Council in favour of amalgamation with Southport. Four conferences between representatives of the Southport Corporation and the Council have resulted in terms being submitted to the following effect: The amalgamation to date from Jan. 1, 1911; the number of Southport councillors to be increased by 15 and the aldermen by five; the rates to be uniform, also the charges for gas, except that, in accordance with the terms upon which Birkdale and Ainsdale amalgamated, Ainsdale has a preferential rate for ten years. Compensation is to be paid to officers and workmen disturbed; and those retained are to be paid at Southport rates.

SUFFOCATING FUMES FROM ELECTRICITY CABLES.

The Long Acre Affair.

At the Meeting of the Holborn Borough Council last Wednesday, the Public Health Committee reported that early on the morning of the 10th of June, the police gave notice to the Borough Surveyor of an escape of gas in several of the houses in Neal Street, Long Acre, and that a number of the occupiers had been poisoned thereby and removed to hospital. The Surveyor communicated with the Gaslight and Coke Company, whose servants proceeded to investigate the matter. No escape of coal gas, however, was found; but on opening the road in front of some of the houses, the ground was found to be very hot, and the bitumen around the cables of the Charing Cross, West End, and City Electricity Supply Company in a molten condition. The Surveyor communicated with the Company, who found about 150 feet of their cables opposite the houses of Nos. 48 to 68 had been fused. The Medical Officer of Health, having made some inquiries, suggested to the Town Clerk the desirability of an investigation being made into the matter by a Government Department; and the Town Clerk addressed a communication thereon to the Home Office. The letter was forwarded to the Local Government Board, who requested Dr. Bond to make the investigation. It appears that eleven patients were removed to the hospital—six being from No. 56, three from No. 60, and two from No. 62; and, in addition, some other occupants of the houses informed the Medical Officer of Health that, though they did not go to hospital, they suffered more or less. Dr. Mott, of the Charing Cross Hospital, who dealt with the cases, expressed the opinion that the symptoms were those of carbon monoxide poisoning. The Medical Officer of Health has informed the Committee that in the houses where the cases occurred the front walls of the basements were defective, and the front areas and stall-boards quite enclosed, so that the gas could easily enter the houses. At the other houses, there were either open gratings over the front areas or in the stall-boards, or the front walls were well concreted, or there was a combination of these conditions, so that the gas could not enter these houses in any quantity. The Medical Officer of Health is now reporting in detail on the matter to the Local Government Board; and the Committee have requested him to incorporate in his report an expression of their opinion that the matter is one of extreme importance, and their hope that the Board will see their way to advise as to the steps it may think desirable to take with a view to preventing as far as possible any recurrence of similar dangers. The matter, it may be remembered, was commented on in the "JOURNAL" at the time, when it was suggested that the trouble had been caused by the burning of the bitumen insulation of the electricity cables, and not by escaping coal gas as was generally supposed.

PUBLIC LIGHTING OF HOLBORN.

At the Meeting of the Holborn Borough Council last Wednesday, a report was presented by the Works and General Purposes Committee dealing with the improved lighting of the thoroughfares of the borough. It furnished the following information on the subject.

On the 23rd of March last, the Committee reported that they had decided to accept offers from several firms to erect (on trial) improved gas-lamps with inverted burners in various parts of the borough; and that they would, in due course, report as to the results obtained. At the same time the Council requested them to consider and report on the cost of an electric lighting scheme for some of the main thoroughfares. The Committee held a special meeting on the 21st ult. for the purpose of receiving a report from the Sub-Committee appointed by them to go fully into the matter.

With regard to the question of adopting the electric light, estimates were prepared by the Borough Surveyor (Mr. E. F. Spurrell) of the cost of alternative systems applied to High Holborn and New Oxford Street only, as follows:—

	Estimated Candle Power.	Estimated First Cost.	Estimated Annual Cost.
1.—By existing lanterns adapted	18,000	£75	£483
2.—By new standards for arc lighting	40,000	800	680
3.—By new suspended lamps for arc lighting across the street	40,000	290	680
4.—By flame arc lighting	120,000	1000	680

In order to instal a system of lighting by high-pressure gas in these two thoroughfares, it would be necessary to lay special mains and erect new columns similar to those in Kingsway (where the system is installed) at a cost of £18 per lamp. The Sub-Committee expressed the opinion, in which the full Committee concurred, that the adoption of either electric light or lighting by gas at high pressure would involve considerable expense and disturbance of the pavements; and that by the adoption of improved burners and lanterns on the existing columns a satisfactory improvement in the lighting could be effected at a minimum cost.

Dealing with the experiments with inverted burners, the Committee stated that the trial lamps were fixed by eight different firms during the months of April and May last in various parts of the borough, and were placed so as to afford an opportunity for a fair test of their respective illuminating powers being carried out. The results of photometrical tests made under the supervision of the Borough Surveyor had been laid before them, from which it appeared that the best effects were obtained from the lamps erected by Messrs. Kempton and Co. and Messrs. Anderson and Co., which gave respectively 27.2 and 26.5 candle power per cubic foot of gas consumed in a two-light burner. The cost of adapting any of these improved burners to the existing lanterns was estimated at 15s. each for a two-light burner; and as there were 1896 lanterns in the borough (excluding the 28 high-pressure lamps in Kingsway, which it was not proposed to alter), the cost of the conversion, allowing for a certain number of lamps with more than two burners, would be about £1478, and the cost of gas and

maintenance of each double-burner lamp consuming in combination 7 cubic feet of gas per hour would be £3 19s. 9d. per lamp per annum. The cost of the whole of the lamps when converted, was estimated, at the present price of gas—viz., 2s. 2d. per 1000 cubic feet—as being about £8000 per annum.

While these experiments were in progress, an offer was received from the Gaslight and Coke Company, who are the present contractors for lighting the public lamps of the borough, to undertake the conversion of the whole of the existing burners to the inverted burner system, under an arrangement whereby the Council would incur no increased expenditure for lighting, and no capital outlay. The letter conveying the offer was signed by the Chief Inspector (Mr. F. W. Goodenough), who submitted the following scheme: The borough is at the present time lighted by 1767 single-burner, 71 two-burner, and 24 three-burner lamps; giving a total estimated illuminating power of 140,000 candles. The cost of these lamps to the Council for the year ended March, 1910, was believed to be about £6700. The Company's suggestion was that 1030 of the lamps should be fitted with one inverted burner of 80-candle power; that 500 lamps should have two similar inverted burners, giving 160-candle power each; that 132 new circular lamps, each fitted with three inverted burners, giving 240-candle power, should be supplied and fixed on the existing columns; and that 200 new circular lamps, each fitted with five inverted burners, giving 400-candle power, should be supplied and fixed on columns extended so that the light would be 15 feet from the ground. This would give a total lighting power of more than 260,000 candles in all. Having specified the thoroughfares in which the five, three, and two burner lamps respectively would be located, Mr. Goodenough said: "If given a contract for ten years in respect of this number of lamps, the Company would be prepared to carry out, at its own cost, the whole of the installation work, including the supply of the necessary lamps, and to charge the following inclusive prices per annum for supplying gas to, lighting, extinguishing, cleaning, painting, repairing, and maintaining, the whole of the lamps: Per one-burner lamp, £2 7s. 6d.; per two-burner lamp, £3 18s.; per three-burner lamp, £6; and per five-burner lamp, £7 10s. The total annual cost would therefore be £6688, or practically the same as in the last financial year, while the illuminating power would, as shown above, be increased 75 per cent." Mr. Goodenough pointed out that the scheme was based upon exceptionally liberal terms, and expressed the hope that it would meet with the approval of the Committee and the Council.

Continuing their report, the Committee said: "The Company estimate the capital outlay to be incurred by them at approximately £5000; and in order to recoup them, they require a ten-years' contract. But Mr. Goodenough, who was present at our meeting, said the Company were willing to give the Council the option of determining it at the end of five years on payment of the sum of £2500, or at the end of seven years on payment of £1500. Further, for an additional payment of 2s. 6d. per annum for each one-burner lamp, the Company are prepared to provide all new lanterns, which would be approximately an addition of £129; making the annual payment to the Company £6817. Comparing the two proposals, the following are the results:—

Conversion of existing lanterns by the Council—	
Cost of conversion	£1478
Annual cost of upkeep and lighting, 326,000-candle power	8000
Conversion and maintenance by the Company—	
Annual payment, 260,000-candle power	6817

In the first case, no new lanterns would be provided; but by the Company's scheme all new lanterns would be fitted, and would become the property of the Council. It should also be borne in mind that the price of gas is now as low as it has ever been, and that should its price be raised, the estimate of the Council's expenditure under the old system would be correspondingly increased. The offer of the Company is, in our opinion, a favourable one to the Council, even should they desire at the end of five or seven years to determine it, and pay the sum required by the Company to recoup them for their loss of anticipated profit. . . . The present contract for maintenance and lighting, entered into on the 1st of April last with the Company, is for twelve months, and could be conveniently determined on the 30th of September next; so that the new system could come into force on the 1st of October. The acceptance of the offer would not involve any alteration of the estimates for the current year." The Committee concluded by recommending that the offer of the Gas Company should be accepted for the supply of all new lanterns, conversion of burners to the inverted system, maintenance, lighting, extinguishing, and supply of gas to the public street-lamps in the borough, painting, and all other conditions contained in their existing contract, for a period of ten years from the 1st of October, 1910, for the annual payment by the Council of £2 10s., £3 18s., £6, and £7 10s. per one, two, three, and five burner lamp respectively; and that the agreement to be entered into with the Company should be determinable at the end of the first five or seven years on payment by the Council of the sums of £2500 or £1500 respectively.

Owing to the absence of the Chairman of the Committee (Alderman Nolan Glave), the report was presented by the Vice-Chairman (Mr. Philip A. C. Wilkinson). The Committee invited the attendance at their deliberations of Mr. Howard Foulds, in the interest of electric lighting.

At the outset of the proceedings, over which the MAYOR (Alderman Max Clarke, J. P., F.R.I.B.A.) presided,

The TOWN CLERK (Mr. Lionel J. Walford) read a letter written by the Metropolitan Electric Supply Company, Limited, who have powers over the whole of the Borough of Holborn, intimating their willingness to tender for the lighting, and expressing their intention to carry it out equally as cheaply as the Gas Company. He said he understood that all the members had received a similar letter the previous day.

Mr. FOULDS suggested that the report should be referred back, as competitive prices had not been obtained from the Electric Light Company; and until their terms were obtained, the Council should not tie themselves to the Gas Company for ten years. It seemed to him that the Company were unduly favoured by the Council when these lighting contracts were before them.

The MAYOR objected to this statement being made.

Mr. FOULDS withdrew it; and went on to say that high-pressure gas

would mean the disturbance of the streets for laying the mains, while the Electric Light Company had already their mains in position.

Alderman C. E. GREEN said from his experience in Hampstead it was impossible for the Electric Light Company to go in for street lighting without laying a special main or cable for it, thus disturbing the streets; and if it had proved a nuisance in Hampstead, what a chaos it would cause in a place like Holborn, with its streets full of traffic. The question of public lighting was not a thing that could be played with. The City of London, after changing from gas to electric light, had found that the latter was not efficient, and had to go back to gas. They in Holborn did not want to make this mistake.

Alderman DIBBIN thought the report should stand over in order to enable the Council to consider the question more carefully, and the Committee to get further information. He said it would be a great mistake if the Committee did not obtain competitive prices.

Mr. WILKINSON, in reply, said the Committee had given serious consideration to the question before the Council, and hoped the report would not be referred back. All the neighbouring boroughs were now entering on fresh lighting contracts in connection with the new inverted gas-burners. Finsbury, Southwark, Bethnal Green, the City of Westminster, the City of London, and others, had adopted these burners, which gave such good results; and Holborn must fall into line.

On being put to the vote, six were in favour of the Committee's recommendation, and fifteen against it. The report was then unanimously referred back to the Committee for further consideration, to enable them to obtain prices from the Metropolitan Electric Supply Company.

ELECTRICITY SUPPLY IN BERMONDSEY.

An Unprofitable Undertaking.

At the Meeting of the Bermondsey Borough Council last Tuesday, a discussion took place on the accounts of the electricity undertaking for the past financial year, which, as stated in the "JOURNAL" last week, show that, on an outstanding loan indebtedness of £152,973, there is a surplus of only £43, against an estimated one of about £500.

Alderman HARBORD, while regretting the small surplus, said there were many causes for it. No doubt a larger amount was spent than was absolutely necessary; but the Lighting Committee had hopes that there would be a greater demand for the energy in future. They had to compete with a Company who in some instances had estimated for a supply of electricity at one or two points below them; and consequently the Council had lost the business. Everything had been done to increase the value of their plant; and they had brought down the cost of production from 1.58d. to 0.71d. per unit. The working expenses had been reduced nearly one-half. They were paying off an enormous amount of their capital expenditure; while the opposing Company had to pay dividends. If the Council were an ordinary trading company, they would have paid 6½ per cent. dividends.

Mr. A. LAYTON pointed out that the Council had sold 402,108 more units than in the previous year. It might, he said, be exceedingly satisfactory; but it did not produce an equivalent increased revenue. Though they had sold all these additional units, they were really £462 worse off than the previous twelve months. This did not appear to him to be satisfactory. He did not see where the anticipated surplus of £600 this year would come from, and was afraid their prices must be increased.

Mr. F. E. EDDIS said he was surprised the undertaking could only show a surplus of £43 on last year's working. He maintained that there ought to be a depreciation account; but when he drew the attention of the Auditor to the omission, he replied that the Council were paying back a certain amount of their loans and did not need a depreciation account. The small profit of £43 was obtained without providing for any depreciation. In the net revenue account they had a deficiency of £1227, which in the general balance was put down as an asset. If they debited adverse balances as assets, how could they get a true return?

Alderman HARBORD said the item £1277 was really an asset. The Committee had allowed £2997 for law costs, and had only spent £1720; so that they had a balance of £1277. They had set aside £3919 for depreciation.

Mr. E. STICKLAND said the undertaking was kept going by the current sold to the Council, who paid to the undertaking £5729, or one-third of the whole proceeds. In the accounts they had a rare juggling of figures; and he could not see how they could go on and make profit without increasing their prices. They charged the Council 2½d. per unit, yet they were selling to other people at 3d. per unit current which cost 1½d. per unit to produce. If a company were supplying the Council with electricity, they would at once stop, and go back to gas. He proposed that the charge should in future be 1½d. per unit.

Colonel BEVINGTON seconded the proposition.

Alderman WILLS pointed out that the outstanding loans amounted to £152,973, and that they had made a profit of £1096, or 6½ per cent., while one Company—their greatest opponents—only paid a dividend of 4½ per cent., and the undertaking supplying St. Olave's paid 6 per cent.

Alderman HARBORD said that in seventeen years they had paid £17,300 off their capital account.

Mr. Stickland's proposition was defeated, and the accounts were passed.

At the last meeting of the West Ham Town Council, the Highways and Parks Committee reported having had under consideration the question of providing a suitable gas testing-station at Canning Town in accordance with section 17 of the Gaslight and Coke Company's Act, 1909. The Borough Engineer submitted, as a result of his inquiries, an offer from the Gaslight and Coke Company to rent to the Council their meter-house and valve-room at Canning Town for this purpose, and the offer is to be accepted.

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons, presided over by Lord MACDONNELL, resumed consideration on June 28 of the above Bill (see *ante*, p. 54).

Mr. F. J. BANCROFT, B.Sc., the Engineer and Manager to the Barnet District Gas and Water Company, and Consulting Water Engineer to the Bridlington Corporation, summarized the position of the Barnet Company, and stated that if the Bill passed works actually being executed by the Company would be arrested. They had acquired land without applying to Parliament for authority; and they considered that they had power to sink wells on it. The Bill, however, would stop them. It would also prevent them deepening or enlarging their existing wells. The word "specified" in clause 3 should be replaced by "authorized." The Barnet Company's land had been "authorized," but not definitely "specified." Clause 3 would rob the Company of powers which were given them by a Committee of Parliament, and which had been upheld on appeal to the House of Lords. If the Bill became the general law, it would be practically impossible to upset it by the insertion of provisions in a Private Act. It would be fair that land should be authorized and specified in future water enactments. Questioned as to whether at present if a water company bought land they could not drain all the water they could get, witness said that unless they had power to sink wells, the decision in the East Grinstead case—that general occupation of land did not give power to statutory companies to sink wells—would apply. It was impossible to specify works which might be necessary several hundred feet underground. It would be better to specify the quantity of water than the works. He objected to clause 3 having a retrospective effect and to the specification, under it, of works. Such specification would, in many cases, be impracticable. With regard to the suggestion of the Lord Chancellor, when the Barnet Company's case was before the House of Lords, that it was not desirable to give water companies the right to sink wells and drain water from the locality without careful examination of all the facts, the site, the works, and so forth, witness pointed out that the judgment was given in favour of the Company without their case being heard. If the Company had been able to present their case, they would have shown that Parliament had had the information; and this might have modified the Lord Chancellor's statement. He agreed, however, that water undertakers when applying to Parliament should "place all their cards on the board." Clause 3 would only prevent the sinking of wells by authorized undertakers. Very real danger was connected with the possibility of people, other than authorized undertakers, sinking wells close to undertakers' wells and taking their water.

Mr. HOLT: Can you suggest any reason why there should be any greater restriction on the taking of water by wells for drinking purposes than for other purposes?

Mr. BANCROFT: I think undertakers in many cases require protection from private supplies sunk for commercial purposes.

By Mr. J. H. LEWIS: It would be desirable to have a survey of the water supplies of the country. He suggested the formation of a Water Commission on the same lines as the Railway Commission or the new Road Board. A general survey of the water supplies of the country would occupy some years; but if the Commission consisted of four—a geologist, a solicitor, one member to deal with overground water, and one to deal with underground water—they could begin operations at once. Local Boards to deal with watersheds would be extremely useful; but they would not obviate the necessity of a Water Commission, which would take a general survey of all the water supplies of the kingdom. At present, a scramble was taking place for watersheds. One of the things to be guarded against was the allocation of watersheds to districts without regard to other parts of the kingdom.

By the CHAIRMAN: The Commission would collect information and act as a Court of Appeal, as the Railway Commission did. The Bill should not proceed, because it would be unjust in some instances and unnecessary in others. In some respects, it was incomplete. Where a person was injured by the abstraction of water, he did not think he ought to be compensated. There should not be property in underground water. Parliament placed on local authorities or companies powers to do collectively what the individual could not do properly. Probably the water under an individual's land had fallen many miles away on another man's land. One man could not hold that his water should be collected by another man at a distance, or that his supply should always be at a particular level. An authorized undertaker supplied water better and cheaper than an individual did. If an undertaker was proved to have abstracted water from an outside area, he should be under obligation to supply water to that area.

The CHAIRMAN: That is a concession of the principle of compensation?

Mr. BANCROFT: I should only supply at ordinary charges.

The CHAIRMAN: If it is impossible to compensate him in kind, would you go so far as to say money compensation should be given?—No; I do not think any property should be conceded in underground water.

By Lord DESBOROUGH: To give compensation in respect of underground water was to enter on a very dangerous principle. Parliament should deal with each case as it arose.

By Sir W. CROSSLEY: He could not say it would be fair to give money compensation even where injury was admitted. If compensation was given, the obligation should rest not only on water undertakers, but on private owners of wells also.

By the CHAIRMAN: The burden of proof of injury should rest on the person seeking compensation. Where there were several undertakers in a district, it would be impossible in some cases to prove that one had not caused injury to a neighbouring well. With regard to supplying to local authorities on the route of a supply being brought from a distance, he did not think the principle as stated in the Bill was fair, because it gave the local authorities the option of a supply without payment towards the cost. The local authorities at the initiation of the scheme should state the quantity they wanted, and where and when they wanted it; and they should participate in the capital outlay. As to clause 6, the provision reserved all the obligations of a company or authority, whereas prior clauses took away some of the powers of the

company or authority to fulfil their obligations. This was not fair. He would be disposed to exclude small companies and small local bodies working under the Public Health Act from the definition of "authorized undertaker." The Water Commission or Water Board might determine the point in each case.

Mr. ALFRED J. BUTLER, the General Manager of the Staffordshire and Worcestershire Canal, gave evidence on behalf of the Canal Association, who represent about 2000 miles of inland waterways. The Association were in favour generally of the principle of clause 3, but held that the canals and inland navigation of England should have similar protection to that which was afforded any private owner of a water supply. The Staffordshire and Worcestershire Canal had suffered from the pumping of water-works, one of their reservoirs (the Pottal Reservoir) which had an available depth of 26 feet, and was about full until 1883, having been depleted by the pumping of the South Staffordshire Water-Works at Huntington until, in 1893, it was empty—a state in which it had remained ever since. The Canal Company did not sue for compensation in this case; the works of the Water Company being authorized. In order to safeguard the interest of canals, he suggested that the definition of "private water supply" in clause 7 should be amended so as to read as follows (the interpolated words being marked by italics):

The expression "private water supply" includes rivers, springs, streams, canals, reservoirs, feeders, ditches, ponds, wells, and bore pipes, and the water flowing or percolating in or into the same, or, being therein, or which, but for the works of an authorized undertaker, would flow or percolate in or into the same, or be therein and owned or used by any person not being an authorized undertaker, or which any such person is entitled to use.

By Lord DESBOROUGH: Parliament had already practically admitted their claim to compensation.

Mr. GRAHAM, speaking on behalf of the Sutton and District Water Company, expressed opposition to the Bill. If protection was to be afforded to underground water, it should extend to the undertakings of water companies—the most important water-getters in the country—inasmuch as the water they obtained was put to the best possible use to which it could be put. It seemed unjust the Bill should impose on them restrictions which did not apply to other water-getters. Clause 3 was unnecessary. As he understood it, it was not to be retrospective. The Lord Chairman's clause afforded ample protection. The greatest possible pains were taken to examine every proposal with regard to a water supply that was brought before Parliament. The Lord Chairman's clause was modified if special circumstances could be shown. The bearing of this was that every case should be considered on its merits. The law relating to underground water was unsatisfactory; but the proposal of the Bill was entirely one-sided. If it applied all round, he would not object to it. A good deal could be said for altering the law, because, no doubt, in some instances, considerable damage was done. Everyone concerned should be put on the same footing. A general inquiry, probably by Royal Commission, should be instituted with reference to the water supply question. One important result of the labours of such a Commission would be the discovery of what "bottom" there really was for complaints of injury. Very exaggerated statements were often made. Excluding the Metropolitan Water Board, there were twenty water authorities in Herts; but he had never heard it suggested that they could not get the water which they wanted. The object of the suggested Commission would be the conservation of the water supply. He approved of the creation of watershed conservancy boards. It was certainly not necessary, in a General Act, to shift the burden of proof. The clause with regard to the giving of water *in transitu* was quite unnecessary. People did not go to a distance for water unless the scheme was a big and ambitious one; and the closest attention therefore was given, when it was being considered, to everybody's rights. He would not exclude from the purview of the Bill small local bodies working under the Public Health Act. Everyone should be treated alike. It was extremely difficult to define "small authority." An authority might be small to-day and large next year; and it might abstract a small quantity this year and a large quantity next year.

Mr. JAMES JOHNSTON, Water Engineer to the Corporation of Brighton, gave evidence on behalf of the Corporation of Brighton, the Corporation of the City of Chichester, the Corporation of Worthing, the Steyning and District Water-Works Company, the Mid-Sussex Water Board, the Crowborough District Water-Works Company, the Hailsham Water Company, and the Newhaven and Seaford Water Company. These places were scattered over Sussex; they represented an area of over 300 square miles and a population of over 300,000. Representing Brighton, and at the request of the other authorities or companies named, he attended to object entirely to the Bill. Clause 3 would put all water authorities to unnecessary expense in the case of new works, however small the works might be. It would cause delay, which might be disastrous to the districts supplied and to the authorities supplying; and if it was retrospective in its operation, it would mean the forfeiture of very extensive rights acquired on terms dictated by landowners, all of which rights had been acquired at great cost by water authorities. At the present time, the Brighton Corporation had underground rights from the Earl of Chichester, extending for at least a mile-and-a-half under his property, for which they had paid either in kind or money. They had not yet exercised any of these rights. They had paid the Earl £6000 for 6 acres of land, which, as land, was not worth £1000; they had re-drained his house at a cost of £700; and they had spent money in laying mains to a village which was practically owned by him. They had not exercised a tenth of the rights thus acquired; yet if clause 3 were retrospective it would deprive them of the whole of these rights. If the clause were not retrospective, they would still be in a very awkward position, because, under clause 4, the landowners who had already been compensated would be able, if the Corporation damaged any of their ponds, ditches, or other property, to obtain compensation a second time. If clause 3 was not retrospective, it was unnecessary. If the Bill passed, the clause would become part of the general law; whereas, on good cause shown, if the Bill did not pass, the clause could be omitted or modified. If clause 3 became part of the general law, it would become most difficult for any water authority to get it modified. If clause 4 were made applicable "all round," it would hit not only water undertakers but colliery

proprietors, brewers, paper and mineral water manufacturers, railway companies, laundries, and dyers and cleaners. Before the law of the land as regarded underground water was altered, the question should be thoroughly threshed out. With reference to the proposed protected area, if the two-and-a-half-mile limit existed, the protected areas of different water undertakings would overlap in some cases by two or three miles; and there would be great expense and confusion in trying to ascertain which works caused particular damage. In regard to clause 5, no authorized undertaker should be called on to supply water *in transitu* unless his plans and estimates had been prepared originally on that understanding. Indeed, he failed to see how any responsible engineer could devise works of any magnitude unless protected in this way. Other things being equal, he was in favour of the general principle of distributing water *in transitu*. If, however, this principle were made the common law of the land, it might lead to the sources of some local authorities (those of rural district councils in particular) being depleted. These local authorities often had great difficulty now in obtaining a supply, in consequence of the expense. The water supply of the country would, in his opinion, eventually become a burning question. The water of the country was not properly conserved, and eventually we should find that resources had been wasted. Rural district councils might neglect sources near them in order to take water in transit from a large authority, and thus save expense. If he had to choose between specifying the works or the amount of water, he would prefer the latter. Under the Act of 1847, a supplying authority was under penalties to give a pure and wholesome supply, and was only exempt in the event of unusual drought or "the act of God." To limit the quantity to be taken from sources would be a very fine excuse for praying in aid the "act of God" in case of failure. He was not at all sure that legally a water authority could not avoid its obligations if Parliament limited them to a certain quantity of water, and particularly if they had to define their works. It was an impossibility for anybody to define beforehand works which would have to be constructed underground—at least in the South Downs area. The available sources of supply were being grabbed by water authorities irrespective of the future demands of other parts of the country. Such grabbing was not in the interests of the proper conservation of water. Hence there should be a Commission which would gather all the facts and report to Parliament with a view to the promotion of a Bill apportioning the country to Water Boards, who would advise Parliament and have a powerful influence when applications were made in respect of fresh water supplies.

The proceedings were resumed on June 30, when

Mr. J. F. BEAVAN, a member of the Cardiff Corporation, gave evidence. He thought it desirable that there should be an inquiry on the general question of the water supply throughout England. The water supply of Cardiff was mainly derived from storage in the Welsh hills, 30 miles distant; the cost of their three reservoirs having been nearly £1,300,000. It would be very unfortunate indeed if Cardiff were prevented from sinking a well in case of stern necessity. As far as he remembered, it had only arisen once in the case of Cardiff. That was during a prolonged drought. It would be a great hardship if they had to apply first to Parliament. If they wished to exercise their discretion outside their area, it might be fair that they should have to apply to Parliament. He did not see much necessity for clause 3. It appeared to him that everyone was fairly protected now, and that there was no necessity for altering the law. When applying to Parliament, there would, he thought, be no objection to defining the plant—stating the horse power, for instance. The provision as to giving supplies in transit was radically wrong. Cardiff had a reservoir 33 miles distant; and if they were bound to supply the intervening populations, they would have no water for themselves. They should not be compelled in any case to give a supply. It would be ruinous for a place like Cardiff to supply water to local authorities in transit. Small local authorities and companies should be allowed to provide schemes under the Public Health Act, as at present. If serious injury was done by pumping, compensation should be given; but when applying for permission to make a reservoir, the promoters should know what their liabilities would be. If compensation were payable, there would be the difficulty that people would be induced to make claims which would give a great deal of trouble. The onus of proof should rest, to the last degree, with the claimant. The proposed radius of $2\frac{1}{2}$ miles was much too big.

Mr. C. H. PRIESTLEY, the Engineer to the Cardiff Corporation, stated that while the water supply of Cardiff was obtained by gravitation, they had power under their Acts to sink wells on land which they had purchased. The time had arrived when the Water-Works Clauses Acts needed revision. The general water supply of the country was not so well conserved as it might be. Many gathering grounds were not utilized to their fullest extent. It was desirable that there should be a general scheme which would benefit the whole community, and not merely portions of it. In order to secure better conservation, there should be an inquiry by Royal Commission into the whole question. He deprecated limitation of the discretion of water undertakers with regard to the use of pumping machinery. They did not know how a district would grow, and what pumping machinery would therefore be required. He was not prepared to say that it was fair that if pumping operations caused injury, the person injured should be compensated. Water was taken by water undertakers for the good of the community. At present, there was no property in subsoil water. If compensation were given, they would create property in such water. The question of supplying *en route* should be settled when the Bill sanctioning the scheme was before Parliament; so that the size of the works could be adapted to requirements.

Mr. JAMES WATSON, the Water Engineer to the Corporation of Bradford, stated that the supply of the city was obtained by gravitation. At Manywells, they had a well which was absolutely dried by a Mr. Pickles, the owner of a farm on the other side of the hedge, who sank a well and pumped the water to waste. Witness sank a deeper well; and the water was now running to Bradford again. If there was further pumping at a still lower level on the adjoining land, was he (witness) to be prevented by the Bill from exercising his common-law rights, as he did before, in order to regain the water?

The CHAIRMAN: This man, by sinking a well and taking away your water, committed a wrong against you?

Mr. WATSON: That is my view.

A wrong for which you think you ought to have been compensated?—Most certainly.

Then you are in favour of the principle of compensation?—I am in favour of the continuation of the common law of the land regarding underground water. I would like that man and a thousand others to be put in exactly the same position as water-works undertakers are going to be placed in if this Bill is passed.

That is to say, whoever causes damage to another should be liable to make the damage good, in money or otherwise?—Certainly. The Bradford Corporation had authority from Parliament to construct two more reservoirs; but, as he read clause 3, if this clause became law, they would have to give multifarious details to Parliament before proceeding with the construction of either. Clause 3, he considered, was an unnecessary restriction on their freedom of action.

Do you think that in supplying such a great city as Bradford with water you could when laying your plans foresee every possible development which circumstances might make necessary in the course of a few years?—No; you could not.

You therefore think it would be better to leave the Lord Chairman's clause as it is (that is, to be considered in reference to each individual case) than to put it into a General Act?—I do so most decidedly.

Mr. WATSON, in further examination, said he considered that the present arrangements for procuring water and making use of it for industrial purposes might be revised and improved. But what could such an authority as had been suggested do? They could get the rainfall of a drainage area and the approximate yield of the rain that fell. After they had this information, they had to face the *crux* of the question. Who could tell whether a certain drainage area, or its valleys, would be suitable for water-works purposes? No one. They would first of all have to make boreholes and pits in order to ascertain whether there was a water-tight foundation. He had known many cases in which they could not get a water-tight foundation at a particular place, and in which therefore they had had to go (say) half a mile up the valley, with the result that, while losing a large portion of the drainage area, they had to give the full amount of compensation water that was fixed. As to a small portion of a water supply, reasonably satisfactory information might be obtained if the suggested Commission took (say) the whole of the wells or pumps or works in a specified area and measured them for a long series of years. But nine-tenths of the people in this country were supplied by gravitation. How long would it take a Commission to ascertain anything beyond what were the drainage areas and the rainfall on them—facts that were easily ascertained nowadays? There was no necessity for the conservation of water supplies so far as water undertakers were concerned. It was not the water undertakers who were depleting the water supplies of the country. The Bill, however, would render much more difficult the work of undertakers—those who had to supply the great bulk of the population of this country. If a Committee or Commission took up the question of our water supplies, it would also need to take up the question of pollution.

Lord DESBOROUGH: You think you ought to have unlimited power to get as much water out of the land as you can, irrespective of the interest of anyone else?

Mr. WATSON: Not irrespective of the interest of anyone else. I want to have the same power as the owner of land. An owner can sink a well and sell the water to a public authority—it is done; and he is under no restriction. I am opposed to the provision that every local authority shall be allowed to demand a supply from water in transit.

Mr. C. G. HENZELL, the Water Engineer to the City of Leeds, stated that the water supply of the city was obtained entirely by gravitation. By a clause in their Act of 1901, they had power to lay an aqueduct, consisting of one or more conduits. One had been laid; and it struck him that, under clause 3 of the Bill, if it became law, they would have to make another application to Parliament before a second could be laid. The Lord Chairman's clause was inserted in the Leeds Act of 1907; and was not retrospective. If clause 3 of the Bill were enacted, it would have a retrospective effect. The question was how far it would prevent Leeds exercising the powers which they at present possessed. If clause 3 was intended to apply only to the future, he thought the matter to which it related might be threshed out when big undertakers applied to Parliament for powers. Asked as to whether he accepted the principle of compensation, he said that the question was a wide one. The Corporation always recognized the principle in any of the works they took in hand. The obligation should rest on the private owner as well as on the public undertaker. The person injured should be required to prove his case. It was equitable that local authorities should be supplied from water in transit; but he did not agree with the clause in the Bill. The matter should always be settled when undertakers were applying in the first instance to Parliament. He would not confer power on a Government Department to say whether, subsequently, a supply should be given. Such small local authorities and companies as at present supplied under the Public Health Act should not be required to apply to Parliament. In their case, the Local Government Board might be empowered to impose restrictions on them. The Bill was entirely one-sided. There were certain provisions in it, however, which he would be prepared to accept if they were applied to colliery owners, brewers, railway companies, and others drawing water. He did not see what good could come from such an inquiry as had been suggested.

Mr. STILEMAN, giving evidence on behalf of the Company supplying water to Eastbourne, stated that they obtained their supply entirely by pumping. Some years ago, owing to drought and to the sea being at a higher level than that in their well, salt water got into the supply. The late Duke of Devonshire (the then Chairman of the Company) allowed them to have land, and found the necessary money; and in the end a fresh supply was secured. If the present Bill had been law, this could not have been done, and the result would have been that the general public of Eastbourne, as well as the Company, would have suffered considerably. Probably two years would have been occupied in obtaining an Act of Parliament.

Abstracts of further evidence tendered to the Committee will be given in a subsequent issue of the "JOURNAL."

PAIGNTON WATER-WORKS.

The members of the Western and Southern Districts of the Institution of Municipal Engineers held a joint meeting at Paignton on Monday of last week, at which the following description of the water-works was given by Mr. J. C. HAWKINS, Assoc. M. Inst. C. E., the Water Engineer to the Urban District Council.

The old water-works, originally owned and carried on by a private Company, but afterwards purchased by the Urban District Council, are situated some two miles west of the centre of the town, and comprise two impounding reservoirs of a capacity of 11 million gallons, and four sand filter-beds, having a total area of 3200 square feet. The source of this supply is springs, issuing up from the bottom of one of the reservoirs. All surface water from the surrounding land is diverted from the reservoirs, as there are a few farms and dwelling-houses within the watershed.

In 1899, the Council promoted a Bill in Parliament, and in the following year obtained sanction to construct additional works on Dartmoor to augment the old supply. Several sites were carefully examined and considered; and eventually it was decided to impound the head waters of the Ventford Brook, a tributary of the Dart. The works proposed under the Act of 1900 were to divert the main road and a leat, build a dam, construct filter-beds and a service reservoir, lay a main, and purchase the watershed. The works were commenced in 1901 and completed in 1907—being divided up into several sections for contract purposes. Mr. F. W. Vanstone, of Paignton, was the Resident Engineer, and Mr. Baldwin Latham, M. Inst. C. E., the Consulting Engineer. The estimated cost was about £70,000; but, as seems to be usual on Dartmoor, the foundations were troublesome, and altogether a sum of about £111,000 was expended.

The watershed owned by the Council is some 700 acres in extent, and is, and always has been, free from human habitation since our early ancestors left their rude stone dwellings. The reservoir has a top water area of 34 acres, and a maximum depth at the dam of 54 feet. It contains 200 million gallons of water, and 400,000 gallons have to be given back to the brook by way of compensation. A fence has been erected round the reservoir, to prevent pollution by the animals which run wild on this section of Dartmoor. The height of the watershed above Ordnance datum varies from 880 to 1695 feet; and the average rainfall over the watershed is something like 68 inches per annum.

The dam is 618 feet long, and impounds a maximum depth of 54 feet of water. The greatest width at the base is 41 feet, and the deepest excavation for the trench was 75 feet below the surface of the ground. All building stone for the dam was quarried close to the site; and the dam is a first-class example of a masonry erection—there being no leaks whatever. Water may be drawn off at four different levels for town supply; and each draw-off is fitted with a screen, worked from the top, to prevent the admission of leaves, grasses, weeds, &c.

Five sand filters have been constructed below the dam; and there have been recently erected three Candy mechanical filters, designed to deal with 8000 gallons of water per hour each. The water, as delivered from the reservoir, has a slight action on lead, and is very soft. After many experiments with limestone of all shapes and sizes in the sand filters, it was considered advisable to erect the Candy filters and use "Magnesite" in them; this material being Mr. Candy's special medium for imparting hardness and neutralizing acidity. Up to the present, the plant has been very successful; and in a recent test of the filtered water, the Medical Officer of Health (Dr. Vickers) reported that the hardness had been increased from $1\frac{1}{2}^{\circ}$ to 3° , and that the water was distinctly alkaline, and thus has now no action on lead. The sand filters accomplish this also; but the process is much slower, and the filtered water is not quite so decidedly hard and alkaline.

The meters employed to register the water are numerous, and of various types. At Holne-moor there are two 8-inch Kennedy meters on the trunk main, and one 6-inch Kennedy meter on the compensation main; and where bulk supplies are given to other districts, there are Venturi, Siemens, and Kent meters. The trunk main is a 9-inch cast-iron pipe, commencing at Holne-moor and terminating on the Paignton district boundary in the Beacon Hill service reservoir, at an elevation of 600 feet above Ordnance datum. It has a total length of just over 16 miles, with a fall of 266 feet. Hatch boxes are fixed at one-quarter of a mile apart, along the whole length of pipes, for the admission at some future period of a scraper. The water, being soft, has a corrosive action on the pipes; and in a few years it may be found that their capacity will be very considerably reduced. Then they are to be scraped, and for a time their efficiency will be restored.

Since the Act of 1900 was obtained, the Council have entered into agreements with Teignmouth, Brixham, and Ipplepen to give them supplies of water in bulk. They take between them about 300,000 gallons per day; but when these supplies attain their maxima, it will be necessary to duplicate or increase the size of the main. For this purpose the Paignton Council are considering the advisability of promoting a Bill in Parliament.

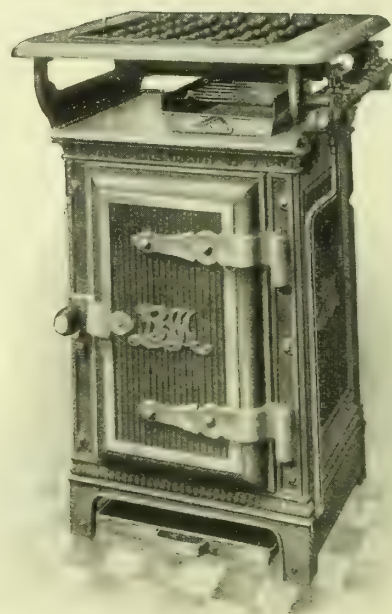
There are three reservoirs: The Beacon Hill, standing at an elevation of 612 feet, and having a capacity of 600,000 gallons; St. Mary's, at a height of 345 feet, and with a capacity of 300,000 gallons; and the Westerland (old works), 182 feet high, and having a holding capacity of 11 million gallons. The Beacon Hill reservoir is connected to each of the two lower reservoirs and to the Brixham service reservoir. Paignton is therefore divided up into three zones for supply purposes; and in case of fire in the town, a good substantial pressure could be obtained from the middle zone reservoir.

Messrs. Ashmore, Benson, Pease, and Co., Limited, are to supply sulphate plant of 2 tons capacity per day, also condensers and a change-valve, to the Weymouth Gas Company, to the design of Mr. Douglas Colson, the Engineer. They have likewise to supply a sulphate heater for plant making $2\frac{1}{2}$ tons per day to the Enfield Gas Company, to the design of Messrs. W. A. Valon and Son.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Meeting of the North British Association of Gas Managers at Dunfermline on Thursday was not distinguished by anything outstanding in the way of contribution to technical literature. It partook more of the festive nature; and, as is usually experienced when a characteristic of this kind attaches to a meeting, there was a very full attendance. The Association received a hospitality which, with a memory now stretching over a long series of years, I do not remember to have seen at all approached. The Corporation of Dunfermline entertained not only the members, but their lady friends, to luncheon in the middle of the day—an event which may be taken as indicative of the goodwill which the Corporation have, not to the gas industry, but to their own Gas Engineer, Mr. A. Waddell. When meeting was over—the proceedings having been brought to a close at an early hour to suit the arrangement—a species of extended garden party was given by the Dunfermline Carnegie Trust in Pittencrieff Glen. The glen is an exceedingly pretty spot, romantic in itself, and overlooked by the ancient towers of the now ruined palace and abbey. Here an hour was spent very pleasantly, despite the afternoon being wet. The weather improved the next day, when the annual excursion was held. Of the meeting itself, it is difficult to find anything to write which is not apparent on the surface of the proceedings. The address of the President was a modest production for Mr. Waddell. He gave a more interesting contribution to the meeting at Stirling last year, when he described his new high-pressure automatic three-way valve. It is not intended to decry the address of Thursday, which was couched in thoughtful vein, and was full of suggestion, such as might have been expected. The paper by Mr. J. W. Napier, of Alloa, on "Gaseous Fuel" introduced a subject which is of first importance at the present day; and it received a fitting amount of attention. Mr. Dickson, of Forfar, discoursed upon the checking of waste in small gas-works, and evoked a discussion such as is frequently experienced when the subject under consideration is not what may be termed a thrilling one—the speaking is readier and the suggestions more practical than when, to use the phrase introduced by Mr. Napier, the ferry is across deeper water. It will be observed that, in accordance with the recommendation of the Council, as it is now designated, the date of the annual meeting is to be changed from the end of July to some time in September—the middle of the month being spoken of. The step is a doubtful one, as by then many members will, for family reasons, have taken their holidays, and will neither have the time left to devote to more idle days, nor be caring to expend more money upon travel. The step is, however, only experimental. It was somewhat of a surprise that so little was said upon the subject of the William Young Memorial. Except the President's references to Mr. Young, there was not much about him on the lips of any of the speakers. This was to be regretted, as, with the step in view on the point of complete and happy fruition, it

would have been natural, and commendable, that more voice should have been given to the debt which the gas industry owes to the great man whose memory the lectureship is intended to keep alive. The meeting, it is true, voted a hundred guineas from the Research Fund to the Memorial Fund. This is a mark of appreciation not to be overlooked; but it would have come more graciously from the Association had it been gifted with more manifestation of esteem.

As will be seen from a report in another column, the Edinburgh and Leith Gas Commissioners have disposed of the question of who was to succeed Mr. W. R. Herring as their Engineer without agitating the world of gas officials. That the Commissioners were resolved by all means in their power to retain the services of Mr. Herring is shown by the fact that, failing their getting his consent to remain in Edinburgh, they have pressed him, and obtained his consent, to continue to give them his advice in the capacity of Consulting Engineer. The terms of the agreement make it clear that the supervision which is intended is not to be of a superficial nature, but is to be continuous and thorough. With his knowledge of the works, and of the whole of the outdoor plant of the undertaking, and with efficient management on the spot, the fortunes of the Commissioners are as secure as they could well be. From the Commissioners' point of view, nothing but felicity can be entertained regarding the change which is now being effected, because, humanly speaking, no risks are being run. The gentleman to whom the care of the works is being entrusted—Mr. A. Masterton—is as familiar with the gas undertaking as anyone in the service of the Commissioners or out of it. He has been so long in office that he is acquainted with the historical side of the undertaking; and, his work having all along been on the engineering side, his knowledge in this direction is as complete as it is possible to be. He has been a most capable assistant—first to Mr. R. Mitchell, and afterwards to Mr. Herring. That he has served with satisfaction under two gentlemen of so widely different mental capacities, is a tribute to Mr. Masterton's talents than which no better need be asked for. By the method they have adopted in settling a subject which, the last time there was a vacancy—when Mr. Herring was appointed—was a somewhat thorny one, the Commissioners have saved themselves, as well as many applicants, much needless trouble; and in the assurance that they have done the best they could for the cause whose interests they have in their hands, outsiders can only acquiesce, and express their wish that the new arrangement may, as there is every reason to expect that it will, bring as much prosperity to the Commissioners as that which is now coming to an end. The Commissioners are this autumn making a more than an ordinarily sweeping change in the personnel of their officials. Not only is the Engineer going; but, before his resignation came, as a bolt from the blue, it had been arranged that both Mr. J. S. Gibb, the Treasurer, and Mr. R. Cockburn, the Collector, should retire, under the age-limit fixed by the last statutory powers obtained by the Commissioners. At the close of the proceedings on Thursday, the Commissioners entertained the two gentlemen, and presented them with copies of an appreciative minute which they had just adopted in public meeting. The proceedings revealed a length

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of service on the part of the two gentlemen which, doubtless, few outside the Gas Commissioners' office realized. They have both seen long service; and both have been meritorious servants. Now that they are going into retirement, it will be a general wish, among all who had the privilege of their acquaintanceship, that both will enjoy their well-earned retiring allowances for a very long period.

At a meeting of the Edinburgh and District Water Trust on Wednesday, Mr. John Murray, the Convener of the Finance Committee, in presenting the annual accounts, said the estimated income for the past year amounted to £174,110, against an actual income of £172,874. This was fully £1200 under the estimate. The decrease was chiefly accounted for under the heading of domestic water-rate, and was owing in great measure to unlet property. The expenditure under the heading of revenue account for the year amounted to £153,042; while the estimated expenditure was £161,048. From this it would be seen that the expenditure was considerably over-estimated. This was mainly accounted for under the heading of repairs, interest, expense of loans, and distribution-pipe renewals, but chiefly under the latter heading. The capital expenditure for the year amounted to £26,064, of which the Fairmilehead mechanical filters were responsible for £7778, and distribution-pipes for £16,199—chiefly in connection with the Craigmillar pipe and other extensions throughout the city. During the year, the contribution to the sinking fund was £20,122; and capital expenditure amounting to £377,828 had now been paid off. The total capital expenditure of the Trust up to Whitsunday last amounted to £2,818,870. Mr. Murray moved that the Trustees adopt the estimates as recommended by the Finance Committee, and that the rates should be as at present. The motion was agreed to unanimously.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, July 29.

The better tone reported last week has been maintained, and production has been readily absorbed at full prices, while in some instances an advance has been scored. The closing quotations are £11 15s. to £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. to £11 18s. 9d. f.o.b. Liverpool, and £12 f.o.b. Leith. For future delivery, further transactions are reported to have taken place at £12 per ton f.o.b. Leith for equal monthly quantities up to the end of this year and over the first half of 1911, and makers are now asking more money in the latter position.

Nitrate of Soda.

In consequence of a substantial increase in the price of this article at ports of shipment, holders in Liverpool have also raised their quotations, which are now 9s. 3d. per cwt. for ordinary quality and 9s. 6d. for refined quality, on spot.

Tar Products.

Business in tar products still continues quiet. Pitch remains about the same. Fresh inquiries are scarce. Creosote is steady. There is a little more demand for this article; but the price does not improve. Benzols and naphtha remain in about the same position, although reports from some quarters state that an improvement in price has been paid. Crude carbolic acid consumers do not improve in their bids; and, on the other hand, makers will not come down in their ideas of price.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., ex works. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 31s. 6d. to 32s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a fair amount of business during the last few days, and prices on the whole have improved to the extent of 1s. 3d. to 2s. 6d. per ton. To-day actual Beckton is quoted at £11 12s. 6d. Outside London makes are £11 6s. 3d. to £11 7s. 6d., Hull £11 16s. 3d. to £11 17s. 6d., Liverpool £11 17s. 6d. At Leith, makers report that they are sold for prompt, and are asking £12 2s. 6d. to £12 5s. for forward. Middlesbrough is quoted at £11 17s. 6d. to £12.

Preston's Saving by Waste-Water Meters.—At their meeting on Thursday last, the Preston Town Council decided to fix twenty waste-water meters in different parts of the borough, with the object of preventing wastage. It was explained that a number of these meters had already been fixed; and in those districts 2,262,000 gallons a day were formerly consumed, compared with 1,612,000 gallons now—a saving of 650,000 gallons per day.

Gas-Meter Testing in Bristol.—The Inspector of Gas-Meters for Bristol examined and tested 444 meters last quarter. The number incorrect within the provisions of Sale of Gas Act, 1859, was 353; and 321 of these, or 92.94 per cent., registered in favour of the consumer. The percentage of error in incorrect meters in favour of the seller averaged 3.50, with a maximum of 9.65. In favour of the consumer the average was 9.56 per cent., with a maximum of 44.90 per cent.

THE "DARWEN" ARCH PIPE

Prevents Stopped Ascension Pipes.

"The Cost is moderate and can be saved in a Single Season."

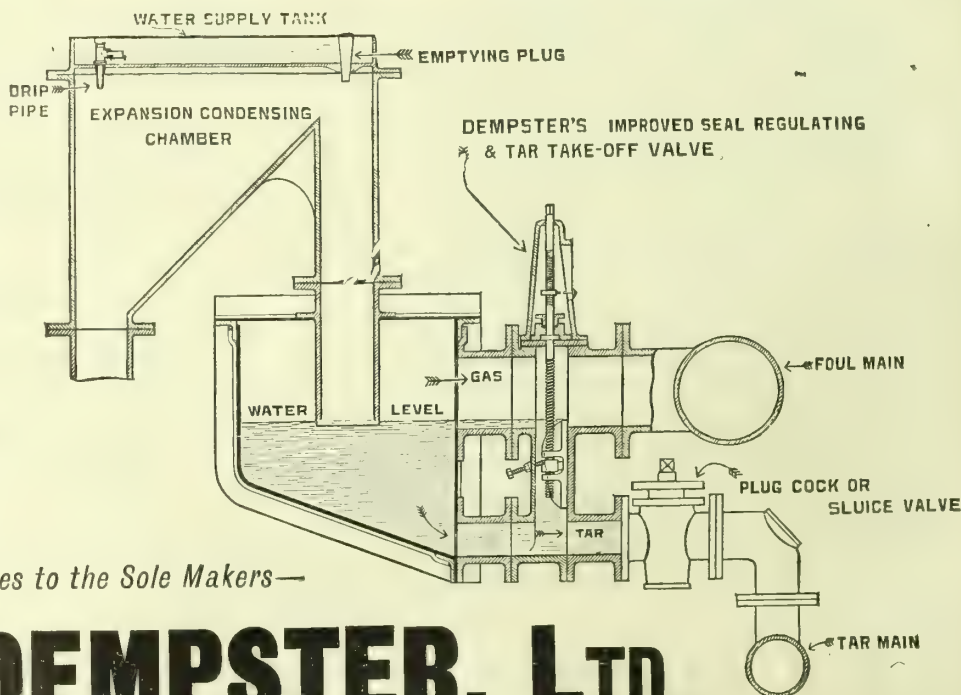
"The Arch Pipes can be seen in operation upon application."

"It will pay you to try them upon troublesome Pipes."

Upwards of 400 are already at Work or on Order.

Please address all Enquiries to the Sole Makers—

R. & J. DEMPSTER, LTD.,
GAS PLANT WORKS, **MANCHESTER.**



COAL TRADE REPORTS.

Northern Coal Trade.

There has been a better demand for coal in the last few days, owing to the making up of arrears after the strike. But the supply is now full; and there are heavy shipments. In steam coals, the price of best Northumbrians is from about 10s. per ton f.o.b., second-class steams are from 9s. to 9s. 3d., and steam smalls are rather more plentiful at from 5s. 6d. to 6s. 9d. The collieries are now working steadily, with a good output. Gas coals are rather more active; and the price of the usual qualities of Durham descriptions varies from 9s. per ton f.o.b., according to quality. For "Wear specials," up to 10s. 6d. per ton f.o.b. is still quoted. There have been more sales to some of the Mediterranean ports; and the price varies from 15s. to 16s. 1d. per ton, according to quality and tonnage, delivered at Genoa. Sales have also been made to Sweden at prices varying from 9s. 1½d. per ton f.o.b. for second-class gas coals. Other sales are in course of negotiation; so that there seems to be more desire to contract forward. In the coke trade the demand is good. Gas coke is quoted from 15s. 6d. to 16s. 3d. per ton f.o.b., according to quality, in the Tyne or Wear.

Holophane Limited.—A Company has been registered under this title, with a capital of £200,000, in £1 shares (100,000 being 7 per cent. preference shares), to acquire from O. A. Mygatt, of Paris, all his interests in the Holophane system of illumination in all parts of the world except France and the French colonies. The first Directors (to number not less than three nor more than seven) are: O. A. Mygatt (President of the Holophane Glass Company of New Jersey), Lieut.-Col. F. J. P. Butler, G. C. Glyn, D.S.O. (Manager of the Holophane Company of London), Lord Ernest William Hamilton (Chairman of the Le Roi No. 2, Limited), and Mr. R. Woodhouse, jun. The registered offices are at No. 12, Carteret Street, S.W.

Abstraction of Water from the Thames.—At a recent meeting of the Conservators of the River Thames, the Special Committee on Thames Water Abstraction reported that they had prepared and submitted to the Hon. T. W. H. Pelham (Assistant-Secretary to the Board of Trade) and Mr. F. J. Willis (Assistant-Secretary to the Local Government Board) a statement of the case of the Conservators for an expression of opinion by these gentlemen as to what they would consider a fair settlement of the questions at issue between the Conservancy and the Metropolitan Water Board with reference to the abstraction of water from the Thames. The report was adopted; and it was announced that a letter had been received from the Metropolitan Water Board, enclosing a copy of a resolution passed by the Board on the subject. It was to the effect that the Board should join with the Thames Conservancy in asking Mr. Pelham and Mr. Willis to give their opinion as to what would be a fair settlement of the questions at issue. The motion further authorized the Works and Stores Committee of the Board to settle their case to be submitted.

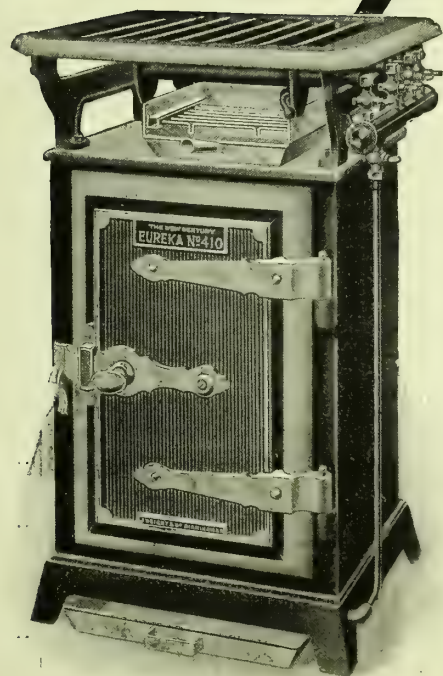
Gas Examinerships of the London County Council.—At the meeting of the London County Council last Tuesday, the recommendations of the Public Control Committee on this subject, given in the "JOURNAL" for the 26th ult. (p. 279), were adopted without discussion.

Bristol Public Lighting by Gas.—Of 10,007 public lamps in Bristol, 9171 are gas; and the consumption of gas for street lighting during the past financial year was 1,411,881,787 cubic feet. In the past six years, the number of gas-lamps has steadily risen from 8150; while in the same period the gas consumed has decreased by upwards of 30 million cubic feet.

Melbourne Metropolitan Gas Company.—The London Agents for this Company (Messrs. John Terry and Co.) have received a cable advice to the effect that the profits for the half year ended the 30th of June last were £82,000. A dividend of 5s. per share has been declared for this period, a sum of £39,000 added to the reserve fund, and a balance of £2305 carried forward.

Coalite's Foreign Contracts.—The following appeared under the heading "Chat on 'Change'" in the "Daily Mail" last Wednesday. "There has been considerable wonder among those interested in Coalite Limited, the parent Company, as to what is taking place with regard to the various foreign contracts, as to which we heard so much some time ago. The following statement by the Secretary of the Company, in a letter to a correspondent, throws some light on the matter. 'With regard,' the Secretary writes, 'to the St. Petersburg negotiations, I have to say that these are still in abeyance, as the St. Petersburg Municipality has not yet made a further call for fresh tenders. I would also state that the negotiations with Continental groups have not fallen through, and that there is an arrangement concluded with the colliery in the South of France that may be put into operation at any time.'"

Profits and the Rates.—At an inquiry relative to the borrowing of further money for the Aston electricity undertaking, Mr. H. R. Hooper, the Local Government Board Inspector, while admitting that the profits last year were eminently satisfactory, asked whether anyone could show him where the advantage came in of transferring to the reduction of the rates £1500 with one hand, and borrowing £1500 with the other for an expenditure like services, which was continually going on. It was no advantage to the ratepayers, and no advantage to the undertaking. To borrow money with one hand at 3½ per cent., and to pay it out as a bonus with the other, meant that the ratepayers had to pay the 3½ per cent. Mr. Godrich (the Chairman of the Electricity Committee) pointed out that they had acted in the interests of the ratepayers; the rates having been reduced in consequence of the contributions from the electricity undertaking. Mr. Hooper retorted that the poor would not benefit from it, because they paid their rent and rates at so much a week. It was only the well-to-do people who got the benefit of the reduction, at a cost to the general undertaking. Why, he repeated, should they borrow £1500 to last them the next two or three years and pay 3½ per cent. for it, when they had the money in their own coffers?



The "EUREKA"

The Pioneer Gas Cooker!

Offer a Consumer the choice between the "Eureka" and any other Gas Cooker, and it is a foregone conclusion that she will choose,

THE "EUREKA"!

SHE KNOWS that Cookery Comfort in its ideal form is embodied in the "EUREKA."

SHE KNOWS that for hard and continuous wear the cooker that stands alone is the "EUREKA."

SHE KNOWS that those nice refinements of finish which appeal so strongly to a woman are among the chief and original features of the "EUREKA."

The Standard Cooker!

The Standardised Cooker!!

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

APPLICATIONS FOR LETTERS PATENT.

17,030.—MEYER, E. G., "Gas-burners of the automatic lighting and governing type." July 18.
 17,043.—LEWIS, G. P., and TRUE, C. L., "Gas manufacture." July 18.
 17,048.—JONES, W., "Gas-producers." July 18.
 17,097.—BEAL, S., and EDWARD DEANE AND BEAL, LIMITED, "Fitting for detachably supporting gas-pendants for show-room purposes." July 18.
 17,167.—DRUMGOLD, C. T., "Cocks for fluids." July 19.
 17,173.—GLOVER, T., "Gas-meters." July 19.
 17,277.—ENGEL, H. W. W., "Lighting plants and apparatus." July 20.

17,281.—MASTERS, J. R., "Gas purifying apparatus." July 20.
 17,333.—CARTER, W. G. & G. A., "Valveless gas-turbine." July 21.
 17,359.—BURKHEISER, K., "Producing sulphate of ammonia in the manufacture of gas." July 21.
 17,416.—WILLIAMS, J., "Pressure-raisers." July 22.
 17,428.—STILL, W. M., AND SONS, LTD., and STILL, E. H., "Incandescent burners." July 22.
 17,442.—HOLMES, E. L., "Gas-governor." July 22.
 17,470.—BOWLEY, J. W., "Measuring the flow of liquids." July 22.
 17,516-7.—M'LOUGHLIN, F., "Water-heaters." July 23.
 17,518.—M'LOUGHLIN, F., "Combination plug-tap." July 23.
 17,548.—OTTO-HILGENSTOCK COKE-OVEN COMPANY, LTD., "Separating tar from gases." July 23. A communication from Dr. C. Otto and Co., G. m. b. H.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER, Silsden Urban District Council. Applications by Aug. 5.
 OUTSIDE SUPERINTENDENT, Stockport Gas Department. Applications by Aug. 10.
 DRAUGHTSMEN, Newton, Chambers, and Co., Thorncliffe Iron Works.
 DRAUGHTSMEN, No. 5268.
 REPRESENTATIVE, "Gas-Works," c/o Streets, Cornhill.

Situation Wanted.

IN GAS OR WATER CONCERN. No. 5265.

Plant (Second-Hand) for Disposal.

PURIFIERS, &c. Malvern Urban District Council.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel, Aug. 5, 2.30 o'clock.
 BROMLEY AND CRAVS GAS COMPANY. Gas-Works, Aug. 4, Six o'clock.
 IRISH ASSOCIATION OF GAS MANAGERS. City Hall, Belfast, Aug. 9.
 SOUTHGATE GAS COMPANY. London Offices, Aug. 18, 3.45 o'clock.

Patent Licences, &c.

IMPROVEMENTS RELATING TO ACETYLENE LAMPS AND GENERATORS, &c. Haseltine, Lake, and Co., Southampton Buildings, W.C.

TENDERS FOR

Coal and Cannel.

BRADFORD GAS DEPARTMENT. Tenders by Aug. 25.
 HAVERFORDWEST CORPORATION. Tenders by Aug. 13.
 HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Aug. 8.
 NEW MILLS URBAN DISTRICT COUNCIL. Tenders by Aug. 16.

Oxide of Iron (New and Spent).

ROCHDALE GAS DEPARTMENT. Tenders by Aug. 17.

Pipes, &c.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

Retort-House Governor.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 6.

Sewage Disposal Works—Engines, Pumps, Valves, Pipes, Weir Plates, &c.

YEovil CORPORATION. Tenders by Aug. 23.

Sulphate Plant.

ACCRINGTON GAS AND WATER BOARD.

Sulphuric Acid.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

Tinned Goods.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 8.

Valves and Ironwork for Purifiers.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL. Tenders by Aug. 16.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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 WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
 Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 315

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.	Apl 1	p.c.	Alliance & Dublin Ord.	81-83	..	6 0 6	£	Stk.	May 12	p.c.	Imperial Continental	179-181	..	4 8 5
1,474,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Feb 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	94-96	..	3 12 11
310,000	Stk.	May 12	7	Bombay, Ltd.	42-64	..	2 9 10	195,242	Stk.	Mar 16	6 1/2	Lea Bridge Ord. 5 p.c.	122-124	..	4 16 0
200,000	Stk.	Feb. 25	15	Do. New, £4 paid.	48-58	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	219-221	..	4 10 6
40,000	Stk.	Feb. 25	15	Bourne-10 p.c.	29-30	..	5 0 0	718,100	Stk.	Feb. 25	7	Do. B.	164-165 1/2	..	4 4 7
50,000	Stk.	Feb. 25	15	Bournemouth Gas & Water 7 p.c.	164-165 1/2	..	4 3 7	306,083	Stk.	June 29	4	Do. Deb. Stk.	144-146	..	3 15 6
311,810	Stk.	Feb. 25	15	Brentford Consolidated	15-15 1/2	..	3 17 5	75,000	Stk.	June 29	5	Malta & Mediterranean	4 1/2-4 1/2	..	0 4 8
75,000	Stk.	Feb. 25	15	Do. New	252-255	..	4 18 1	560,000	Stk.	June 29	5	Met. of 5 p.c. Deb.	100-102	..	4 8 0
380,000	Stk.	Feb. 25	15	Brighton & Hove Orig.	188-190	..	4 0 0	250,000	Stk.	June 29	4 1/2	Melbourne 4 1/2 p.c. Deb.	100-102	..	4 8 3
330,000	Stk.	Feb. 25	15	Do. A Ord. Stk.	120-122	..	4 2 0	541,920	Stk.	June 29	4 1/2	Monte Video, Ltd.	123-123	..	4 7 8
50,000	Stk.	Feb. 25	15	Do. 5 p.c. Pref.	99-101	..	3 19 3	1,775,892	Stk.	June 29	3 1/2	Newcastle & Gateshead Con	103 1/2-104 1/2	..	4 3 9
206,250	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	214-217	..	5 1 5	329,435	Stk.	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	83-91	..	3 16 11
226,000	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	153-156	..	5 2 7	55,940	Stk.	June 29	3 1/2	North Middlesex 7 p.c.	132-133	..	5 1 10
240,320	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	44-45	..	4 14 8	300,000	Stk.	June 29	3 1/2	Oriental, Ltd.	138-140	..	5 14 4
460,000	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	19-20	..	4 19 2	60,000	Stk.	June 29	3 1/2	Ottoman, Ltd.	64-64 1/2	..	6 3 1
109,000	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	89-91	..	4 18 11	31,800	Stk.	June 29	3 1/2	Portsea Island A.	134-136	..	5 1 0
165,700	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	106-108	..	5 1 10	60,000	Stk.	June 29	3 1/2	Do. B.	126-128	..	5 1 7
82,278	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	85-87	..	4 0 6	100,000	Stk.	June 29	3 1/2	Do. C.	119-121	..	4 19 2
55,000	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	7-9	..	4 0 10	114,800	Stk.	June 29	3 1/2	Do. D and E.	100-102	..	4 18 0
250,000	Stk.	Feb. 25	15	Buenos Ayres 4 p.c. Deb.	3-4	..	—	398,490	Stk.	June 29	3 1/2	Primitiva Ord.	74-74 1/2	..	4 13 4
100,000	Stk.	Feb. 25	15	Cape Town & Dis., Ltd.	58-64	..	6 0 0	796,980	Stk.	June 29	3 1/2	Do. 5 p.c. Pref.	54-54 1/2	..	4 10 11
100,000	Stk.	Feb. 25	15	Do. 4 1/2 p.c. Pref.	49-50	..	5 0 0	488,900	Stk.	June 29	3 1/2	Do. 4 p.c. Deb.	97-99	..	4 0 10
50,000	Stk.	Feb. 25	15	Do. 6 p.c. 1st Mort.	88-90	..	5 0 0	312,650	Stk.	June 29	3 1/2	River Plate 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	Feb. 25	15	Do. 6 p.c. Deb. Stk.	109-111	..	4 10 1	250,000	Stk.	June 29	3 1/2	San Paulo, Ltd.	153-164	..	5 10 9
157,150	Stk.	Feb. 25	15	Chester 5 p.c. Ord.	108-110	..	4 11 7	62,500	Stk.	June 29	3 1/2	Do. 6 p.c. Pref.	114-124	..	4 18 0
1,531,280	Stk.	Feb. 25	15	Commercial 4 p.c. Stk.	103-105	..	4 15 3	125,000	Stk.	June 29	3 1/2	Do. 5 p.c. Deb.	49-50	..	5 0 0
50,000	Stk.	Feb. 25	15	Do. 3 1/2 p.c. do.	80-82	..	3 13 2	135,000	Stk.	June 29	3 1/2	Sheffield A.	234-236	..	4 4 9
475,000	Stk.	Feb. 25	15	Do. 3 p.c. Deb. Stk.	89-91	..	5 9 11	209,984	Stk.	June 29	3 1/2	Do. B.	234-236	..	4 4 9
800,000	Stk.	Feb. 25	15	Continental Union, Ltd.	135-137	..	5 2 8	523,500	Stk.	June 29	3 1/2	Do. C.	233-235	..	4 5 9
200,000	Stk.	Feb. 25	15	Do. 7 p.c. Pref.	121-123	..	4 9 5	70,000	Stk.	June 29	3 1/2	Do. D	11-11 1/2	..	6 1 9
492,400	Stk.	Feb. 25	15	Derby Con. Stk.	104-105	..	3 16 2	6,429,895	Stk.	June 29	3 1/2	South African.	121-123	..	4 8 10
55,000	Stk.	Feb. 25	15	Do. Deb. Stk.	96-98	..	2 0 0	1,895,445	Stk.	June 29	3 1/2	Do. 3 p.c. Deb.	79-81	..	3 14 1
143,995	Stk.	Feb. 25	15	East Hull 5 p.c. Ord.	233-244	..	4 18 0	209,820	Stk.	June 29	3 1/2	South Shields Con. Stk.	157-158	..	5 1 3
486,000	Stk.	Feb. 25	15	European, Ltd.	173-184	..	4 18 8	605,000	Stk.	June 29	3 1/2	S'th Suburb'n Ord. 5 p.c.	121-123	..	4 12 0
351,000	Stk.	Feb. 25	15	Do. £7 10s. paid.	105 1/2-106 1/2	..	4 7 7	60,000	Stk.	June 29	3 1/2	Do. 5 p.c. Pref.	120-123	..	4 1 4
16,198,672	Stk.	Feb. 25	15	Gas 4 p.c. Ord.	89-91	..	3 16 1	117,058	Stk.	June 29	3 1/2	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
2,600,000	Stk.	Feb. 25	15	light 3 1/2 p.c. max.	104-106	..	3 15 6	502,310	Stk.	June 29	3 1/2	Southampton Ord.	110-112	..	4 9 3
4,002,235	Stk.	Feb. 25	15	and 4 p.c. Con. Pref.	8-52	..	3 13 2	120,000	Stk.	June 29	3 1/2	Tottenham A 5 p.c.	139-141	..	4 19 3
4,531,906	Stk.	Feb. 25	15	Coke 3 p.c. Con. Deb.	93-95	..	5 5 3	453,940	Stk.	June 29	3 1/2	and B 3 1/2 p.c.	114-116	..	4 14 10
258,740	Stk.	Feb. 25	15	Hastings & St. L. 3 1/2 p.c.	117-119	..	5 9 3	149,470	Stk.	June 29	3 1/2	Edmonton 4 p.c. Deb.	97-99	..	4 0 10
82,500	Stk.	Feb. 25	15	Do. 5 p.c. Ord.	17-17 1/2	..	6 5 9	182,380	Stk.	June 29	3 1/2	Tuscan, Ltd.	9-9 1/2	..	8 8 6
70,000	Stk.	Feb. 25	15	Hongkong & China, Ltd.	145-147	..	4 15 3	149,900	Stk.	June 29	3 1/2	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
131,000	Stk.	Feb. 25	15	Ilford A and C	109-111	..	4 19 1	236,476	Stk.	June 29	3 1/2	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,780	Stk.	Feb. 25	15	Do. B	95-100	..	4 0 0	255,636	Stk.	June 29	3 1/2	Wands- B 3 1/2 p.c.	139-141	..	4 15 9
65,500	Stk.	Feb. 25	15	Do. 4 p.c. Deb.	—	..	—	79,416	Stk.	June 29	3 1/2	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

OXIDE OF IRON.**O'NEILL'S OXIDE**

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.**WINKELMANN'S****"VOLCANIC" FIRE CEMENT.**

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old
Broad Street, London, E.C. "Volcanism, London."**BROTHERTON & CO., LIMITED.**Offices: City Chambers, LEEDS.
Correspondence invited.**HYDRATED OXIDE OF IRON.****PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

READ HOLLIDAY AND SONS, LTD.,

HUDDERSFIELD,

Are prepared to Supply

BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.

ENQUIRIES SOLICITED.

"HALLITE" Asbestos High-Pressure

Sheeting.

HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.**SULPHURIC ACID for Sale, specially**
suitable for making Sulphate of Ammonia,
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKE-
FIELD.**"GAZINE" (Registered in England and**Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.Telegrams: "DORIO," Newcastle-on-Tyne. National
Telephone No. 2497.**PATENTS AND TRADE MARKS**PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.**AMMONIACAL Liquor wanted.**CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."**GAS OILS.****MEADE-KING, ROBINSON, & CO.**Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, Exchange Street, MANCHESTER, and
11, Old Hall Street, LIVERPOOL.**JOHN RILEY & SONS, Chemical Manu-**facturers, Hapton, near Acorington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.**SULPHATE OF AMMONIA**SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.We guarantee promptness, with efficiency for Re-
pairs.JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.**J. & J. BRADDOCK (Branch of Meters**Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

Telegrams:—

"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,

NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIACAL Liquor wanted.BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.**J. E. C. LORD, Ship Canal Tar Works,**Waste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.**D. ANDERSON AND COMPANY,**

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams:

Telephone:

"DAGOLIGHT LONDON,"

2886 HOLBORN.

W. EDGAR,

GAS APPARATUS MANUFACTURER.

BLENHEIM WORKS, HAMMERSMITH, LONDON, W.

Telegrams:

Telephone:

"GASOSO LONDON."

14 HAMMERSMITH.

TAR WANTED.

Telephone: Central Manchester, 7002.

Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS,

Albert Chemical Works, BRADFORD,
MANCHESTER.Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.**WARNER & VAN DER BIESEN,**

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

FINEST DUTCH BOG-ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,
Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.**SULPHURIC ACID.****SPECIALLY prepared for Sulphate of**
AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

GAS-WORKS requiring Extensionsshould Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.**KRAMERS AND AARTS WATER-**
GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

AMMONIA.Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.**OXIDE OF IRON.**

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.**SPECIALLY prepared for the Manu-**
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated WM. PEARCE & SONS, LTD.

86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

JOHN W. LEITCH AND COMPANY,

MILNSBRIDGE CHEMICAL WORKS,

near HUDDERSFIELD.

The Manufacture of

PURE BENZOL FOR GAS ENRICHMENT
a speciality.**LUX'S GAS PURIFYING MASS.**

See Advertisement on First White Page.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

F. BOYALL, Contractor for PaintingGASHOLDERS, OIL-TANKS, ROOFS, and all
kinds of LOFT and other PAINT WORK.

70, Balcarne Street, Well Street, HACKNEY, N.E.

GAS TAR wanted.BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.**BRISTOL RECORDING GAUGES**
AND THERMOMETERS.J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding

Oxide Lightly.

See Illustrated Advertisement, June 21, p. 914.

GAS PLANT for Sale—We can alwaysoffer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.**IT is Worth Your While to Buy Direct.**THE RELIANCE LUBRICATING OIL COMPANY
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11½d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
Water Lane, Tower Street, LONDON, E.C.**CORRESPONDENCE CLASSES.****GAS Engineering and Gas Supply.**

City and Guilds of London Institute.

Teacher: HERBERT LEES (Silver Medallist),
Assoc.M.Inst.C.E., Engineer and Manager of the Hex-
ham Gas Company, Lecturer at Rutherford College,
Newcastle-on-Tyne.

For Terms, &c., address ELVASTON ROAD, HEXHAM.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

STRETFORD GAS COMPANY.

SECRETARY.

THE Chairman and Directors Thank
all Applicants for their Offers, and Inform them
that the Vacancy HAS NOW BEEN FILLED.
Stretford, July 28, 1910.

GENTLEMAN, for some Years Con-
nected with a Water Company now absorbed by
Municipality, SEEKS OCCUPATION with either a
Gas or Water Concern. Thoroughly Acquainted with
the whole of the Official Work, Registration, Accounts,
and Rating. Good Organizer. Excellent Testimonials
and References as to Abilities and Character. Small
Initial Salary accepted with prospect of advance on
work proving satisfactory.
Address No. 5265, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, Two or Three Expert
DRAUGHTSMEN, accustomed to Gas Plant
and Constructional Work.
Apply, by letter, stating Age, Experience, and Salary
required, to Messrs. NEWTON, CHAMBERS, and Co., Ltd.,
Thorncliffe Iron-Works, near SHEFFIELD.

REPRESENTATIVE required to intro-
duce and push important article used in all Gas-
Works. Must have Good Connections and be good
Salesman.
Please write, stating Qualifications, District, and
References, to: "Gas-Works," care of STREETS, 30,
CORNHILL, E.C.

WANTED by a Firm of Ironfounders
and Chemical Engineers, with Established Trade
among Chemical Manufacturers, to undertake the Sole
Rights of Making and Selling Chemical Specialities in
Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, immediately, Two or Three
DRAUGHTSMEN, fully Experienced in the
Design of Modern Gas Plant.
Apply, by letter, Stating Age, Qualifications, and
Salary required, to No. 5268, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

COUNTY BOROUGH OF STOCKPORT. (GAS DEPARTMENT.)

OUTSIDE SUPERINTENDENT.

THE Gas Committee are prepared to re-
ceive APPLICATIONS for the above Position,
Forms for which may be obtained from the Engineer,
Portwood Gas-Works, and must be returned not later
than the first post on Wednesday, Aug. 10, 1910.
Commencing Salary, £130 per Annum.

ROBERT HYDE,
Town Clerk.

Town Hall, Stockport,
July 29, 1910.

SILSDEN URBAN DISTRICT COUNCIL.

APPLICATIONS are invited for the
Position of GAS MANAGER to the above
Council.

The Salary will be at the rate of £100 per Annum,
together with House, Coal, and Gas free.
Applications for the above Appointment, endorsed
"Gas Manager," giving Age, Qualifications, previous
Experience, and the date when Duties can be com-
menced, accompanied by copies of not more than Three
recent Testimonials, must be sent to the undersigned
not later than Six p.m. on Friday, Aug. 5, 1910.

Applicants must state Experience with Sulphate of
Ammonia and Regenerator Furnaces.

JOHN DRIVER,
Clerk.

Town Hall, Silsden,
July 29, 1910.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete
to Plan and Specification; also 14 feet and 16 feet
Diameter GASHOLDERS, with STEEL TANKS. Can
be seen temporarily erected. Re-erected Cheap for
immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

FOR Disposal—10-H.P. Portable Steam-
ENGINE, practically new, by Marshall and Sons,
Gainsborough, insured by National (90 lbs. pressure).
4-H.P. Horizontal STEAM-ENGINE, 5-H.P. Horizontal
STEAM-ENGINE. BOILER TANK $\frac{1}{2}$ in. Plate, capacity
3070 gallons, absolutely sound. Cheap. Stationary
STEAM CRANE, long jib. Offers Solicited.
W. JOHNSON, Junr., New Hythe, KENT.

PURIFIERS FOR SALE.

THE Malvern Urban District Council
are open to receive OFFERS for the following
PURIFIERS: Two 16 ft. by 12 ft. by 5 ft.; Four 16 ft.
by 8 ft. by 5 ft.; and Two Four-Way Valves and Con-
nections.

Permission to View and further Particulars can be
obtained from the undersigned.
The highest or any Tender will not necessarily be
accepted.

By order,
W. J. RENDELL BAKER,
Engineer and Manager.

IRISH ASSOCIATION of GAS MANAGERS.

PRESIDENT:
Mr. R. HARRISON, Monaghan.

THE ANNUAL MEETING Of the Association

WILL BE HELD IN THE
BANQUET HALL, CITY HALL,
BELFAST,
ON TUESDAY, AUG. 9, 1910.

The Chair to be taken at 11.30 a.m. by the
LORD MAYOR.

Business: Report of Committee; Admission of New
Members; Election of Office Bearers; Revision of Bye-
Laws; President's Address; Reading of Papers, &c.

PAPERS TO BE READ.

1. "Exhausters in Small Gas-Works," by Mr. C.
BRYAN DONKIN, Birmingham.
2. "Distribution Pressures, Past, Present and Future,"
by Mr. WM. H. ROBERTS, Newtownards.

By invitation of the President, Light Refreshment
will be partaken of about 2 o'clock p.m.
The Members and their Friends will dine together at
Ye Olde Castle Restaurant at Six o'clock p.m. Tickets
3s. 6d. each.

For the following day, an Excursion has been arranged
for the Members and Lady Friends. Train will be
taken from Belfast to Parkmore, whence a drive will
be taken to Glenariff and on to Garron Tower, returning
via Larne. Tickets (inclusive) 10s., Applications for
which should be received by Aug. 3.

GEO. AIRTH,
Hon. Secretary and Treasurer.
Dundalk, July 23, 1910.

FOR DISPOSAL—Brick Plant com-
plete. Including 400,000 Place and Hard Stock
BRICKS, 15s. to 25s. per Thousand f.o.r. Maidstone.
12-H.P. Portable STEAM-ENGINE by Marshall, of
Gainsborough, insured 90 lbs. Steam by National,
nearly as good as when delivered from Workshops, £140.
High-Pressure BOILER, new, insured 200 lbs. Steam.
Suitable for 2-Ton Lorry, £20. 4-H.P. Horizontal
STEAM-ENGINE, £5. 5-H.P. ditto, £6. Cheap 8-H.P.
Portable STEAM-ENGINE £25. Offers solicited.
Full Particulars on Application to WM. JOHNSON,
JUNR., New Hythe, Larkfield, KENT.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for
the Supply of TUBES and FITTINGS, SUL-
PHURIC ACID, and TINNED GOODS.
Specification and Form of Tender may be obtained
upon Application to Mr. W. Whatmough, Gas Manager.
Sealed and endorsed Tenders to be sent to me not
later than Nine a.m. Monday, Aug. 8, 1910.

By order,
GEO. G. BOUCHIER,
Town Clerk.
Municipal Buildings, Heywood,
July 20, 1910.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

TENDERS FOR GAS COAL.

THE above Board invite Tenders for
the Supply of GAS COAL as required by them
during the next Twelve Months, at their Gas-Works,
Crown Nest, Hebden Bridge.

Tender Forms and Further Particulars may be ob-
tained from Mr. E. J. Wellens, Engineer and Manager,
Gas Offices, Carlton Street, Hebden Bridge.

Sealed Tenders, endorsed "Tender for Gas Coal,"
must be addressed to James Simpson, Esq., Chairman,
Gas Board, Offices, Carlton Street, Hebden Bridge, to
be delivered on or before Monday, Aug. 8, 1910.

R. CRABTREE,
Clerk to Gas Board.
Gas Offices, Carlton Street,
Hebden Bridge, July 23, 1910.

BOROUGH OF ROCHDALE. (GAS DEPARTMENT.)

TENDERS FOR OXIDE OF IRON (New and Spent).

THE Gas and Electricity Committee of
the above Corporation invite TENDERS for the
Purchase of about 300 Tons of SPENT OXIDE OF
IRON containing upwards of 50 per cent. of Sulphur,
and also for the Supply of about 300 Tons of NEW
OXIDE.

The Spent Material will be delivered free into
Waggons at the Milnrow Road Sidings of the Lancashire
and Yorkshire Railway Company, at Rochdale, and the
Purchaser must provide the necessary Waggons.

Tenders for the new Material must be accompanied
by an Analysis; and the percentage of moisture Guarant-
teed must be stated.

Any further Information may be obtained on Ap-
plication to Mr. T. Banbury Ball, the Manager at the
Gas-Works, who will supply Samples of the Spent
Material, and to whom Samples of New Oxide should
be sent.

Tenders, endorsed "Oxide," addressed to the Chair-
man of the Gas and Electricity Committee, must be
sent in to me not later than Noon on Wednesday,
Aug. 17, 1910.

By order,
WM. HENRY HICKSON,
Town Clerk,
Town Hall, Rochdale,
July 28, 1910.

COUNTY BOROUGH OF DEVONPORT. (GAS DEPARTMENT.)

TENDERS are invited for the Supply of
a RETORT-HOUSE GOVERNOR.
Further Particulars may be obtained from the under-
signed.
Tenders, endorsed "Governor," addressed to the
Town Clerk, Devonport, must be delivered on or before
Aug. 6, 1910.

W. P. TERVET,
Engineer and Manager.

SULPHATE OF AMMONIA PLANT.

THE Accrington District Gas and
Water Board are prepared to receive Drawings,
Specifications, and TENDERS for a Modern 3 Tons
per day Plant, erected Complete at the Great Harwood
Works of the Board. Taylor's Saturator.
By order,
C. HARRISON,
Engineer and General Manager.
Offices of the Board:
St. James' Street, Accrington,
July 26, 1910.

URBAN DISTRICT COUNCIL OF BANGOR (CO. DOWN).

THE Council of the above Urban Dis-
trict invite TENDERS for the Supply and Erec-
tion of IRONWORK VALVES, &c., for Two Concrete
PURIFIERS, each 30 feet square, at their Gas-Works.
Drawings and Specifications can be had on Ap-
plication to Mr. B. Mitchell, Gas Manager, at the Works.
Tenders to be delivered not later than Twelve o'clock
noon on Tuesday, the 16th of August, 1910, endorsed
"Tender for Purifiers," and addressed to Mr. James
Milliken, Town Clerk, Bangor (Co. Down).
J. MILLIKEN,
Clerk to the Council.
Town Hall, Bangor (Co. Down),
July 26, 1910.

CORPORATION OF HAVERFORDWEST.

COAL.
TENDERS are invited for the Supply
of about 1800 Tons of Double Screened GAS
COAL of the Very Best Quality, to be delivered at the
Haverfordwest Railway Station or at the Gas-Works
Quay, Haverfordwest, by water communication, in
quantities as required by the Gas Manager during the
Year commencing on the 1st of September next, for the
Corporation of Haverfordwest.
Tenders by Aug. 13.
Forms of Tender and further Particulars of
R. T. P. WILLIAMS,
Town Clerk.
Haverfordwest, July 30, 1910.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.
THE Gas Committee of the Bradford
Corporation are prepared to receive TENDERS
for the Supply of Best GAS COAL, COBBLES, NUTS,
and CANNEL, all to be well Screened, Dressed, and
free from Shale and Pyrites, to be Delivered at the
several works of the Corporation during the period of
One Year, commencing on the 1st day of October next.
Form of Tender, with any further Information re-
quired, may be had on Application to Mr. Chas. Wood,
Gas Engineer, Town Hall.
Sealed Tenders, endorsed "Tender for Coal," to be
sent to me on or before Thursday, the 25th of August
next.
The Contracts will be let subject to the Fair Con-
tracts Clauses of the Corporation, which may be seen
at the Town Clerk's Office, and which the accepted
Contractors will be required to sign.
The lowest or any Tender will not necessarily be
accepted.

FREDERICK STEVENS,
Town Clerk.
Town Hall, Bradford,
July 26, 1910.

YEovil CORPORATION.

(CONTRACTS NOS. 2, 3, 4, 5, and 6.)

THE Corporation of the Borough of
Yeovil are prepared to receive TENDERS for
the Construction of certain WORKS and the Ad-
ditions to, and Alterations of, certain existing Works
at their Sewage Disposal Works at Pen Mill and the
Sewage Lift Works at Dodham Bridge, respectively.
That is to say:—

CONTRACT No. 2—The PERCOLATING BED and
other Works and the Additions to, and Altera-
tions of, certain existing Tanks and Works at
the Sewage Disposal Works at Pen Mill.

CONTRACT No. 3—The ENGINES and PUMPS and
other MACHINERY to be Erected and set to
work at the Sewage Disposal Works and the
Sewage Lift Works at Dodham Bridge.

CONTRACT No. 4—The WEIR PLATES and other
Iron and Steel Articles required at the Sewage
Disposal Works.

CONTRACT No. 5—The VALVES and PENSTOCKS
required at the Sewage Disposal Works.

CONTRACT No. 6—The Cast-Iron Straight Socket
PIPES and Special PIPE CASTINGS required
at the Sewage Disposal Works.

Drawings may be inspected and Specifications and
Forms of Tender in respect of Contract No. 2, and
Contract No. 3, may be obtained on payment of the
sum of Two Guineas each, and in respect of the three
Contracts Nos. 4, 5, and 6, on payment of the sum of
Two Guineas (to be returned in each case on receipt of
bona-fide Tenders), on Application at the Office of the
Borough Surveyor at Yeovil, or at the Office of Messrs.
T. & C. Hawksley, Civil Engineers, Caxton House,
Westminster, S.W., on and after Tuesday, the 2nd day
of August, 1910; and Tenders must be addressed to the
Town Clerk, and delivered at his Office in Yeovil at or
before noon on Tuesday, the 23rd day of August, 1910.

The Corporation do not bind themselves to accept the
lowest or any Tender.

HENRY B. BATTEN,
Town Clerk.
Yeovil, July 26, 1910.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, &c.

THE New Mills Urban District Council invite TENDERS for the Supply of 3000 Tons of Best GAS COAL, and 500 Tons of CANNEL for the Year ending June 30, 1911.

Forms of Tender and full Particulars may be had on Application to the Gas Manager.

Tenders, properly endorsed, to be sent to me, the undersigned, not later than Aug. 16, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

J. POLLITT, Clerk.

Town Hall, New Mills,
July 28, 1910.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 5th of August next, at Half-past Two o'clock, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 30th of June last.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford,
July 19, 1910.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 4th day of August, 1910, at Six o'clock p.m. precisely, and on this occasion

AT THE WORKS OF THE COMPANY, IN HOMESDALE ROAD, BROMLEY, KENT, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 20th of July to the 4th of August, 1910, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 20, 1910.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 18th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half-Year ended the 30th of June, 1910; to declare Dividends; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 5th to the 18th of August, both days inclusive.

ERNEST L. BURTON,
Secretary.

Secretary's Office, 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 2, 1910.

THE Proprietors of the Patents Nos.

7188, of 1901, for "IMPROVEMENTS IN, OR RELATING TO, ACETYLENE GAS-LAMPS OR GENERATORS;" 11,612, of 1902, for "ACETYLENE GAS-LAMPS FOR TABLE USE;" 23,629, of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" 10,185, of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS IN LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

Just Published. Price 1s. net.

THE SALE OF GAS APPARATUS

BY

J. PATER WIATT.

Author of "Chemistry in Physics," "Internal Combustion Engines," &c., &c.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER."
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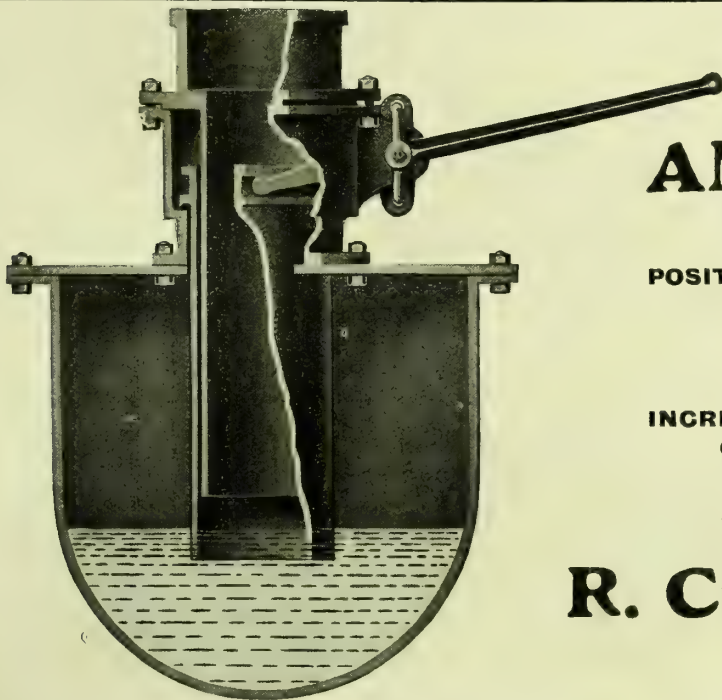
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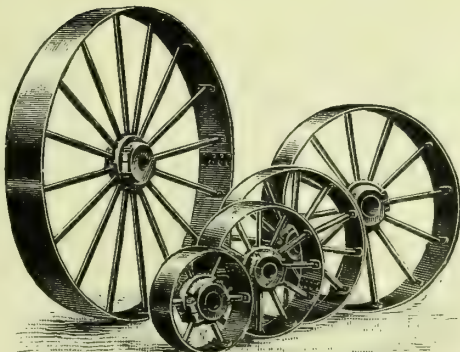
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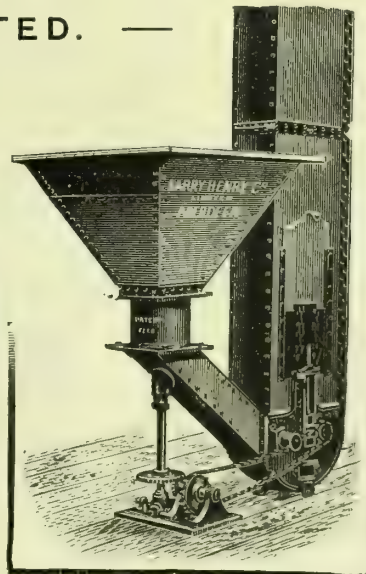
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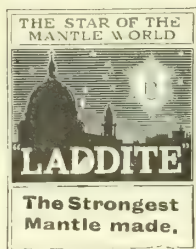
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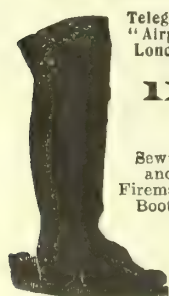
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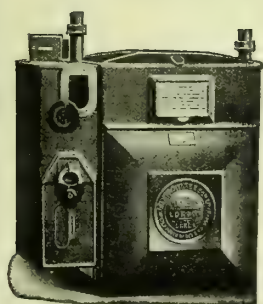
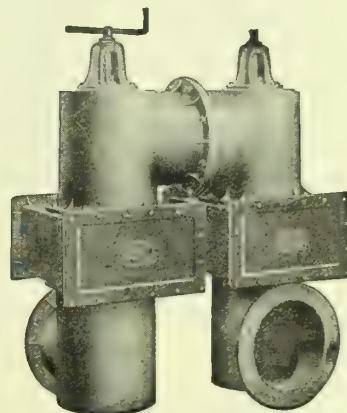
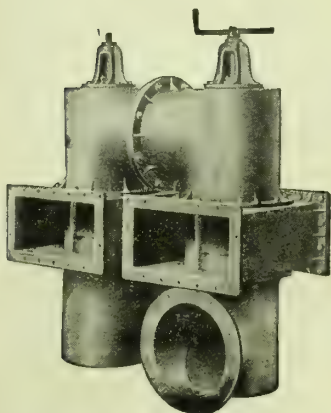
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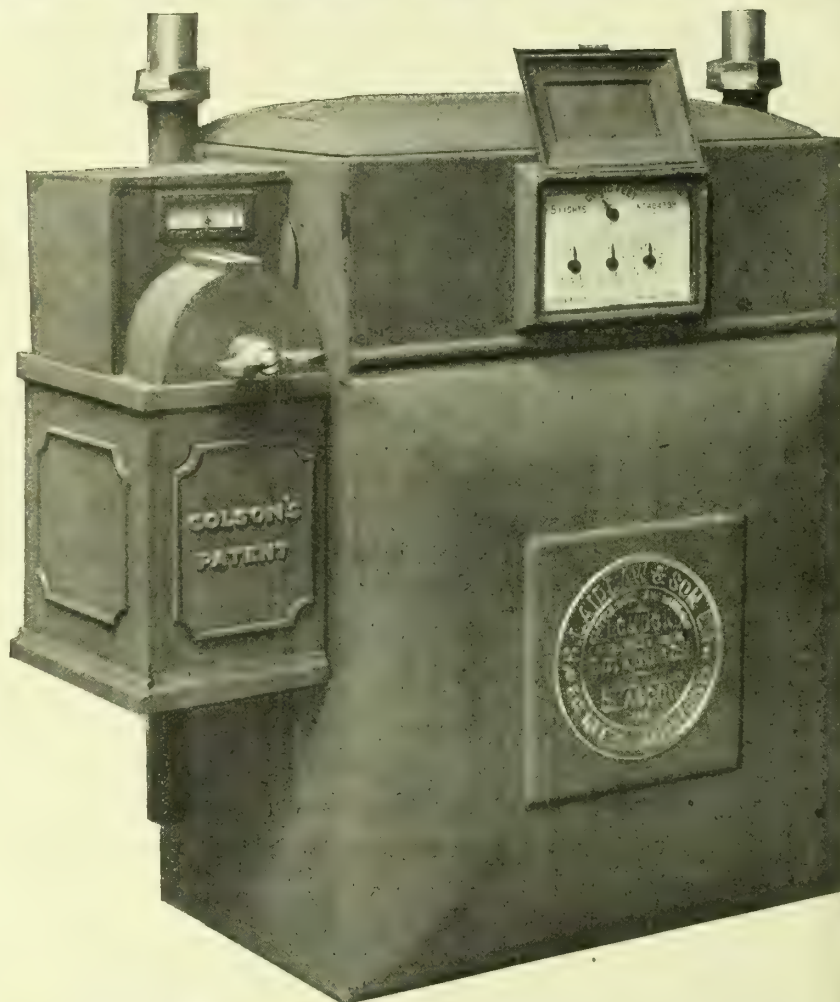
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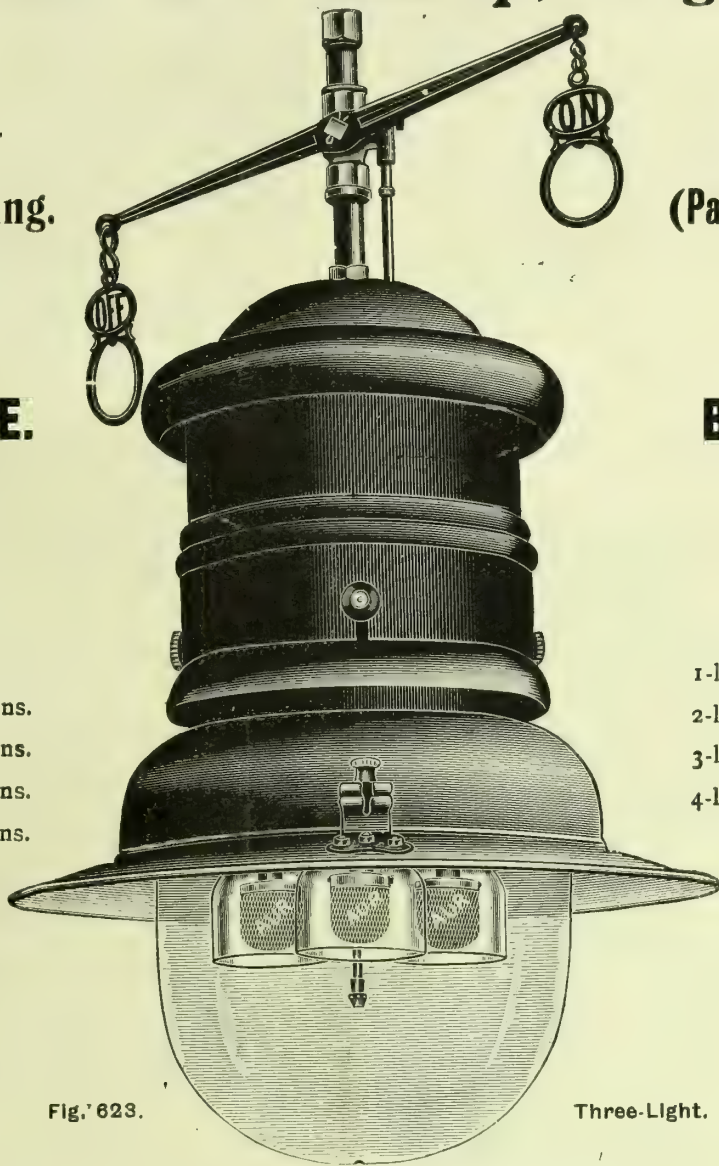
Inverted Arc Lamp, Fig. 623.

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For Exterior Lighting.

Welsbach-Kern
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BRITISH MADE.

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1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623.

Three-Light.

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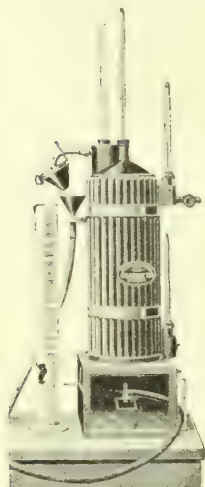
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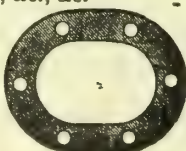
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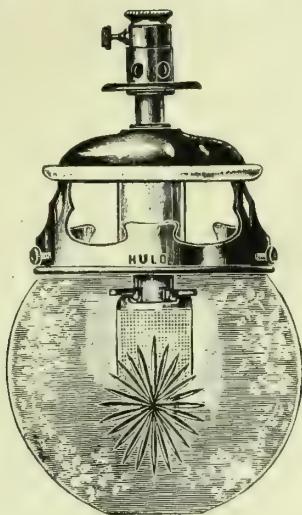
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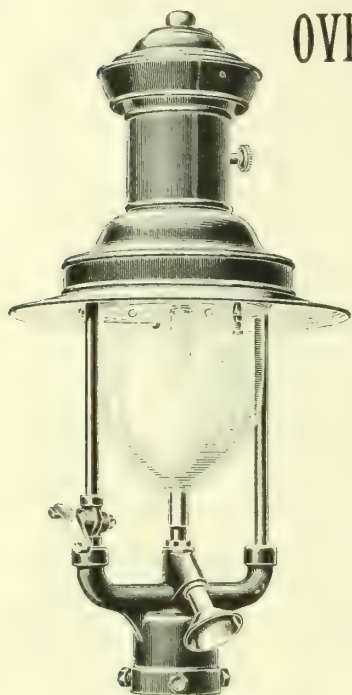


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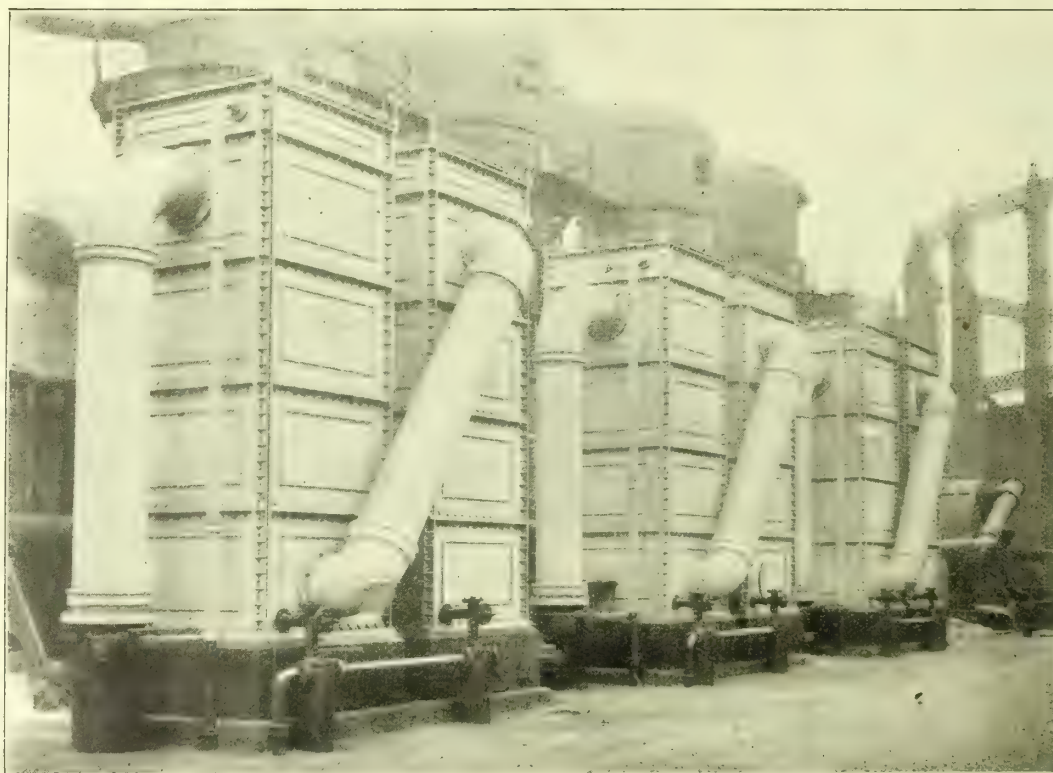
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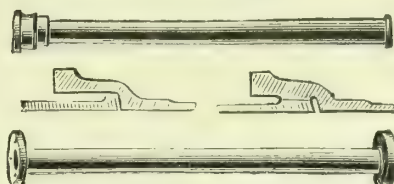
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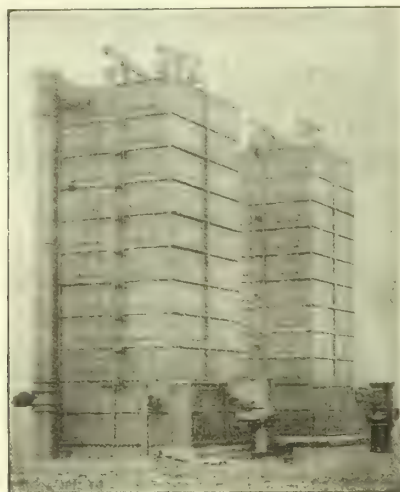
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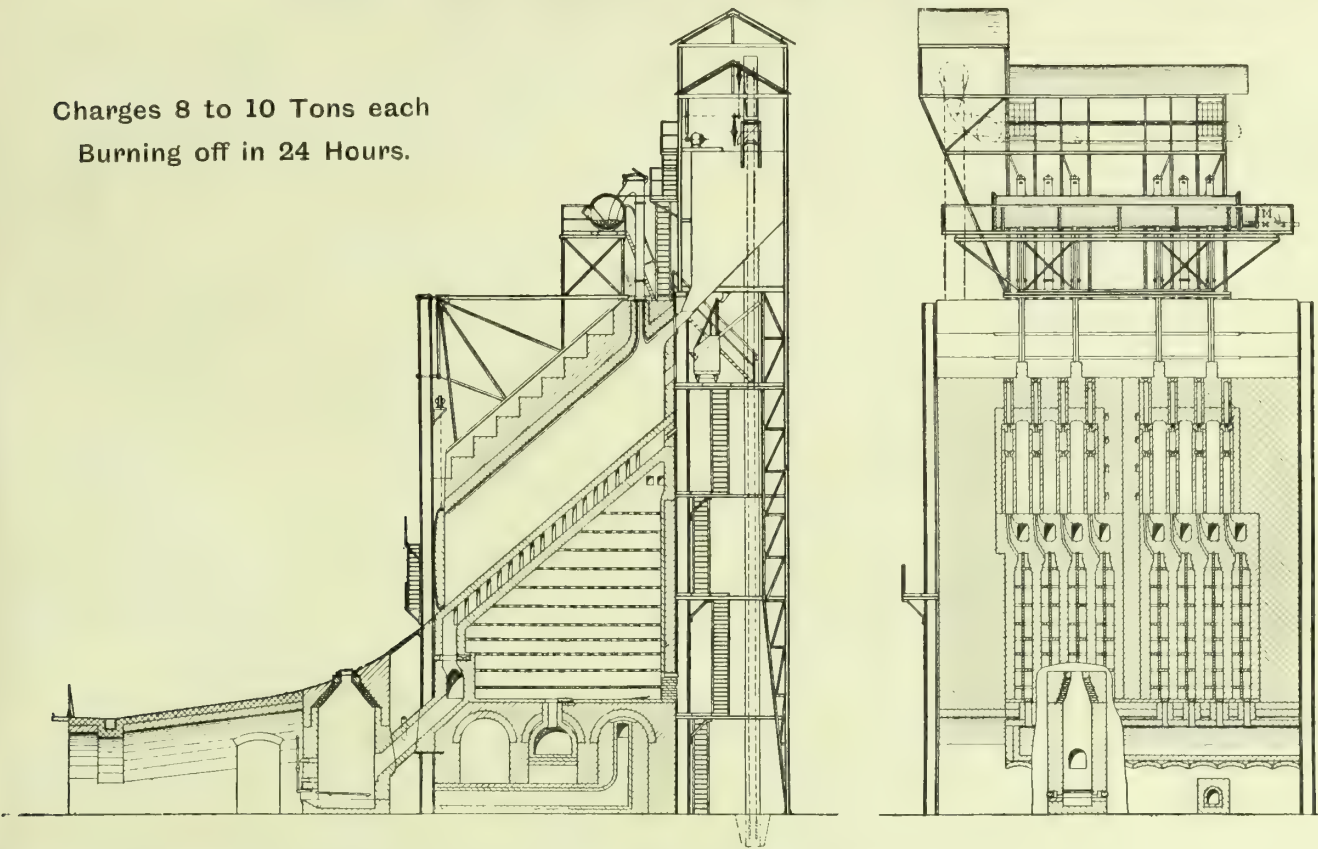
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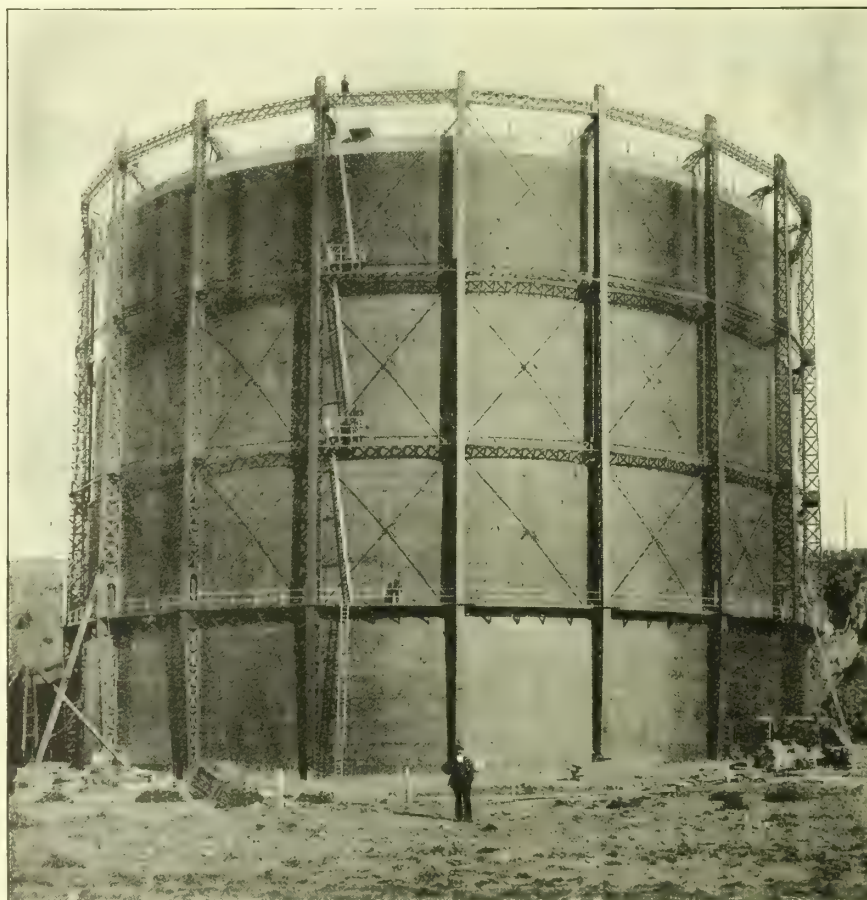
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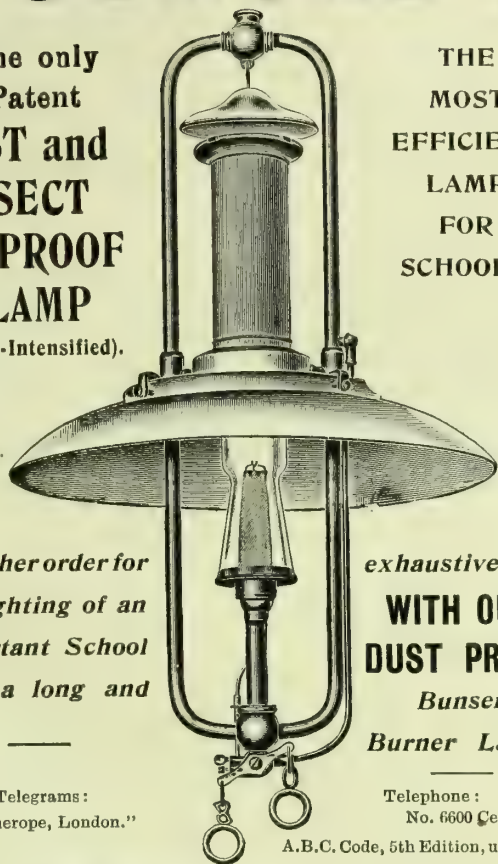
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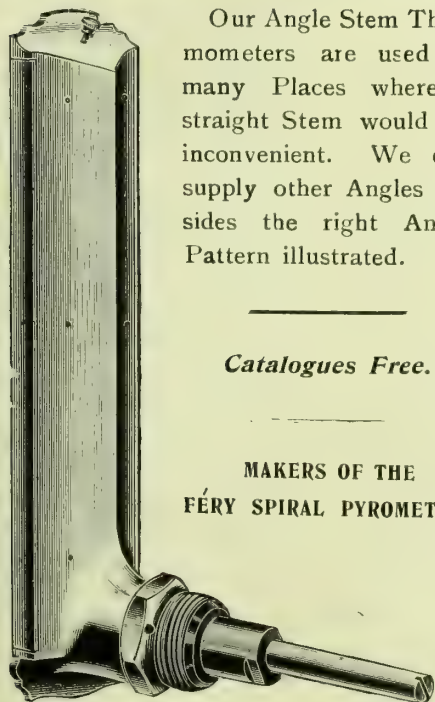
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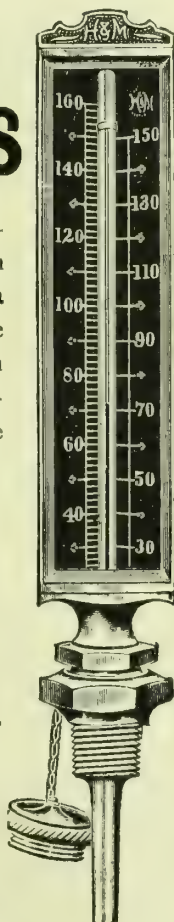
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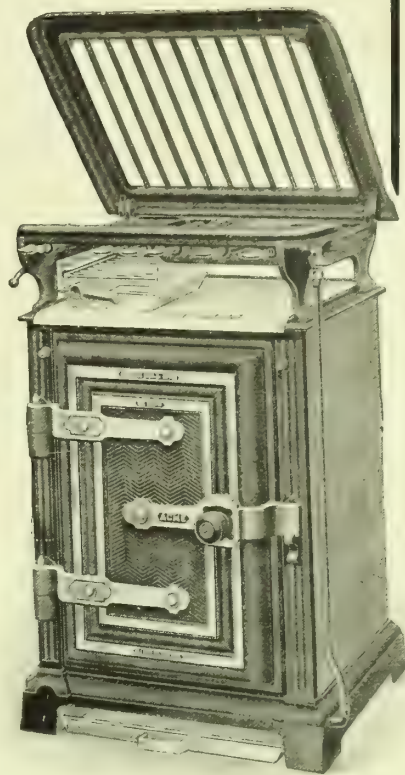
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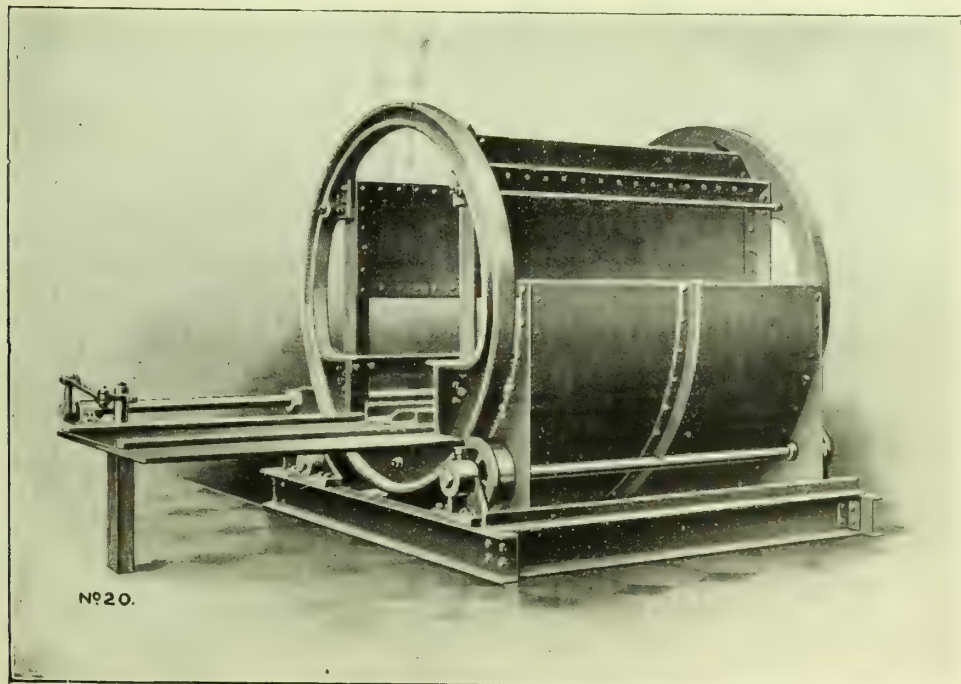
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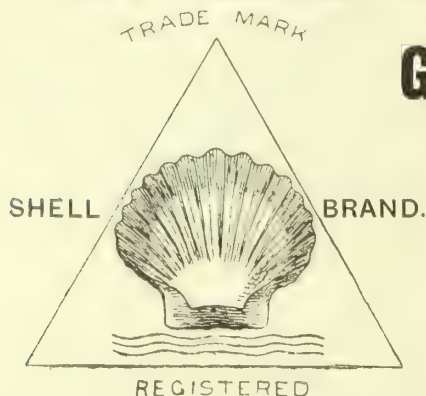
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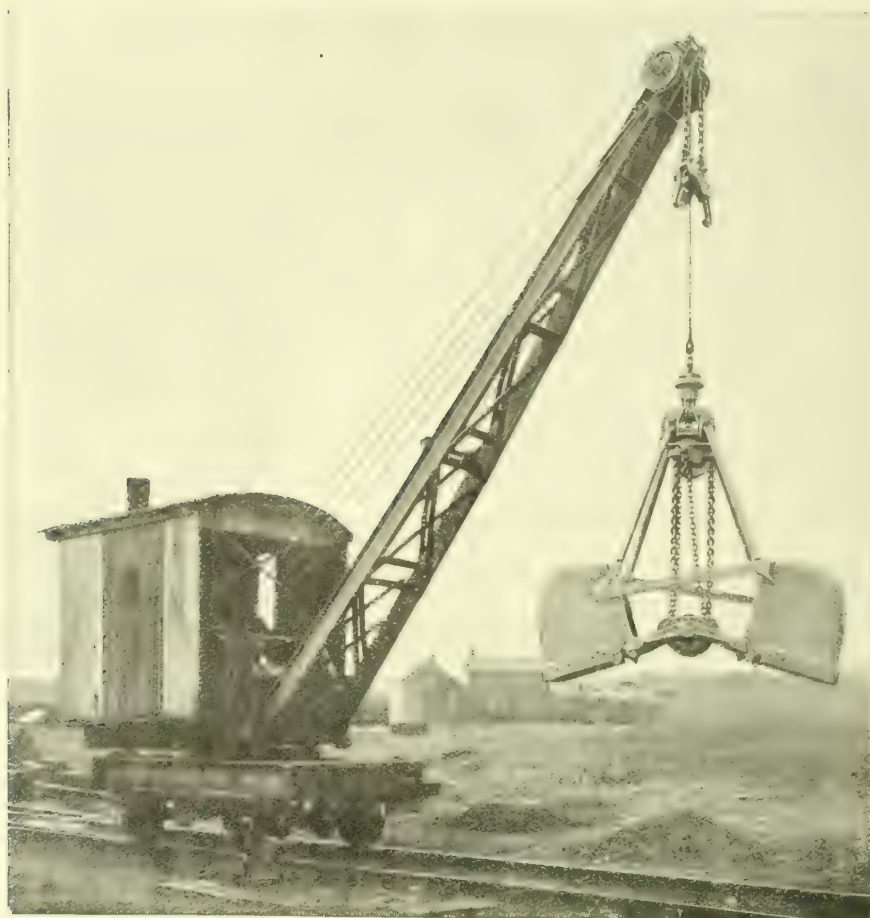
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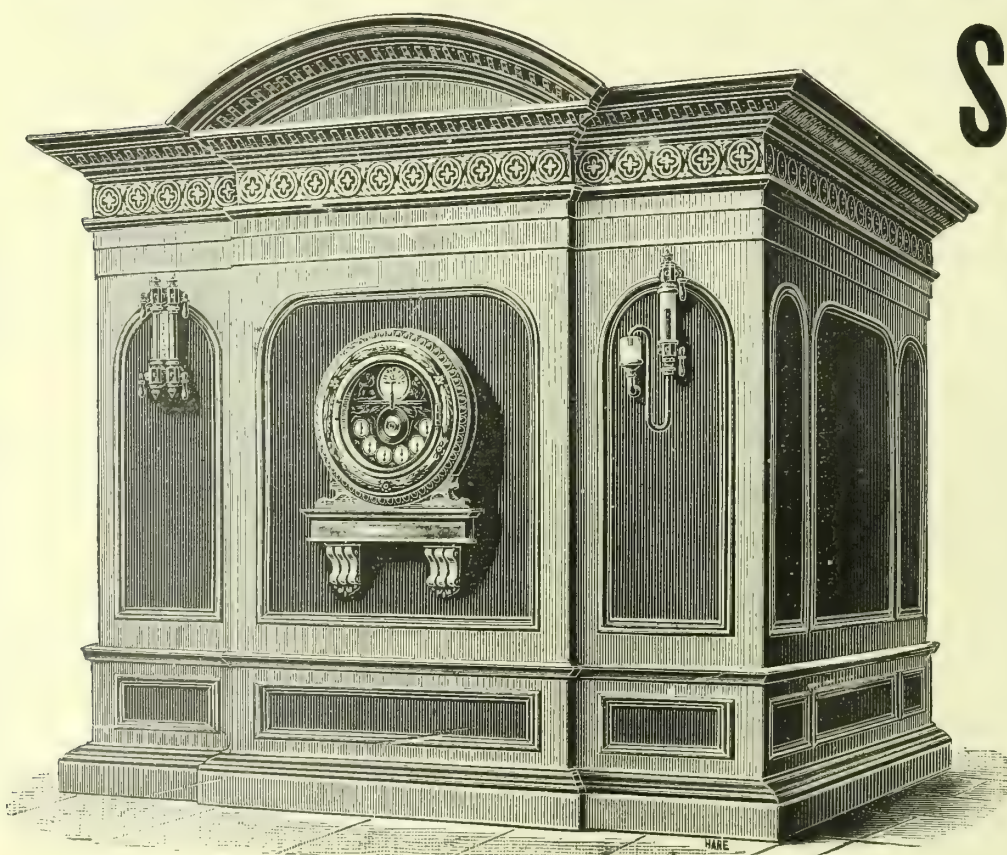
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VOL. CXI., No. 2465.—TUESDAY, AUGUST 9, 1910.

EDITORIAL NOTES—GAS, &c.

The Lines to Increased Stability.

PROGRESS such as the Gaslight and Coke Company have been making in their administrative, technical, and commercial departments, has been, and must continue to be, the result of an amount of hard work of which but a poor appreciation can be formed from the outside. Those who were well acquainted, though outside the Company, with the stereotyped conditions of a bygone time, can perhaps shape some sort of estimate of the hard work, though still an indifferent one. But all the vast labour, anxiety, and trouble are hidden from the gaze of the ordinary proprietors of the Company beneath the figured concentrations of the half-yearly accounts. To only those figures half year by half year, the major part of the proprietors look; and the latterly recurring feeling that "all's well," and that their interests are in safe hands, has had a sort of somnolent effect on them, and their contentment does not direct their feet to Horseferry Road. Friday's meeting was the first after the annexation of the West Ham Company; it marked the first complete year's working of the co-partnership scheme; and there were many interesting topics for consideration. Nevertheless, though the number of Gaslight proprietors has been supplemented by the West Ham proprietary and some 9010 worker co-partners, the attendance at the meeting was thinner than ever. The Gaslight and Coke Company is the premier undertaking of the gas industry, both in seniority and in size. It is one of the big recognized institutions of the industry; and we should like to see if something cannot be done to wake up a little more enthusiasm among the owners of the capital in the concern. We recognize fully that contentment has a deadening effect on shareholders; but are there any other reasons that keep them from these meetings? We suggest one. At Horseferry Road, there are all the conveniences for holding the meetings. Ample accommodation, immediate access to everything required, and it is suitable as a *rendezvous* for Directors and officers. But Horseferry Road is off the beaten track. It is away from the City; not central for railway termini other than Victoria Station; nor is it on the main routes of vehicular traffic. In a word, it is not sufficiently accessible; and there is a matter there for the administration to consider. A Company occupying such a position as the Gaslight and Coke ought, indeed, to have imposing offices in one of the most prominent positions in the Metropolitan area.

But to turn to the meeting on Friday. The address of the Governor (Mr. Corbet Woodall) was composed of many different matters, illustrating the numerous activities of the management and the ramifications of the business—technical and commercial; and, in the results, the care exercised in management and the zeal of the executive staffs and employees. It showed that the great aim of the work and policy of the administration is the progressive stability of the concern; and there can be no question as to the correctness of the lines that are being followed both within and outside the works to achieve the objects in view. At the head and front of the efforts to increase this stability, we would put the work that is being done among the staff and in the ranks of the employees. No big industrial concern does well that is ill-manned—that has employees indifferent to employers' interests, or employees whose intelligence is mediocre, and whose knowledge of their special branch of work has no sound substratum. At the end of a year's experience, the Governor is able (as we felt sure he would be) to attest to the mutual interest that has been fostered by co-partnership, and to the realization of the hopes of himself and colleagues—both Directors and officers. This result, springing from the application of co-partnership at, above all, the works of the Gaslight and Coke Company, should embolden those who were a time ago sceptical to acknowledge now that like effects could be realized anywhere by the same

means. Then an effort of immense value in commercial relations and developments is the educational work that proceeds among the Company's large staff and employees in the distribution department. These men are the real links between Company and consumers, and between gas-utilization knowledge and ignorance; and their influence upon the business cannot be under-estimated. Their education incorporates not only principles and approved practices, but their ideas and knowledge of appliances are being constantly modernized. The work of the lady demonstrators, too, in the Company's area, cannot be too highly applauded.

Addition to stability is largely accomplished by serving in the best possible manner the interests of the consumers. The policy of the Board has included also an increased care in (as the Governor puts it) the "nursing" of capital. What has been the effect of this so far as the consumers are concerned? During the past five years, the price of gas in the Gaslight district, through the various economies in manufacture and otherwise, has gone down by pence (another 1d. is to come off next Christmas) per 1000 cubic feet, and the dividend has increased from £4 8s. to £4 13s. 4d. per cent. But through the "nursing" of the capital, the charge for dividend per 1000 cubic feet of gas sold is nearly 1d. less than at the beginning of the period named, which 1d. represents the handsome sum of about £100,000 a year. This is remarkable. There have been recent attempts, as part of the strategy of the opponents of the industry's progress, to traduce the character of gas companies by hinting at practices that bordered (to put it mildly) on dishonesty. The results of such administration as is presented not only by this, but by other gas companies, throw back the miserable slurring insinuations in the teeth of those who made them. And not only by the means already indicated—the new administrative policy, staff activity, the mutual interest engendered by co-partnership, knowledge disseminated by the special instruction of the workers, and dividend economies produced by the guarding of capital expenditure and a generous (but not too generous) attention to depreciation—but by extraordinary advances in manufacturing result has contribution been made to stability, and (as was shown last week in reviewing the Company's accounts) continues to be made. The laurels of the technical staff are many, and not less than those of the commercial staff, whose successes in the district have been great. It was the successes in public lighting competition that gave the Governor the material for the concluding part of his address. In short, whichever way one looks, it is seen that there is now in this huge concern a systematic pulling together from all quarters to bring about fresh accretions of stability, to the advantage of Company and consumers alike. In the work, the amalgamation of the West Ham concern and district has already, though the period of the alliance has been brief, proved its wisdom. From it, economies have already begun to issue; without detriment, but with advantage, to the service of the consumers. Much was said months ago from West Ham as to what would happen as the result of the amalgamation; but the fears are proving to have been nothing but the imaginings of a few political extremists.

The Half-Year's Working in South London.

ACCOUNTS such as those the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) will be presenting to the proprietors to-morrow require careful scrutiny, and not a mere glance, to avoid arriving at altogether fallacious conclusions. During the half year, the Company have added considerably to the strength of their position; and this is not ascertained by reference alone to the balance carried to net revenue account (£219,884), which is £42,606 less than in the corresponding period of 1909. It has to be remembered the price of gas was 1d. per 1000 cubic feet lower during the past half year than in the corresponding period; and taking the six months as a whole, the private consumption was only marking time. Influences affecting

consumption—most probably climatic—came into play in the first three months of the half year which caused the sale of gas then to recede. But in the midsummer quarter, we have this fact, that the receipts for gas—despite the price being 2s. 2d., compared with 2s. 3d. in the corresponding period of last year—were only £101 less, which suggests that the day consumption in those three months made an excellent move forward. As a matter of fact, the whole of the decrease in the private gas-rental (£27,601), save the £101, occurred in the first quarter of the year; the second quarter recouping itself in the striking manner mentioned. Taking the half year through, the sales of gas, 6,290,732,000 cubic feet, displayed an increase of 3,996,000 cubic feet, which is small, but is better than nothing. To the second quarter, however, must be given the credit for bringing about a result that could not have been hoped for if the experiences of the first quarter had prevailed. The factors that come into play now in creating rises and falls in consumption are greater in number, and more powerful in effect, than was the case in the olden days before such a diversity of uses sprung up to aid the industry's expansion. But the decline in gas receipts, which is about equal to the sum of the penny reduction, is only one item to set against the reduction of the transferable balance. If we look on the other side of the account, we can total up £55,038. more outlay on repairs and maintenance of works and mains and service-pipes and repairing and renewing meters, stoves, and fittings, which extra expenditure on the Company's property is £12,432 in excess of the reduction in the balance on revenue account. But the profit is sufficient to pay the statutory dividend at the rate of £5 9s. 4d. (2s. 8d. higher) per cent., increase the amount paid to workmen co-partners, and leave a surplus of £12,932 to add to the undivided balance.

From these few considerations alone, it is seen that there is abundant reason for the submission with which this article opened—that these accounts will not brook a mere glance upon which to form judgment as to what the half year has done for the Company. But with increased politic expenditure and the sales of gas not recouping the reduction in the price of gas, and yet the balance to net revenue merely affected to the extent already indicated, it is patent that, at least in one direction, the operations must have resulted in material economies for the concern. That direction is the carbonizing department, which has again, continuing recent history, served the Company and the consumers well. The expenditure on coal, £321,959, was £46,736 less than in the corresponding half of 1909; and this reduction of cost was partly accounted for by the fact that the quantity of coal carbonized (544,962 tons) was 25,113 tons less than in the first half of the year 1909, though the quantity of gas made (6,441,516,000 cubic feet) was 34,734,000 cubic feet more—the quantity of gas paid for per ton of coal carbonized being 11,543 cubic feet. There is good working here; and going back but a few years, one looks on the then carbonizing results and on the present with somewhat curious feelings as to what might have been if recent happenings had only happened before. But while the carbonizing results will undoubtedly live up to the newly established records—perhaps will pass beyond them—in the immediate future somewhat heavier charges for coal have to be borne, due not to any great industrial boom, but to that big legislative mistake the Coal Mines (Eight Hours) Act, and, in addition, the Port of London dues, which are going to make some addition to coal costs.

Running over certain of the other items of expenditure on manufacture, purification increased by £4041, but carbonization wages decreased by the substantial amount of £6629; while repairs and maintenance of works went up by £27,086, due mainly to the coal-handling plant renewals. The total outlay on manufacture (£518,488) was £20,609 less. Distribution charges (£161,356) were £28,716 more; but this increase is exceeded by additional amounts (in all £29,685) spent on repairs, maintenance, and renewals of mains and service pipes, stoves, and fittings. The additional sum expended on the public lamps suggests that the Company are continuing to prosecute their scheme of converting them to inverted burners. Among other items are noticed indications of an improvement in the general moral character in the Company's district—the bad debts being some £400 less than in the corresponding half of last year, and the number of slot meters broken open (4435) being nearly 1000 less, and the amount of money abstracted (£369), about £200 less. The total expenditure was £805,434, or an increase of £13,967.

The chief point of interest on the income side has been dealt with when referring to the gas sales. But the total income from gas (including public lighting) was £669,197, or less by £28,348—due, as explained, to the reduction of price. The meter and stove rental (£69,395) advanced by £1396. The number of meters in use (349,970) is greater by 8611; that of ordinary stoves (78,515) is higher by 737; that of slot-meter consumers' stoves (199,329) is more by 7779; and that of gas-fires (25,950) is greater by 2368. Concerning residuals, the receipts from tar and breeze remain the same; those from coke are rather lower; but there is a distinct improvement in sulphate of ammonia. But the final result, £244,814, is not so good by £4596. The receipts for fittings amounted to £40,387, which is better by some £3000. Finally, then, the total income is £1,025,319, or less by £28,639. This decrease added to the increase of £13,967 in the disbursements, makes the difference of £42,606 shown by the balance (£219,884) transferred to the net revenue account. Nevertheless, it is clearly seen that this ultimate figure does not in any way reflect the excellencies of the half-year's operations.

To Create New Demands for Sulphate of Ammonia.

A LARGE amount of specially interesting information is published this week in our news columns concerning the work of the Sulphate of Ammonia Committee; and we would particularly ask the consideration of all readers (among whom there is not one who is not directly or indirectly concerned) to the facts disclosed by it. The facts point as incisively as anything can possibly do to the necessity, in the interests of the future of the sulphate of ammonia market, of no half-hearted measures in propaganda work, and of complete adhesion of all, and not part only of the, producers in the United Kingdom. Pondering over these facts, one is struck, and that forcibly, by the plainness of their indications. It is not a common occurrence in the produce markets that one has the directive signs regarding the future set forth in such strong relief; and sulphate of ammonia producers at home, speaking collectively, will only have themselves to blame if they do not give proper weight and signification to the indications, and, by cohesion and material contribution throughout the United Kingdom, accord their support to the systematic work that is being done to create expansion of demand equal to the annually progressive output of the commodity. The Executive of the Sulphate of Ammonia Committee have given to the acutely defined signs their due importance, and are moving accordingly in several ways. They will, however, be impotent as an agency for lasting good unless they are loyally and strongly supported in keeping at work the increased machinery that is necessary, under present and prospective changing conditions in the sulphate of ammonia market, to create new demand, not only at home but abroad—but more especially at home—that shall have correspondence with the largely expanding supply, the potentiality of which in the matter of reducing market prices in future, if there is no creation of any fresh demand, is great. We do not wish to pose as alarmists; that is far from our thoughts. But we do desire to impress, and that seriously, the importance of a proper appreciation of the signs of coming events in the matter of supply, and of the economic truth that an article cannot maintain its price if the demand falls, to any extent, to the rear of production.

Looking ahead, the Executive of the Sulphate of Ammonia Committee have come to the conclusion that a more extended propaganda scheme designed for creating fresh demand is essential; and they have already set to work to give effect to their determination. Now on what grounds have they so decided? The grounds are well defined. Ten years ago, the world's estimated production of sulphate of ammonia was 495,000 tons; while now it is computed to be not short of 961,000 tons. This means that the supply has practically doubled in a decade. That is rapid progress. Year by year there is an increase in output on an enlarged scale in this country—chiefly now from coke-ovens, shale-works, and iron-works. Something like 24,000 tons represented in 1909 the development upon the preceding year in production in this country from sources other than gas-works; and no one can say when this is going to end, as all coke-oven owners who can do so will, as opportunity offers, convert their systems to the recovery form. Then, again, the abstraction of nitrogen from the air is an accomplished fact. Though too, this country has now friendly inter-relations

with other countries in the matter of propaganda work, it must not be forgotten that those countries have had the advantage of being before us in more generous schemes of propaganda. Then, furthermore, there is the competition of other nitrogenous fertilizers. The effect of the increased output of sulphate of ammonia must be, if there is not complete absorption in future, and so maintenance of market values, to bring down the prices of the competitors, as has already happened in the case of nitrate of soda. And of this we may be sure, that the competitors are well informed of, and are fully alive to, all that is being done to create new demand in connection with sulphate of ammonia; and their knowledge will have a contrary effect to that of discouraging their endeavours to sustain favour. The nitrate of soda people have the advantage that they can reduce output according to the dictates of demand; while sulphate of ammonia is a secondary product of processes that must go on. The production cannot be stopped; but we do not want an excess of supply over demand. That is the situation, immediate and prospective; and the known factors composing it are sufficient to urge the prudence of "taking Time by the forelock," and vigorously prosecuting work in order that the demand shall be on a progressive scale in parallel with the supply.

The overthrow of custom, the setting up of new beliefs among agriculturists, and the consequent opening up of new outlets, do not by any means form light work. Special study, and unremitting effort in giving light and leading, are needed. The proof of the truth as to the superiority of sulphate of ammonia has to be forced upon users of fertilizers. In this matter, there has been something to learn from the comprehensiveness of the propaganda work of other countries; and the new manager and lecturer to the Committee (Mr. W. Popplewell Bloxam, B.Sc., F.C.S., F.I.C.) has been gathering from the Continent information of considerable value as a guide and, we hope, as an incentive. Reading the condensed report published elsewhere of a special conference of sulphate of ammonia makers, one feels almost ashamed of the rearward position held in this country in comparison with America, Germany, France, and Belgium in regard to propaganda enterprise. Representatives of three of these countries sketched at the meeting what has been, and is being, done in them in this regard. Figures show the effect. Their words and information should inspire to greater things here. One feels altogether abashed to see how proportionately badly off we are in contribution to propaganda work in comparison with those other countries. Only 60 per cent. of the total production of sulphate of ammonia in this country contributes to the propaganda work, as against 90 per cent. in Germany, France, and Belgium, and nearly 100 per cent. in the United States; and though our percentage of production contribution is so low, the amount subscribed per ton stands at the bottom of the list—severely poor and insignificant in contrast with the robust figures of our Continental neighbours. On propaganda work, Germany spends 2s. per ton; Belgium, 1s. 8d.; France, 1s. 7d.; America, 10d.; and Great Britain—7d.! It is not the fault of the Sulphate of Ammonia Committee that the propaganda work has not been on a scale commensurate with (say) that of Germany or America. The fault lies at the doors of the producers of 40 per cent. of the sulphate of ammonia output in the United Kingdom, and of the less generous contribution per ton. This we hope is going to be altered now. The Committee have taken powers (but only 7d. will be asked for this year) to levy a subscription of 8d. per ton, which will then be 2d. less than America, and 1s. 4d. less than Germany, with respectively 100 and 90 per cent. production contribution; and they earnestly invite the outstanding producers to come in and assist in the work—work creative of demand and protective of interests—on the enlarged scale, as indicated in the Committee's report published elsewhere in to-day's issue. From the at present non-contributing percentage, they hope to get the financial succour, with the extra 1d. per ton, to enable them to persevere with the enterprising endeavour to keep demand, at any rate, *pari passu* with supply.

The non-contributors are asked to look at the question seriously, and to take a perspective view of possibilities. Then to interrogate themselves as to whether they are now acting fairly or wisely in taking a listless attitude or determinately keeping aloof from this co-operative effort. In some quarters—among certain dealers—there is a little misconception as to the real objects of the Committee. Their labours are not directed to the regulation of market prices

in any way, other than the regulation that all producers must desire, and that is the maintenance of prices, as opposed to the depression that must result from inactivity. The work of the Committee is purely intermediary as between sulphate of ammonia makers and those who can profitably make use of nitrogenous fertilizers. The work is intended to be (as it has been within the limits of activity) creative of new demand, through educational means—lectures, literature, exhibitions, competitions, and large-scale growing demonstrations—and through co-operation with kindred Continental bodies. Their efforts are those of pioneers and removers of obstructions due to incomplete knowledge. Let this be carefully weighed: Without new demand, the freely presented indications assure us, the market value of sulphate of ammonia must in the near future recede. How better than by the plans of the Committee is fresh demand to be created?

Another Electrical Fallacy Exposed.

SOME few weeks ago the "Elektrotechnischen Zeitschrift," in the course of comments on the decision of the City Council of Westminster to displace electric arc lamps by high-pressure gas-lights for street lighting, asserted (as some of our London electrical contemporaries have done) that a 3000-candle power high-pressure gas-lamp had not so far been achieved for practical use. A lamp of this nominal candle power in London was stated to have shown no more than 2500 Hefners—or, say, 2250 candles—on repeated measurements (*ante*, p. 188). The falsity of this general statement has already been effectively demonstrated by German testings of high-pressure gas-lamps; and we now have in a letter from Mr. J. F. Simmance (which is published in our "Correspondence" columns to-day) a clinching refutation of the slur which the electrical press has endeavoured to cast upon the high-pressure gas-lamps in use in the streets of London. Measurements made on one of the lamps in Aldwych on Thursday last by Mr. Simmance showed that the mean candle power at angles which are of most moment is actually 4000 candles, or about 4450 Hefners. Thus, not only is the modern London high-pressure gas-lamp proved to have a candle-power nearly twice as high as the 2500 Hefners which the electricians have sought to ascribe to it, but the general statement that a 3000-candle power gas-lamp has not been practically achieved is shown to have been an impious fabrication by which it was hoped to bolster up the fast-fading claims of the electric arc lamp to the most powerful unit for public lighting. Facts are stubborn things; and we hope that, when the electricians believe they have achieved an arc lamp of as high candle-power as the Aldwych gas-lamp, they will invite Mr. Simmance to confirm their belief by tests with his street photometer. When equality of candle-power has been attained, we may inquire of the electricians the cost for the arc lamp in respect of current consumption and maintenance charges. Their first efforts, however, must be directed towards establishing a mean illuminating power of 4000 candles, or 4450 Hefners, for any arc lamp.

Mr. Simmance calls attention to a point in connection with the testing of the illuminating power of street lamps which becomes of considerable importance when a minimum candle-power has been stipulated for. This is the effect of variations in the pressure and humidity of the atmosphere on the pentane or other flame standard of light, and on the light afforded by a street lamp. When the latter is of the high-pressure gas type, the relative effect of atmospheric changes must undoubtedly be less than with a gas-flame supplied at ordinary pressure. But we are scarcely in a position to deny that the light afforded by high-pressure gas-lamps is not slightly affected by fluctuations in the pressure and humidity of the atmosphere; and undertakers of street lighting under a guarantee of candle-power must allow sufficient margin to ensure the stipulated candle-power being afforded in the worst atmospheric conditions. We are, of course, speaking of the case in which an absolute candle-power is guaranteed, irrespective of the rate of consumption of the gas in the lamp. The pentane or other flame standard is known, however, to vary with changes in atmospheric pressure and humidity; and it is but right that the effect of these variations should be eliminated in determinations of the light afforded by high-power lamps. For instance, on a frosty day with a high barometer, the pentane standard may actually be affording a light of (say) $10\frac{1}{2}$ candles instead of 10 candles; and if the candle-power of the high-pressure lamp

under comparison with it were reckoned on the assumption that the standard was actually of its nominal value, the light of the gas-lamp would be returned as of about 3900, instead of 4000 candles. It is necessary that, where an absolute candle-power is guaranteed for gas-lamps in competition with electric arc lighting, the standard of light to be employed in the tests either should be unaffected by variations in the atmospheric conditions, or its value should be corrected so as to eliminate the effect of the latter.

Illegal Overdrafts, and Borrowings without Sanction.

THE hands of the Local Government Board have been considerably strengthened by the decision that has been given by Mr. Justice Neville in the action by the Attorney-General, at the relation of certain ratepayers of West Ham, against the Corporation and Mr. Patterson, the Borough Treasurer. The action had reference principally to overdrafts for general purposes and to borrowings on account of the electricity undertaking anticipatory and in excess of the sanctions of the Local Government Board. This sort of thing has been peculiarly prevalent since the large inroads by municipal bodies into electricity adventure; and while the Local Government Board admonished, they seemed entirely void of power to stop any such procedure. Only the other day, the Chairman of Section A of the Local Legislation Committee of the House of Commons (Sir F. Layland-Barratt) severely criticized the Warrington Corporation, in connection with their Omnibus Bill, for entering into large expenditure without properly providing loans to meet it, and for coming before the Committee with the request that they should whitewash them for what they had done. The only "safeguard" ratepayers have against indiscreet and illegal borrowings is the Local Government Board. But many municipalities—the West Ham Corporation is one of several instances, but a bad one—have deliberately over-ridden the Board in most contemptuous fashion. The Board cannot be held altogether blameless—speaking generally, not particularly of West Ham. There are occasions when their assents or refusals have been deferred a tantalizing and unreasonable length of time. But this is not the common occurrence. The common occurrence has been the other way about—overdrafts and expenditure and borrowings in excess of sanctions long before the Board have even been approached. The Board, in fact, have had their authority and their control in relation to local finance disregarded with supreme indifference; and their warnings have often been the object of ridicule.

The West Ham Corporation, as already said, have been especially bad sinners, both in respect of general and electrical purposes, in this matter of overdrafts and excess borrowings. We need not, in view of the reference in our "Legal Intelligence," particularize here the extent of their financial misdemeanours. It is the principle of the whole thing, rather than the degree in any single instance, that concerns us. This is a form of transgression that has grown and spread among municipal bodies; and the sooner an effective stop is put to it, the better. Mr. Justice Neville's judgment will have a salutary effect to this end. The Council had obtained an overdraft from the bank for general purposes in respect of borrowing powers granted for specific objects. This his Lordship declared *ultra vires* and illegal. The Corporation had applied money due to the consolidated loans fund towards the repayment of the overdraft. This his Lordship also declared *ultra vires* and illegal. The Corporation had borrowed money from the bank for the purpose of the electricity accounts; and the doing of this, otherwise than in the exercise of borrowing powers with the sanction of the Local Government Board, his Lordship likewise declared *ultra vires* and illegal. These declarations have no doubt come as a shock to many municipal authorities; but they will hereafter find them very useful in view of the fact that they, in a sense, define what they may not do in these particular matters. They go further than this, and afford additional protection, inasmuch as banks will be very chary henceforth in accommodating municipal authorities financially in any way that might infringe the declarations of Mr. Justice Neville in the West Ham case. Concerning the liability incurred by the London and County Bank in this instance, his Lordship was relieved from expressing his opinion in respect of this aspect of the case by an arrangement by which the bank refunded several thousands of pounds interest received by them on the balances of overdrafts. The event showed their wisdom in coming to this

arrangement; for, as the whole of the transactions were *ultra vires* and illegal, their position might have been worse in the end than under the timely compromise that was effected. For municipal bodies and banks on the one hand, and ratepayers on the other, the decision is of exceeding great value, and will do much towards disciplining the financial acts of the first-named and settling their financial affairs on a sounder basis. There is a growing feeling in Parliament and among ratepayers that local finances require more rigid regulation than they have hitherto received.

Standard Burner Bills—An Appeal to the Public.

There is one thing for which credit can be given to the opponents of the Standard Burner Bills; that is consistency—consistency in their tenacity to a lost cause, their refusal to see the rational side of the question, and their persistency in misrepresentation. An article in a provincial paper suggests that they are now appealing from the House of Lords and the House of Commons to the people; and what they want the people to do is to stir up their representatives in Parliament to see that, before the Bills are finally passed and receive the Royal Assent, clauses are inserted providing for that *quid pro quo* about which so much has been heard (and which the House of Commons Committee have properly said is so amply provided for in existing legislation), in the shape of a reduction in the price of gas, or, alternatively, provision for "maximum and minimum calorific power tests for the quality of the gas supplied." If the two Committees of Parliament who gave such careful and patient attention to all that was laid before them could not understand the questions at issue, certain it is that the public will not understand it from the one-sided and extravagant submissions in the article before us. For that poor, misguided, and heedless user of flat-flame burners, pity is asked; and the terrible injustice to him is laid bare, instead of the advice being tendered to give up his foolish practice, and not adopt the "Metropolitan" No. 2 burner or any other argand whether dear or cheap, but bring to his service the low-priced incandescent burner, and get the fulness of the capacity of the gas for rendering illuminating power by the incandescing of a mantle. These Standard Burner Bills have disclosed what a wonderfully lavish amount of sympathy can be expended on the undeserving.

Carbonization Results.

One of the most interesting features of the report of the Directors of the South Suburban Gas Company to which the Chairman (Mr. Charles Hunt) had to direct attention last Friday was this statement: "A further improvement in carbonizing results forms a gratifying feature of the half-year's working. The average production of gas per ton of coal carbonized exceeds all previous records of the Company; and the cost of carbonizing labour now ranks among the lowest in the Kingdom." It is not observed that Mr. Hunt stated what these carbonizing costs were per 1000 cubic feet of gas sold. Perhaps his modesty, and that of Mr. S. Y. Shoubridge (the Engineer), would not allow him to. It is seen from the accounts that the quantity of gas sold in the half year was 696,654,000 cubic feet, and carbonizing wages amounted to £3656 11s. 10d. Dividing the latter figure by the former, we calculate that the cost of carbonizing wages per 1000 cubic feet sold was slightly under 0.8d. The statement in the report is justified. The production of gas per ton of coal in the half year averaged 11,700 cubic feet, or 370 cubic feet per ton more than in the corresponding period of last year—representing a saving of 1939 tons of coal. There are some engineers who are sceptical as to any large advantage accruing from such increased makes, lower carbonizing wages, and lessened quantities of coal carbonized. They point to increased fuel accounts, and higher charges for repairs and maintenance; and to the fact that, with a smaller quantity of coal carbonized, there is a reduced quantity of coke, tar, &c., for sale. We are among those who do not think that any general harm will accrue to the industry by the volume of supply of secondary product being reduced relative to the sales of gas. The markets, taken as a whole, will stand a real withdrawal of part of the supply. And a complete answer to those who doubt the advantages of realizing a higher gas production per ton of coal may be found in the improved financial accounts of all companies who are working under the modern conditions.

Capital and Dividend Charges.

The importance of giving careful consideration to capital expenditure and depreciation cannot be too urgently impressed on all gas company administrators by their technical officers. The effects of prudence in this matter are remarkable, and beneficial alike to consumers and undertakings. Twice during the past week Mr. Corbet Woodall has, in speeches at meetings of gas proprietors, given striking illustration of this. At the meeting of the Gaslight and Coke Company, he pointed out that, by prudent attention to capital expenditure and depreciation, the charge for dividend in five years had descended by nearly 1d. per 1000 cubic feet, which represented to the gas consumers the handsome sum of about £100,000 a year. Notwithstanding this decreased claim for dividend per 1000 cubic feet (the price of gas has receded by 3d. or 4d. per 1000 cubic feet), the dividend per cent. of capital employed has gone up from £4 8s. to £4 13s. 4d. We remember, about five years ago, hearing Mr. Woodall privately bemoaning the price charged for gas by the Gaslight and Coke Company, and the lowness of the return to the proprietors. Time has brought changes. Again, speaking at the Tottenham and Edmonton Gas Company's meeting on Saturday, he pointed out that the capital ten years ago was equal to £526 per million cubic feet of gas sold; and the charge for interest and dividend was 8·75d. Now the same items are respectively £431 and 6·2d. Thus the charge for interest and dividend is 2·55d. less per 1000 cubic feet than it was ten years ago. In this case, too, the price of gas has dropped considerably; and the dividend has gone up in a manner that has caused the proprietors who owned stock ten years ago, and have kept it, to rejoice. In the case of both Companies, a further 1d. reduction in the price of gas is promised next Christmas. These are conditions over which the Chief Engineers of the Companies (respectively Mr. T. Goulden and Mr. A. E. Broadberry) and their colleagues may be most heartily congratulated in company with their Chairman and the Directors.

Personal.

Mr. JARDINE, of the gas-works staff at Dumfries, has been appointed, out of a large number of applicants, Manager of the Dalbeattie Gas-Works, in room of Mr. W. Spowart, resigned.

At their quarterly meeting last week, the Belfast Borough Council passed a resolution adopting the part of the proceedings of the Council in Committee on the 14th ult. (*ante*, p. 178) relating to the appointment of a Gas Engineer and Manager. This confirms the selection of Mr. JAMES D. SMITH, of Stirling, to the position, at a commencing salary of £800 per annum, with house and gas.

In the "JOURNAL" for the 28th of June, it was announced that Mr. H. KING HILLER had relinquished the position of Engineer-in-Chief of the Shanghai Gas Company, Limited, with the view of returning to England and commencing consulting practice in London. Before leaving Shanghai, he paid a professional visit to Manila, in the Philippine Islands, on behalf of a Syndicate who are about to construct gas-works in the city. We are pleased to learn that he reached England safely last Friday.

It will be seen, from the notice of the proceedings at the recent annual meeting of the Sulphate of Ammonia Committee, which appears elsewhere, that Mr. W. G. BLAGDEN, who was identified with the formation of the Committee some fourteen years ago, and was Chairman continuously during the whole period of its existence, has found it imperative to relinquish the position; and his resignation has been accepted with the utmost reluctance and regret. Mr. MILNE, of the Gaslight and Coke Company, who was for some years Deputy-Chairman of the Committee, has been unanimously elected Mr. Blagden's successor.

Presentation to Mr. Bernard F. Browne.—We learn from the "Review of the River Plate" that Mr. Bernard F. Browne, the Manager and Chief Engineer of the Primitiva Gas and Electric Light Company, was made the recipient on the 3rd ult. of a gold medal by the works employees, and of an album by the other employees. Mr. Browne joined the Company about eight years ago as Engineer at the Retiro works, and on the retirement of Mr. G. W. Anderson in 1906 he became General Manager and Engineer, which post he held until the amalgamation of the three Companies. During his connection with the Company he brought the service up to a very high standard of efficiency. He was held in the highest estimation by his Directors and all the members of his staff; and during his residence in Buenos Ayres he made numerous friends, who regret that it is not probable that he will return. It was mentioned in the "JOURNAL" for the 7th of June that he would shortly be leaving Buenos Ayres for England; and he started on the 4th ult., accompanied by his sister. He is a son of Mr. A. F. Browne, of Vauxhall.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 416.)

THE Stock Exchange had a dull time last week, and five days were quite enough of that. Business was on a reduced scale and devoid of any remarkable interest; the most noticeable feature perhaps being the obstinate weakness of Consols. After having closed well the previous Friday, markets, upon re-opening on Tuesday, were disposed to be rather cheerful. But once again foreign influences came in and spoiled the position. American advices were flattening, and Continental selling was resumed. Government issues were weaker; and Consols receded $\frac{1}{8}$. Rails were nervous about labour troubles, and lower prices were the rule pretty well all round. On Wednesday, there was some recovery, though dearer money knocked Consols down another $\frac{1}{8}$, and business grew a little more active. Rails were calmer and stronger; Americans looked up a bit, though rather jumpy; and Foreign were firm. The activity died down on Thursday; and the hardening of money lowered gilt-edged securities. Rails were a tug-of-war between good dividends on the one hand and strike fears on the other. The Foreign Market was steady. Friday's business was quiet; and the general tendency was to droop for lack of support. Most markets were dullish, though some of the speculative lines were in favour. Saturday was another dull day. Consols were $\frac{1}{8}$ lower, and prices in general were for the most part down. In the Money Market, the supply was abundant to meet all the demands for loans. Discount rates hardened in face of a large issue of Treasury Bills. Business in the Gas Market was on a holiday scale; but prices did not suffer from that, and the general tendency was very good. In Gaslight and Coke issues, the ordinary was quiet and strong, though one bargain was marked specially at 106 $\frac{1}{4}$. All the other transactions ranged from 106 $\frac{1}{2}$ to 107—a rise of $\frac{1}{8}$. In the secured issues, the maximum realized 89 $\frac{1}{2}$, and the debenture from 80 $\frac{1}{4}$ to 80 $\frac{3}{4}$. Not much was done in South Metropolitan; but transactions were between 122 $\frac{1}{4}$ and 123—a rise of 1. The debenture changed hands at 80 and 80 $\frac{1}{2}$. In Commercials, there was no business marked. Among the Suburban and Provincial group, Alliance and Dublin was done at 81 free (a fall of 1), Brentford old at 255, British at 44 $\frac{1}{4}$, and Brighton ordinary at 154 and 155. In the Continental companies, Imperial was quiet and firm at from 179 $\frac{1}{2}$ to 181, Union realized 91 (a rise of 1), ditto preference 135 $\frac{1}{2}$, and European fully-paid 23 $\frac{3}{4}$ and 23 $\frac{1}{2}$ —a fall of $\frac{1}{2}$. Among the undertakings of the remoter world, Bombay changed hands at 6 $\frac{1}{4}$, Primitiva at from 7 $\frac{1}{16}$ to 7 $\frac{7}{8}$, ditto preference at from 5 $\frac{1}{8}$ to 5 $\frac{3}{8}$ (a fall $\frac{1}{8}$), and ditto debenture at 97 $\frac{7}{8}$ and 98.

ELECTRICITY SUPPLY MEMORANDA.

Wires and Fires: Another Terrible Story—Plunder—Lamp Patent Wars and Rumours of Wars—Degenerate Finance at Bristol—Faversham's White Elephant.

SINGULAR, indeed, is it that so many people are callously heedless of warnings. After the terrible life-destroying and property-consuming fire at Clapham last Christmas time, it might have been expected that every similar establishment would have taken all possible steps in the endeavour to have assured the place against a similar catastrophe. But though the Clapham warning was so recent, though at the time the terrible story ran through the country and caused universal sympathy, we have almost like circumstances repeated at Accrington, with a roll of five lives (all comparatively young women) lost and a considerable destruction of property. And the origin? The means by which the so-called "safest" illuminant is so largely provided in similar establishments. Throughout the country, this fresh story from Accrington has been published; and coming on the top of the Clapham "holocaust," the Electricity Publicity Committee will have something to do to blot from the minds of people that the outstanding cause—the origin—of the fire was due to the fusing of an electric wire. It was on the Saturday night preceding the Bank Holiday. The big drapery establishment of Messrs. Williams, Limited, was thronged; when a flexible wire in one of the shop windows fused, and though the manager of the department seized the wire and endeavoured to smother the flaming insulation, the inflammable goods in the neighbourhood were already well alight, and the devastating work had begun. Flexibles and lamps appear to have been used indiscriminately in this window for the purpose of giving effect. There was a small outbreak only a few weeks previously in the same premises, and some towels then caught fire—through the fusing of a wire. The wiring, it was declared at the inquest, was put in by a competent electrical engineer; and had frequently had attention since. The evidence as to the origin does not leave any doubt; and Mr. Harold Gray, the Electrical Engineer to the Accrington Corporation, does not question the fusing of a wire being the cause, because at the inquest he commented on the dangerous practice of putting flexibles and lamps in proximity to inflammable materials. But our electrical contemporaries as usual try to veneer the real thing with "ifs" and such expressions as "it is alleged." One electrical paper seems to have missed the fire altogether. Regarding the loss of life, it is thought by some that the lives might have been saved if there had been greater presence of mind at the beginning of the

fire, and had the fire brigade arrangements been more perfect. Those are matters about which we cannot say anything. But the evidence is conclusive as to the rapidity of the spread of the conflagration; and one realizes the excitement that must exist at such a time. Turning from Accrington to Herne Bay, when the new pavilion of the pier was crowded with people, just before nine o'clock on Thursday evening, the fusing of an electric wire caused a fire that fortunately was soon subdued, and without producing much damage. But the volumes of smoke that rolled in at the entrance occasioned considerable alarm, and those on the spot—not the occupants of the editorial chairs of our electrical contemporaries in the neighbourhood of Fleet Street—state that a stampede was only narrowly averted by the coolness of the conductor and members of the band. The origin of the recent fire at the Kelvin Hotel at Belfast has not been so definitely established as the foregoing instances; but in one quarter at least, the origin was attributed to the electric wiring.

Those administrators of municipal gas undertakings who are being compelled by Parliament to discontinue, or are being restricted in, the practice of taking profits from the concerns in aid of the rates, which concerns have never themselves asked aid of the rates, or those authorities who are prudently placing themselves under restraint in the matter, will be enabled to bear the curtailment of liberty with greater fortitude and equanimity by the knowledge that, in the electrical industry, there is a distinct movement in favour of keeping the profits made by a municipal concern for the benefit of its patrons, and therefore of the undertaking itself. Electrical managements are crying out for adding to stability, and for placing their concerns in a better position for fighting the competitor, by the sane utilization of surplus profits, instead of distributing them broadcast among the ratepayers. The question has lately been raised at Carlisle, Aston, and Dewsbury. The Local Government Board, following what has been done in the committee-rooms of Parliament, have been, at recent loan inquiries, scattering wise counsel in regard to the matter among local authorities—at Carlisle and Aston for example; and the sage advice of Mr. Hooper on the subject is causing no small amount of fluttering among those town councillors who stoop to the undignified proceeding of, as the Chancellor of the Exchequer would say, robbing gas and electricity hen roosts. Mr. Hooper is called blessed by electrical engineers when on this subject; but his equally sound views on the subject of public lighting brings on a head devoted to commonsense some terrible imprecations. But let that pass. We had from him, at Aston, the *reductio ad absurdum* in the matter of profit appropriation for the rates. He asked whether anyone could show him where the advantage came in of transferring to the reduction of the rates £1500 with one hand and borrowing £1500 with the other for an expenditure for services. In such a course, there is no advantage to the ratepayers, and no advantage to the undertaking. To borrow money with one hand at $3\frac{3}{4}$ per cent., and to pay it out as a bonus with the other, means that the ratepayers have to pay the $3\frac{3}{4}$ per cent. The argument is good in one way, if the ratepayers really pay the $3\frac{3}{4}$ per cent. But in well-conducted undertakings, the consumers pay the interest, and ought not to be called upon to pay more. All electrical concerns have not, however, been well conducted. Many have been carried on at prices for electricity that have not been equal to the weight of outgoings incurred in running the undertakings, and the ratepayers have had to supply the deficiency, which is unfair upon those who are not consumers. In our opinion, to the total of the deficits incurred by undertakings, and made good by the ratepayers, there ought to be a refunding to the latter from any future profits. Beyond this ratepayers are not entitled to, nor do they deserve, anything.

Though our electrical contemporaries are as silent as the grave over the matter this week, we are still hoping to be interested by them as to the success or otherwise of the prospectus of Metalite Limited. We are wondering whether the absence of information means a very sparse public application, and that the underwriters have received an extraordinarily high voltage shock. If so, then the promoters of the Company will long ere this have come to the conclusion that the public penetrated the character of the promoters' advertisements and prospectus, and were not prepared to accept as gospel all the statements that were made. Since the appearance of these advertisements and the prospectus, clouds have been crossing the metallic filament firmament; and they threaten some heavy legal storms. The General Electric Company have issued an "important notice to the public" regarding legal proceedings having been commenced, by the proprietors of the patents under which Osram lamps are manufactured, and against importers of tungsten filament lamps. But as the "Metalite" variety of lamp is a home production, it cannot be precisely said that the "important" announcement is directed to it. But it was significant that the Osram notice should have synchronized with the large advertisements of the Metalite Company. Then supplementing the Osram advertisement is one by the Thomson-Houston Company, in which they notify the public that no liability or risk of patent litigation is incurred by purchasing their lamps, as they hold a licence from the Osram Company. "Metalite" Limited have also had a look in with an advertisement equal in size to the Osram and Thomson-Houston ones combined, in which they claim "certain secret processes" and the protection of 27 patents and provisional patents in Great Britain and throughout the world. The "Electrical Review" has not been supporting the Metalite Company in their pretensions; and its criticism of the contents of the prospectus has had a strain of sarcasm all through.

The remarkable dividend estimates are said by the Company to be based upon "results obtained by the vendor companies since the perfection of the patents and processes." The "Electrical Review," however, points out that "the British patents already granted date from 1907 (a patent *not* utilized in the British Metalite lamp) and Aug. 16, 1909. Of the patents applied for, six are dated May 3, 1910, and one June 1, 1910. What 'results' can possibly have been obtained from these?" However, we must confess to curiosity as to how the Company have monetarily fared in their appeal to the public, by plunging into extraordinary expense, fabrication regarding incandescent gas lighting, and bombast.

The Bristol Town Councillors do not seem to be able to arrive at any decided opinion as to the prospects of their electricity undertaking. Alderman Pearson, year by year, tries to make his sanguine temperament spread its influence throughout the Council Chamber; but it does not always work now. Councillors have seen the "profits" of the concern steadily dwindle year by year, till now they are a *minus* quantity; and they cannot for the life of them understand the wherefore, with increased numbers of units turned out and paid for—at a price. In 1905, a profit of £9844 was boasted. Since then the surplus has disappeared, and has receded into a shortage of the amount required to meet financial obligations—on this occasion to the extent of £2030, though it is only fair to say this is after putting £3109 to reserve to meet renewals. The councillors are told by Alderman Pearson that it is the metallic filament lamp that has done the mischief; but the surplus reflux began before the metallic filament lamps had foisted their ungainly shapes and glare upon the public eye. But these lamps have, of course, had a large economical effect. Every consumer who uses them makes himself a less profit-producing customer, and at the same time reduces the demand for the electric lighting station's best paying units. At the same time, new lighting consumers are not at Bristol coming on by leaps and bounds. Last year the undertaking only connected up 170 new consumers; and it must be remembered that the return on the capital expended per consumer in doing this is not so great as in the fat days of old. On the other hand, Alderman Pearson refers with eyes uplifted and heart full of gratitude to the fact that the power load has increased by 650-horse power. This is what the layman cannot understand. The power load increases the total output of units magnificently; but yet there is the fact of surpluses reduced until they have disappeared, and there have been new entries in the category of deficits. Better far, says the observer of local events, would it have been if the conditions of 1905 had been preserved. Instead, a large capital expenditure has been piled up for unprofitable business. With a wave of the hand, Alderman Pearson cries, "Look at the amount of capital that has been repaid," against which the hideous fact rises up that the financial results are not what they were five or six years ago before so much of the capital had been repaid. Facts are facts; and all Alderman Pearson's magniloquence will not disturb them from their rightful position among material things.

"Curses, not loud, but deep" there must surely be at Faversham over the continuation of the financial fiasco in connection with the electricity undertaking. When one looks into the accounts, one feels almost inclined to pity the compilers for the evidence that they contain of diligent scraping together of odds and ends of revenue (even to an instalment of a pupil's premium), and of the thinning down of the items of expenditure, to make a little better showing than before. Sympathy almost induces us to refrain from comment. But it is such undertakings as this, and the financial burden imposed upon the ratepayers, that stand as a protest against the gilded hollow advice that electrical experts were wont to give these ambitious and gullible local authorities in the days lang-syne, and still give when there is opportunity. It is our duty to call attention to them. Here is a little concern making losses year by year much larger than the total receipts from private consumers, and charging these losses upon the ratepayers, among the largest of whom is the Gas Company. Here is this electricity concern with an expended capital of £22,567 at March 31 last, and with £20,749 still owing. Yet the total sale of electricity to private customers brings in only £1015; and the ratepayers are charged a sum all but the equal of that by £300 for public lighting by electricity—making the total income from electricity £1727. The net revenue account shows a deficiency on the working, to be supplied by the rates, of £1276—making the total deficiency from the time of formation £6185—equal to more than one-fourth of the total capital expenditure. Is "scandalous" too strong a term to apply to this condition of things? We think not. Meanwhile the Gas Company flourish, despite the fact that they have been relieved of the larger part of the public lighting, to the disadvantage of the ratepayers, to serve the purposes of the needy but burdensome local electricity supply concern.

We learn from the Hon. Secretary (Mr. Octavius Thomas, of Pontypridd) that the Council of the Wales and Monmouthshire Institution of Gas Engineers and Managers intend arranging a series of classes in "Gas Supply" at Cardiff, Newport, Swansea, and Pontypridd during the coming winter.

Mr. Harold Porritt, J.P., Chairman of the St. Anne's-on-the-Sea Gas Company, died on the 31st ult., at the age of 55. He was principal of the firm of Messrs. Joseph Porritt and Sons, woollen manufacturers, of Helmsore, and second son of the late Mr. J. Porritt, one of the founders of St. Anne's.

THE PROFESSIONAL GAS EXAMINER.

IT was reported in last week's "JOURNAL" (p. 353), that the London County Council had adopted, without discussion, certain recommendations of the Public Control Committee in reference to the conditions of service of the gas examiners appointed by the Council. The recommendations and the report on which they were based were quoted in the "JOURNAL" for the 26th ult. (p. 279); and as their adoption by the Council entails a radical change in the status of the gas examiners which may affect detrimentally the interests of the London Gas Companies and consumers, it is right that attention should be drawn to them.

The appointment of a gas examiner under the London Gas Acts is entrusted to the London County Council (as successor to the Metropolitan Board of Works) and, in regard to the City area only, to the Corporation of the City of London. The gas examiner so appointed is to be "a competent and impartial person"—a condition which applies also to gas examiners appointed throughout the Provinces under the Gas-Works Clauses Act, 1871. Hitherto the London County Council have appointed men whose obligations to the Council have been fulfilled when they have carried out the statutory testings for the day, and have made the reports thereon specified in the Acts. For the rest of the day, the examiners have been free to engage in other work; and since the Council have desired that a large proportion of the testings should be made after dusk, it is obvious they were thus able to secure the services of many men who devoted the greater part of the daytime to some other professional work. Attendance at the testing-place for about three hours each day sufficed for carrying out the necessary testings. For this work a remuneration of £135 (rising to £165) per annum has hitherto been paid; and for it the services of men principally engaged elsewhere as analysts, consulting chemists, lecturers, or demonstrators have commonly been obtained. The gas examinership has been only a subsidiary appointment held in such cases by energetic men of good professional standing as a means of filling profitably time which would not ordinarily be occupied by their general professional work. Obviously, the examiners obtained in this way have been men whose whole-time services could only have been secured for not less than treble the remuneration paid by the London County Council to them as gas examiners. Moreover, they have for the most part been men of much higher standing and repute than the Council could have otherwise secured, except at greatly enhanced remuneration. Consequently they have been generally accepted as competent in the sense in which that word is used in the London Gas Acts with reference to the person who may be appointed a Gas Examiner. This, coupled with the fact that their duties as gas examiners for the Council have constituted only a small part of their professional practice or work, has given them an independence of that body which has gone far towards ensuring the impartiality that the Acts likewise stipulate shall be an essential qualification of a gas examiner. On the whole, the arrangement has worked well; and despite attempts from time to time on the part of the Chemical Department of the London County Council to dictate to these "competent and impartial persons" how they should fulfil their duties, the Gas Companies and the consumers have seldom had serious reason to doubt that they were, and have remained, duly qualified in respect both of competence and impartiality.

Now the Council have decided to abolish, with all decent speed, this satisfactory system. They have arranged that the successors of the present gas examiners shall be officers whose whole services shall be devoted to the work of gas examination; that each of these officers shall have charge of two testing-places; that their salary shall be £200 (rising to £250) per annum; and that they shall be subject to the Council's usual conditions of service. The only reasons given in favour of the change are an estimated saving of about £300 a year, and that "a more efficient control over the work of gas testing would be secured by substituting for the part-time examiners, as they retire, a class of officers whose whole services would be devoted to this work." That is to say, for the sake of an estimated saving of £300 a year on an expenditure of over £3000 in respect only of the remuneration of the regular gas examiners, the Council intend to appoint men who for one-and-a-half times the remuneration will undertake twice as much work as the present gas examiners. Bearing in mind the fact that, as already explained, the present men have the most valuable hours of the day free for other work, and consequently are prepared to accept relatively low remuneration for their appointments as gas examiners under the Council, it will be obvious that the examiners appointed under the new scheme will be men whose professional services cannot command nearly such a high scale of remuneration as the services of the examiners now holding appointment. In other words, they will be immensely inferior in standing professionally; and the proof of ability and competence afforded by the market value of a man's services will, in their case, be far less satisfactory and well assured.

Much worse than this, however, will be their entire subservience to the Council, by which the latter will secure "more efficient control over the work of gas testing." If the gas examiner is competent, as the Acts require that he should be, he needs no control in the work of gas testing; nay, he should resent any attempt on the part of the Council to control his work as casting a slur on his ability and competence, and as constituting an unwarrantable interference with him in the performance of his duties. If he

needs any control in the work of gas testing, there is *prima facie* evidence that he is not competent, and is not therefore qualified to hold the appointment. The sacrifice of independence which is involved under the new system in the disability to engage in other work, and the fact that the gas examiner thereunder becomes wholly and solely a salaried officer of the Council, are the worst aspects of the change. It would be absurd to pretend, however, that gas examiners holding appointments in these terms are impartial persons in the sense in which this expression is used in the clauses of the London Gas Acts relating to their appointments; and consequently no report made by them will be susceptible of proof before the Chief Gas Examiner or a Magistrate. Thus the London County Council have stultified themselves by adopting the egregious recommendations of their Public Control Committee, and have only succeeded in warning the Gas Companies and the public at large of their aspirations to exercise *ex parte* more efficient control over work which the Legislature has expressly confided to "competent and impartial persons."

ASSOCIATION OF CONSULTING ENGINEERS.

Its Aims and Objects.

IN view of the criticism which the proposal to form an Association of Consulting Engineers has met with, the Committee have issued a memorandum setting forth in detail its aims and objects; and they ask for publicity to be given to it.

The Committee point out that one of the principal objects of the Association is to secure that municipal and other public works shall be supervised by duly qualified consulting engineers; and in order that this may be done, it is necessary to know who is so qualified. There appear to be no means of ascertaining this at the present time; and it is hoped that the register of the Association will give the information. The Association will not be antagonistic to the principle of specialization, as the intention is to include all branches of the profession—civil, mechanical, electrical, gas, and possibly others. It is not suggested that every member should possess a knowledge of all branches, or even of more than one; all that is proposed is for every member to be a properly trained and qualified engineer, and that he shall act solely in a professional capacity—that is, as a consulting engineer. It is not intended to encroach in any way on the authority of the councils of the leading institutions which deal with the different branches of engineering.

The bye-laws governing professional conduct issued by the Institution of Civil Engineers, and now adopted also by the Institution of Electrical Engineers, require that the members of these Institutions, when acting in a "professional capacity"—that is, as consulting engineers—shall conform to certain rules. The above Institutions cannot make any distinction between their members, and are therefore not able to say to which of them the rules are applicable. The register of the Association will, it is hoped, form a complete list of the qualified consulting engineers to whom these rules will be applicable at all times. The register will be open to inspection by authorities who are responsible for spending public money, as well as to anyone else requiring the advice of a consulting engineer. The rules of the Association, which are now under consideration, will be based on the above-mentioned rules, to which it is intended to add others applicable to consulting engineers only. These rules will be submitted to a general meeting in the autumn. At present, membership of the Association is confined to those who are corporate members of the Institution of Civil Engineers and also of the Institution representing the particular branch of the profession in which they now practice. The Association is not prepared at present to accept the responsibility of considering the qualifications of engineers other than those already mentioned; but it will no doubt be able to do so in the future, should it receive the support it desires from all members of the profession.

Recent Wills.—Major Philip Cardew, for some time Electrical Adviser to the Board of Trade, whose death occurred on the 17th of May last, left estate of the gross value of £30,332. His Honour John Shiress-Will, County Court Judge for Birkenhead since 1906, and Editor of the two works on the law of gas and water supply and electric lighting with which his name is associated, left estate valued at £2300 gross, of which £2220 is net personality.

Use of Tar for Road Surfaces.—In the "JOURNAL" last week, a description was given of the Paignton Water-Works by Mr. C. Owen Baines, the Engineer and Surveyor to the Urban District Council. It was extracted from a paper read by him at a district meeting of the Institution of Municipal Engineers held in the town. In the same paper the author referred to the use of tar for road making. Crude tar from the gas-works was mixed with distilled tar in proportions varying between 1 to 3 and 1 to 6, depending upon the quality and the consistency of the crude tar. The cost per superficial yard was $\frac{3}{4}$ d., sometimes more, according to the distance from depôts. About 460 gallons of tar were usually disposed of in a day's work; and the tarred area was sanded in addition. The author said it was absolutely essential for successful tar-spraying to have a good and dry surface, clean and free from dirt of every kind. The road should be swept again with a horse broom; and even then a man should follow to clear off anything of an adhesive nature.

GASHOLDER CUPS.

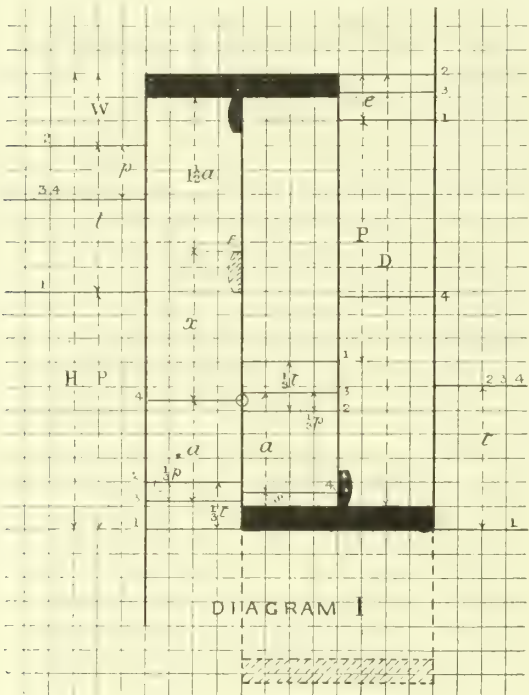
By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.
[THIRD ARTICLE.]

IN the second article on this subject (Vol. CX., p. 368), formulæ were given for solving the various problems relating to the "blowing" of gasholder cups. These problems were, for the most part, treated graphically in the first article. In this, the third article, the construction or evolution of the formulæ is given.

EVOLUTION OF FORMULÆ.

CASE I.—Taking example 3 of the first article [Vol. CX., p. 28], draw the diagram showing respective stages of water levels 1, 2, 3, 4, as in fig. 7 in that article, but repeated below with the notation given on p. 368 of the second article. The data given for this example are :

$P = 10'', H = 19'', e = 2'', S = \frac{1}{2}'', D = 18'', W = 3'', p = 2\frac{1}{4}''$



By inspection, we see that

$$t = H - W - P$$
$$a = D - e - P - S - \frac{1}{3}t + \frac{1}{3}p$$
$$x = D - 2\frac{1}{2}a - \frac{1}{3}t + \frac{1}{3}p.$$

Now filling in values of *a* and *t*, we have

$$a = D - 2\frac{1}{2}\left(D - e - P - S - \frac{H - W - P}{3} + \frac{p}{3}\right) - \frac{H - W - P}{3} + \frac{p}{3}$$
$$= D - 2\frac{1}{2}\left(D - e - P - S - \frac{H}{3} + \frac{W}{3} + \frac{P}{3} + \frac{p}{3}\right) - \frac{H}{3} + \frac{W}{3} + \frac{P}{3} + \frac{p}{3}$$
$$= D - 2\frac{1}{2}D + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S + \frac{5}{6}H - \frac{5}{6}W - \frac{5}{6}P - \frac{5}{6}p - \frac{H}{3} + \frac{W}{3} + \frac{P}{3} + \frac{p}{3}$$
$$= -1\frac{1}{2}D + 2\frac{1}{2}e + 2P + 2\frac{1}{2}S + \frac{1}{2}H - \frac{1}{2}W - \frac{1}{2}p.$$

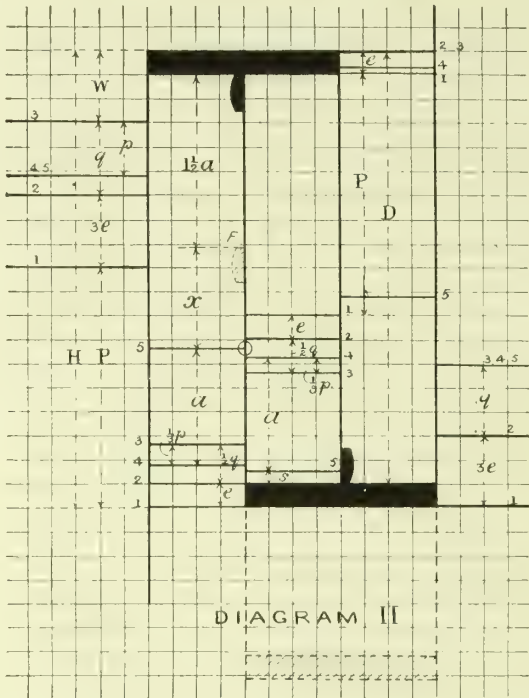
Bringing all to a common denominator, and separating the plus and minus quantities, we have

$$x = \frac{4P + 5e + 5S + H - 3D - W - p}{2},$$

which is the formula given in the second article for case I (p. 369).

CASE II.—Taking particulars from example 4 in the first article (p. 29), we have the successive water levels as shown in Diagram II., for Case II. The data given are :

$P = 10'', H = 19'', e = 1'', S = \frac{1}{2}'', D = 18'', W = 3'', p = 2\frac{1}{4}''.$



By inspection of the diagram, we see that

$$q = H - W - P - 3e$$
$$a = D - 2e - P - S - \frac{1}{2}q + \frac{1}{3}p$$
$$x = D - 2\frac{1}{2}a - e - \frac{1}{2}q + \frac{1}{3}p.$$

Hence, filling in values of *q* and *a*, we have

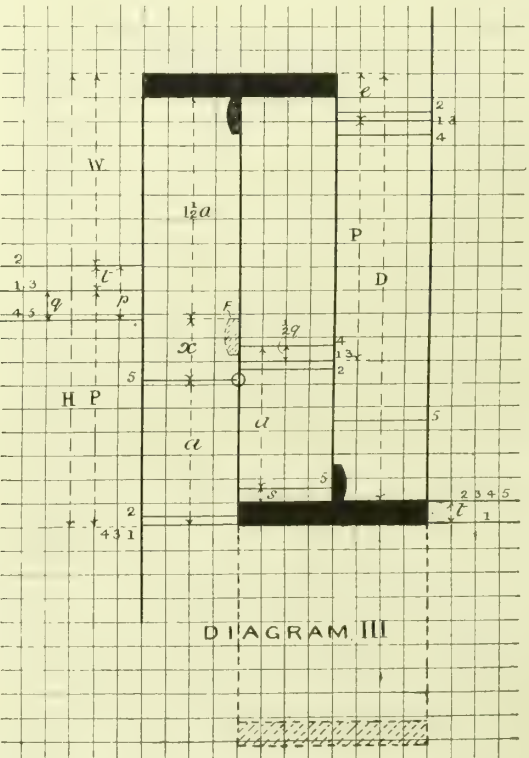
$$x = D - 2\frac{1}{2}\left(D - 2e - P - S - \frac{H - W - P - 3e}{2} + \frac{1}{3}p\right) - e - \frac{H - W - P - 3e}{2} + \frac{1}{3}p$$
$$= D - 2\frac{1}{2}D + 5e + 2\frac{1}{2}P + 2\frac{1}{2}S + 1\frac{1}{4}H - 1\frac{1}{4}W - 1\frac{1}{4}P - 3\frac{3}{4}e - \frac{5}{6}p - e - \frac{H}{2} + \frac{W}{2} + \frac{P}{2} + \frac{3e}{2} + \frac{p}{3}$$
$$= -1\frac{1}{2}D + 1\frac{3}{4}e + 1\frac{3}{4}P + 2\frac{1}{2}S + \frac{3}{4}H - \frac{3}{4}W - \frac{1}{2}p.$$

Therefore $x = \frac{7P + 3H + 7e + 10S - 6D - 3W - 2p}{4},$

which accords with formula for Case II. already given in the last article (p. 369).

CASE III.—See example 5 (p. 29) for data and water levels. The successive water levels during the uncupping are shown on Diagram III. below, the data for which are as follows :

$P = 10'', H = 19'', e = 2'', S = \frac{1}{2}'', D = 18'', W = 8'', p = 2\frac{1}{4}''.$



From inspection, we see

$$t = H - W - P$$
$$\text{and } q = p - t$$
$$\therefore q = p - H + W + P$$
$$\text{and } a = D - e - P - S + \frac{q}{2}$$
$$\text{also, } x = D - 2\frac{1}{2}a$$
$$\therefore x = D - 2\frac{1}{2}\left(D - e - P - S + \frac{q}{2}\right).$$
$$\text{or } x = -1\frac{1}{2}D + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S - 1\frac{1}{4}q.$$

Filling in value of *q* (as above), we have

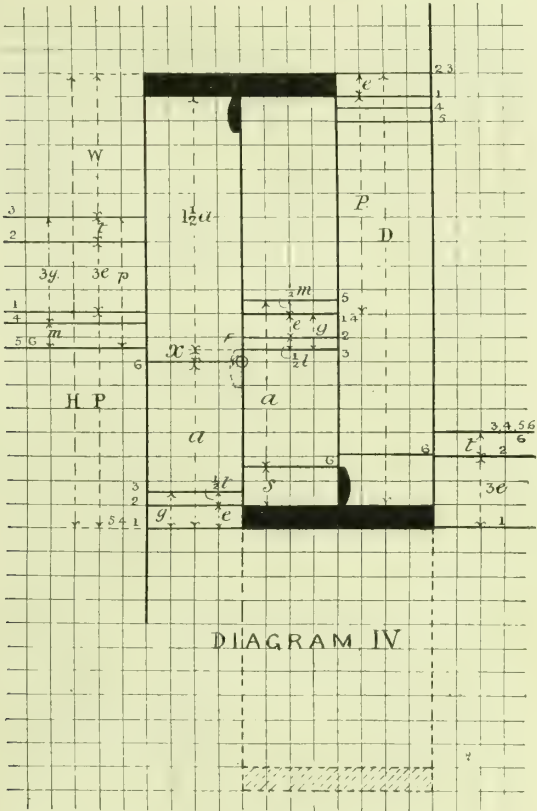
$$x = -1\frac{1}{2}D + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S - 1\frac{1}{4}p + 1\frac{1}{4}H - 1\frac{1}{4}W - 1\frac{1}{4}P$$
$$= -\frac{3}{2}D + \frac{5}{2}e + \frac{5}{4}P + \frac{5}{2}S - \frac{5}{4}p + \frac{5}{4}H - \frac{5}{4}W.$$
$$\text{Therefore } x = \frac{5P + 5H + 10e + 10S - 6D - 5W - 5p}{4}$$

as given in previous article (p. 369).

CASE IV.—This was not worked in the first article, as it seldom arises in practice; and it is a combination of Cases II. and III. Taking the same cup as before, but altering the water levels, we will assume the following:—

$$P = 9", H = 19", e = 1", S = 1\frac{1}{2}", D = 18", W = 6", p = 5\frac{1}{2}.$$

[NOTE.—These dimensions are unlikely to occur in practice, but are selected to render the process clear.]



The successive stages being shown on Diagram IV., as numbered. We see by inspection that the following hold good:—

$$x = D - 2\frac{1}{2}a$$
$$\text{But } a = D - e - P + \frac{1}{2}m - S$$
$$\therefore x = D - 2\frac{1}{2}(D - e - P + \frac{1}{2}m - S)$$
$$\text{But } m = p - 3g, \text{ and } g = e + \frac{1}{2}t$$
$$\text{Now } t = H - W - 3e - P$$
$$\therefore g = e + \frac{H - W - 3e - P}{2}$$
$$\text{Hence } m = p - 3\left(e + \frac{H - W - 3e - P}{2}\right).$$

Now filling in the value of *m* in the formula for *x* above, we have

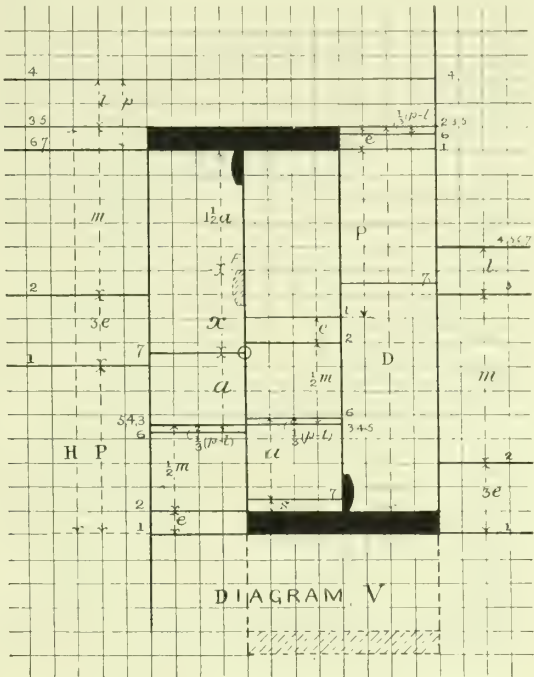
$$x = D - 2\frac{1}{2}\left[D - e - P + \frac{1}{2}\left\{p - 3\left(e + \frac{H - W - 3e - P}{2}\right)\right\} - S\right]$$
$$= D - 2\frac{1}{2}D + 2\frac{1}{2}e + 2\frac{1}{2}P - 1\frac{1}{4}p + 3\frac{3}{4}e + 1\frac{3}{8}H - 1\frac{7}{8}W - 5\frac{5}{8}e$$
$$- 1\frac{7}{8}P + 2\frac{1}{2}S.$$
$$= -1\frac{1}{2}D + \frac{3}{8}e + \frac{5}{8}P - 1\frac{1}{4}p + 1\frac{3}{8}H - 1\frac{7}{8}W + 2\frac{1}{2}S.$$

$$\text{Therefore, } x = \frac{5P + 15H + 5e + 20S - 12D - 15W - 10p}{8}$$

as given in the last article (p. 369).

CASE V.—Taking the data given for Example 5 on p. 369 of the previous article, we have the various water levels as indicated in Diagram V. below. The data are as follows:—

$$P = 7", H = 17", e = 1", S = \frac{1}{2}", D = 16", W = 0, p = 3", l = 2"$$



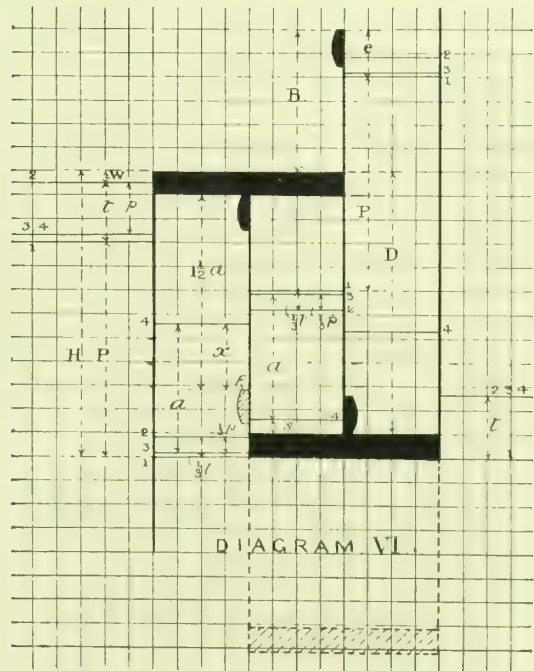
From inspection, we see that

$$x = D - e - 2\frac{1}{2}a - \frac{1}{2}m + \frac{1}{3}(p - l)$$
$$\text{but } a = D - 2e - P - S - \frac{1}{4}m + \frac{1}{3}(p - l)$$
$$\text{and } m = H - P - 3e$$
$$\therefore a = D - 2e - P - S - \frac{1}{2}H + \frac{1}{2}P + 1\frac{1}{2}e + \frac{1}{3}p + \frac{1}{3}l$$
$$\text{and } x = D - e - 2\frac{1}{2}D + 5e + 2\frac{1}{2}P + 2\frac{1}{2}S + 1\frac{1}{4}H - 1\frac{1}{4}P - 3\frac{3}{4}e$$
$$- \frac{5}{6}p + \frac{2}{3}l - \frac{1}{2}H + \frac{1}{2}P + 1\frac{1}{2}e + \frac{1}{3}p - \frac{1}{3}l.$$
$$= -1\frac{1}{2}D + 1\frac{3}{4}e + 1\frac{3}{4}P + 2\frac{1}{2}S + \frac{3}{4}H - \frac{1}{2}p + \frac{1}{3}l.$$
$$\text{Therefore, } x = \frac{7P + 3H + 7e + 10S + 2l - 6D - 2p}{4}$$

This accords with the formula for Case V. in the last article (p. 369).

CASE VI.—This is the first case for shallow cups with raised grip plate. The particulars are taken from Example 6 in the last article (p. 369), except that *W* is $\frac{1}{2}$ inch instead of zero, to render the process clear. Diagram VI. is constructed from the following data, and the water levels indicated thereon.

$$P = 9", H = 12", e = 2", S = \frac{1}{2}", D = 11", W = \frac{1}{2}", p = 2\frac{1}{4}", B = 6".$$



From inspection, we note that

$$t = H - W - P$$

$$a = D + B - e - P - S - \frac{1}{3}t + \frac{1}{3}p$$

$$x = D - 2\frac{1}{2}a - \frac{1}{3}t + \frac{1}{3}p$$

$$\therefore x = D - 2\frac{1}{2}(D + B - e - P - S - \frac{1}{3}t + \frac{1}{3}p) - \frac{1}{3}t + \frac{1}{3}p$$

Filling in the values of t and p , we have

$$x = D - 2\frac{1}{2}\left(D + B - e - P - S - \frac{H - W - P}{3} + \frac{p}{3}\right) - \frac{H - W - P}{3} + \frac{p}{3}$$

$$= D - 2\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S + \frac{5}{6}H - \frac{5}{6}W - \frac{5}{6}P - \frac{1}{6}p - \frac{H}{3} + \frac{W}{3} + \frac{P}{3} + \frac{p}{3}$$

$$= -1\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 2P + 2\frac{1}{2}S + \frac{1}{2}H - \frac{1}{2}W - \frac{1}{2}P - \frac{1}{6}p$$

$$\text{Therefore, } x = \frac{4P + H + 5e + 5S - 3D - W - p - 5B}{2}$$

which is the formula given on p. 369 of the last article for Case VI.

CASE VII.—Taking Example 7 of the second article (p. 370), the water levels are shown in Diagram VII. to accord with the various stages of uncupping according to the directions set forth in the first article. Repeating the data, we have,

$$P = 9", H = 12", e = 2", S = \frac{1}{2}", D = 11", W = 2", p = 3", B = 6".$$

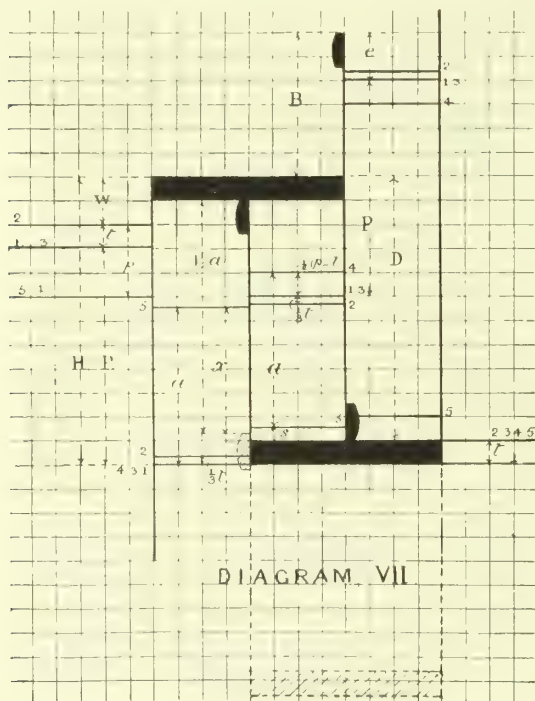


DIAGRAM VII

We find from inspection that

$$t = H - P - W$$

$$a = D + B - e - P - S + \frac{1}{2}(p - t)$$

$$x = D - 2\frac{1}{2}a$$

$$= D - 2\frac{1}{2}\left\{D + B - e - P - S + \frac{1}{2}(p - t)\right\}$$

$$= D - 2\frac{1}{2}\left\{D + B - e - P - S + \frac{p}{2} - \frac{H}{2} + \frac{P}{2} + \frac{W}{2}\right\}$$

$$= D - 2\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S - 1\frac{1}{4}p + 1\frac{1}{4}H - 1\frac{1}{4}P - 1\frac{1}{4}W$$

$$= -1\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 1\frac{1}{4}P + 2\frac{1}{2}S - 1\frac{1}{4}p + 1\frac{1}{4}H - 1\frac{1}{4}W$$

$$\text{Therefore, } x = \frac{5P + 5H + 10e + 10S - 6D - 5W - 5p - 10B}{4}$$

which agrees with Formula VII. in the previous article (p. 369).

CASE VIII.—The data given in Example 8 of the second article (p. 370) are taken for this case—viz.:

$$P = 9", H = 12", e = 2", S = \frac{1}{2}", D = 11", l = 1", p = 2\frac{1}{4}", B = 6".$$

The successive water levels, due to uncupping, are shown to accord with same in Diagram VIII.

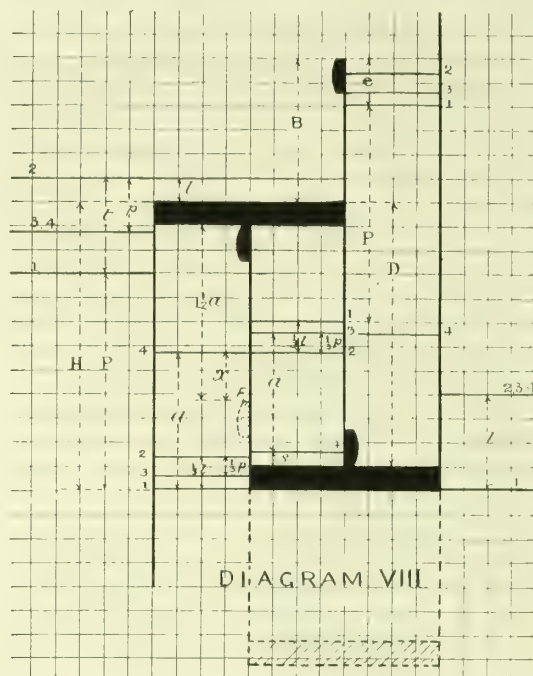


DIAGRAM VIII

From inspection, we see that

$$t = H - P + l$$

$$a = D + B - e - P - S - \frac{1}{3}t + \frac{1}{3}p$$

$$\text{and } x = D - 2\frac{1}{2}a - \frac{1}{3}t + \frac{1}{3}p$$

$$\therefore x = D - 2\frac{1}{2}\left(D + B - e - P - S - \frac{H - P + l}{3} + \frac{p}{3}\right) - \frac{1}{3}t + \frac{1}{3}p$$

$$= D - 2\frac{1}{2}\left(D + B - e - P - S - \frac{H}{3} + \frac{P}{3} - \frac{l}{3} + \frac{p}{3}\right) - \frac{H}{3} + \frac{P}{3} - \frac{l}{3} + \frac{p}{3}$$

$$= D - 2\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 2\frac{1}{2}P + 2\frac{1}{2}S + \frac{5}{6}H - \frac{5}{6}P + \frac{5}{6}l - \frac{5}{6}p - \frac{H}{3} + \frac{P}{3} - \frac{l}{3} + \frac{p}{3}$$

$$= -1\frac{1}{2}D - 2\frac{1}{2}B + 2\frac{1}{2}e + 2P + 2\frac{1}{2}S + \frac{1}{2}H + \frac{1}{2}l - \frac{1}{2}p$$

$$\text{Therefore, } x = \frac{4P + H + 5e + 5S + l - 3D - p - 5B}{2}$$

This is identical with Formula VIII. on p. 369 of previous article.

CASE IX.—The data in this case are the same as in Example 9 (p. 370)—viz.:

$$P = 10", H = 12", e = 2", S = \frac{1}{2}", D = 11", l = 1", p = 4", B = 6".$$

The successive water levels are shown in Diagram IX. below.

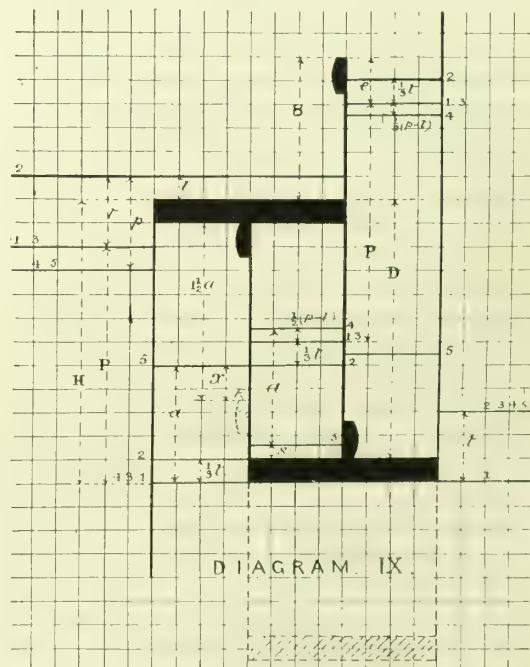


DIAGRAM IX

From inspection, we see that

$$t = H + l - P$$

$$a = D + B - P - e - S + \frac{1}{2}(p - t)$$

and $x = D - 2\frac{1}{2}a$

$$\therefore v = D - 2\frac{1}{2} \left(D + B - P - e - S + \frac{p}{2} - \frac{H}{2} - \frac{l}{2} + \frac{P}{2} \right)$$

$$\text{or } x = \frac{5P + 5H + 10e + 10S - 6D + 5l - 5p - 10B}{4}$$

which agrees with Formula IX on p. 369 of previous article.

The determination of the various problems by the graphical method is somewhat complicated, and unless very great care is taken, it is easy for errors to creep in. It is therefore important that the results obtained graphically should in all cases be checked by the formulæ.

The application of the formulæ presented in these articles is so exceedingly simple that no one need hesitate to grapple with them when desirous of determining whether or no a gasholder cup will blow gas to waste during the process of uncupping.

CONCLUDING REMARKS.

Much might be said on the treatment of gasholder cups, and matters akin to them; but it would be beyond the scope of the present articles. Before leaving the subject, however, it may be well to call attention to a few important points too frequently lost sight of.

(1) *Level of Water in the Tank.*—When putting a new gasholder into action, it is almost the universal practice to fill the tank with water to the overflow level before the gasholder rises, or at the best the inner lift alone is suspended. As a consequence, a large quantity of water is run to waste when the holder is inflated. When the entire holder is empty and at rest in the tank, a gasholder tank should be filled short of the overflow level by a depth equal to the pressure given by the entire holder when inflated. If the whole gasholder is on the rest-stones, and the pressure it would give when inflated would be 10 inches, then the water should not be higher than 10 inches below the overflow. Then, when the holder is giving its full pressure, the water outside will rise to the overflow level, without any waste.

(2) *Level of Vent Pipes in Crown of Gasholder.*—When filling a gasholder with gas for the first time, it is important that the vent pipe or pipes for the emission of air from the crown of the holder should reach within an inch or two of the actual water level inside the holder. The holder being at rest, this water level should be below the overflow level by a distance equal to the pressure given by the holder when fully inflated. It would not be sufficient to let the air vent pipe reach within a few inches of the overflow level, but of the *actual* water level, which is, or should be, below this.

NOTE.—Of course, if the tank has been filled too full of water, contrary to the directions given above, this rule requires modification.

(3) *Testing Cups for Soundness.*—It is very important to remember, in testing a gasholder for soundness, that the grips should be specially tested during the action of cupping and uncupping, as it is at such times that they have to resist the greatest pressure of gas or air. It is not sufficient to test them when the holder is fully inflated, because the pressure in the grips is not then nearly so great as during the time of cupping and uncupping. Much greater attention should be paid to the testing of cups and grips than is ordinarily the case. Of course, when testing for soundness, the greater the pressure that can be put on the grips the better.

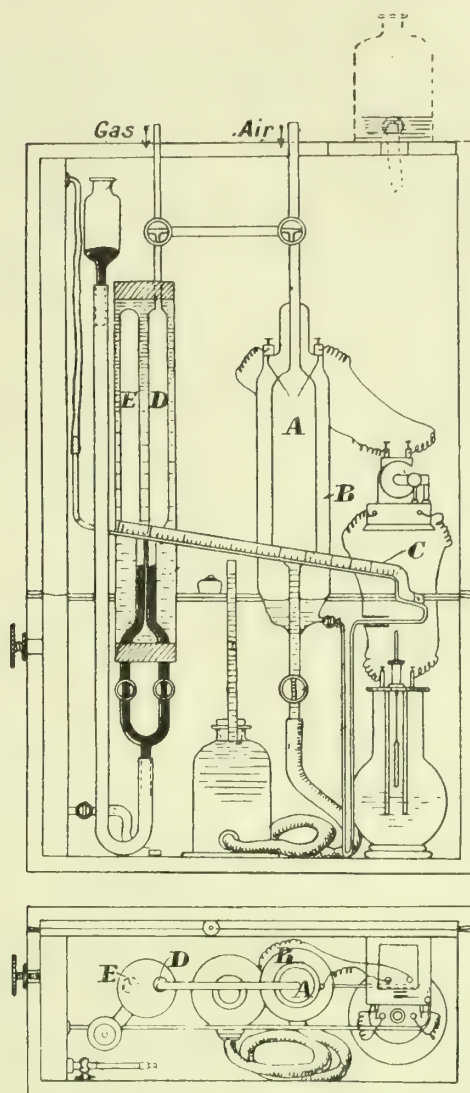
∴ Erratum. First article, Vol. CX., p. 370. Example 8. for $x = -1\frac{1}{8}$, read $x = -1\frac{1}{4}$.

THE STRACHE GAS CALORIMETER.

A calorimeter designed by Dr. H. Strache, Professor at the Technical College at Vienna, embodies a different principle from those hitherto employed. A description of it—taken from the "Journal für Gasbeleuchtung"—was circulated at the meeting of the German Association of Gas and Water Engineers held at Königsberg this summer.

The Junkers and similar calorimeters, which determine the increase of temperature of a uniform stream of water due to the heat from a gas-flame burning at a uniform rate, necessarily require a water supply and waste pipe; and they cannot, therefore, be employed where these are not available. Other types of gas calorimeter depend on the determination of the radiation from a body heated by a gas-flame; but these are liable to inexactness in consequence of changes in the surface of the body and in the air currents. The Strache calorimeter dispenses with a water supply, and is stated to give exact results.

The Strache calorimeter consists (as shown) of an explosion pipette A surrounded by a glass jacket B, the expansion of the air in which can be measured on a sensitive pressure-gauge C. A burette D is used to measure off a known volume of the gas to be tested; and this volume is passed into the explosion pipette, and burned with a sufficient quantity of air. The burette is placed alongside, and its mercury seal is in communication with



a similar tube E containing a volume of air equal to 30 c.c., at standard temperature and pressure. The volume of gas taken in the burette is such as to balance the pressure of the air contained in the control tube; so that it is known forthwith that the volume of gas taken for the explosion is exactly equal to 30 c.c. in standard conditions of temperature and pressure. Correction of the volume by calculation is thus avoided. The heat evolved by the combustion of the 30 c.c. of gas in the explosion pipette is communicated to the air in the jacket of the double-walled explosion vessel and causes the air to expand. The degree of its expansion is a measure of the heat communicated to it, and is ascertained by the readings of the pressure-gauge, which is in communication with the air in the jacket. The whole apparatus is arranged compactly in a portable case resembling that of the various forms of Orsat's or Haldane's gas analysis apparatus.

The advantages claimed for the Strache calorimeter are:

- (1) Independence of water supply, waste pipe, or other permanent fittings.
- (2) Portability and ease of employment at any spot.
- (3) Small amount of gas—viz., 30 c.c.—which is required for a determination.
- (4) Rapidity with which a determination can be made; the time occupied being from three to five minutes.
- (5) Simplicity and low cost of the apparatus, as compared with calorimeters which require a water supply and gas-meter and governor.
- (6) Exactness of results.
- (7) Independence of observations of temperature and barometric pressure.

A number of examples of determinations are given in the paper from which this description of the apparatus is taken, showing that concordant results are obtained in successive determinations on the same sample of gas.

Synthesis of Methane.—At a recent meeting of the Chemical Society, Messrs. W. A. Bone and Hubert F. Coward stated that, as the result of a continuation of their previous experiments, they were able to report a not less than 95 per cent. yield of methane from less than 0.03 gramme of highly purified sugar charcoal (containing not more than 0.06 per cent. of ash and less than 0.1 per cent. of hydrogen) by maintaining it in a steady current of pure, dry hydrogen at 1150° for 17 to 25 hours continuously; thus completing the proof of the direct synthesis of methane from its elements at this temperature.

RETORTS v. LARGE CHAMBERS.

In the "JOURNAL" last week (p. 324), we gave a summary of a paper on the above subject read by Dr. R. Geipert at the meeting of the Association of Gas and Water Engineers of Austria-Hungary. A paper was read at the same meeting by Herr O. Peischer, the Manager of the Innsbruck Gas-Works, giving a descriptive account of the new municipal works of the town, with special reference to the installation of horizontal carbonizing chambers. These chambers have been already described in the "JOURNAL" for April 26 last (p. 231); and the results of an eleven-days' trial run and of three months' regular working were then given. Much of the matter contained in Herr Peischer's paper before the Innsbruck meeting has, therefore, already been brought to the notice of readers of the "JOURNAL." There is, however, a certain amount of fresh information; in particular, the report of the further experience gained since the first three months of the working of the new settings.

The results of six months' working of the chambers show an average make of gas of 11,052 cubic feet per ton. The gross calorific power of the gas made averaged, on 488 tests, 613 B.Th.U. per cubic foot; and the net calorific power 562 B.Th.U. per cubic foot. There were put into the chambers in this time 1695 charges in place of a possible maximum of 1950; so that the settings were only actually utilized to 87 per cent. of their possible capacity. The fuel consumption was accordingly relatively high—viz., 16·5 per cent. of the weight of coal carbonized, or 31·2 lbs. of wet coke per 1000 cubic feet of gas made. The tar produced amounted to 5·4 per cent. of the weight of coal carbonized. Less than 1 per cent. of the tar made was thick tar or pitch. The tar had a specific gravity of 1·06 and was of a freely fluid, oily character. It was applied directly for heating boilers by means of the pipes and jets used for crude oil. The coke was somewhat harder and in larger lumps than ordinary retort coke, but rather less hard than vertical retort coke. The gas produced varied in calorific power at times from 393 to 640 B.Th.U. per cubic foot; but the different grades mixed quite well in a single gasholder, and the daily variations in the calorific power of the gas distributed were ordinarily no greater than 23–34 B.Th.U. per cubic foot. Such fluctuations caused no trouble to consumers.

Practically no scurf was formed in the retorts. The ascension pipes were burnt through before each charging; and in cases where the charges had not been completely burned off, a good deal of smoke was thus produced, which it would be desirable to lead into a lofty flue. There were no cases of stopped ascension pipes. The coke was discharged from the horizontal chambers by means of an electrically driven machine. This has worked perfectly during the six months except that on three occasions small points which needed attention were dealt with during the night-time when it was not in use. A pressure gauge is attached to each ascension pipe, so that the pressure in each chamber can be constantly observed. It is maintained at 0 to 2½ 10ths, either by varying the dip or by opening a bye-pass valve which allows the gas to go direct into the foul main without passing through the dip. There is telephonic communication between the carbonizing stage and the engine-house, so that the exhausters may be regulated according to the instructions of the carbonizing foreman who observes the pressure gauges and the records of calorific power. The make of gas per man per shift would, with the addition of another setting, amount to 56,500 cubic feet, which is a great advance on what had been accomplished with the old retorts. The figure is not really comparable with a corresponding figure of 247,000 cubic feet quoted by Herr Weiss, of Zürich, for his settings of vertical retorts, because his figure does not include attendance on the furnaces, and applies to a much larger installation.

It is a truism that the smaller the installation the higher are the wages relatively to the make of gas. A vertical retort installation of the same productive capacity as the carbonizing chamber plant at Innsbruck would have cost £8300 more than the latter; and the interest and depreciation charges on this additional expenditure would have been about £800 a year more, which, at the rates of pay which prevail at Innsbruck, would have served to pay seven men for one shift per diem, or for the requisite attendance on three settings of carbonizing chambers. A comparison instituted between the settings of 18 vertical retorts and the horizontal chambers at Innsbruck, which makes out that only three men are required to produce the same amount of gas with the vertical retorts as 32 men with the carbonizing chambers, is invalidated, not only by the difference in the sizes of the installations on which the figures are based, but by the fact that the labour reckoned for the vertical retorts is only that required for charging and discharging them; whereas the figures for the carbonizing chambers comprise the whole labour employed in the carbonizing house. Such comparisons, to be of any value, must be made on absolutely the same basis; and the cost of the installation must be also taken into account.

The discussion on the papers read by Dr. Geipert and Herr Peischer was opened by Herr F. Bössner, the Chief Engineer of the Municipal Gas Undertaking, of Vienna, who contended that the vertical retorts should be compared with carbonizing chambers on the basis of their working without steaming. Thus Herr

Delbruck had pointed out that, as a mean of the results obtained with Dessau vertical retorts at Mariendorf, Zürich, Cologne, and Dessau, the make of gas per ton of coal was 11,690 cubic feet, and the coke consumed as fuel amounted to 14·62 per cent. of the weight of coal carbonized. ["JOURNAL," Vol. CX., p. 500.] On the other hand, Herr Krause, the Manager of the Hamburg Gas-Works, states that for the Munich chamber settings at his works a yield of 11,840 cubic feet of gas per ton of coal, with a fuel consumption of 14 per cent., was guaranteed. The high yield actually obtained at Hamburg was verified by the speaker from the works' books in the summer of 1909. The inclined carbonizing chambers at the Vienna works in two carefully checked trials of six days each, with a pressure of 2·10ths in the ascension pipes and using very wet coal, gave a make of 12,093 cubic feet per ton of coal; the gross calorific power of the gas being 573 B.Th.U. per cubic foot. The coke consumed in the producers amounted to 14·2 per cent. of the weight of coal carbonized. It would thus appear that the carbonizing chambers are not inferior to vertical retorts as apparatus for the distillation of coal.

The fuel item for vertical retorts, when worked with steaming, should include the fuel consumed in producing the steam as well as the coke consumed in the retorts according to the water gas reaction. Delbruck gave the average make of gas in vertical retorts with steaming at 13,592 cubic feet per ton, and the fuel consumption at 15·7 per cent. The difference between the make of gas with and without steaming is, therefore, 13,592 – 11,698 = 1894, or nearly 1900 cubic feet per ton; and the carbon contained in this amount of gas, and the steam (taken at double the theoretical quantity) admitted, would entail a consumption of coke equivalent to 2·44 per cent. of the weight of coal carbonized—making the total coke consumed in the working of vertical retorts with steaming equal to 15·7 per cent. + 2·44 per cent. = 18·14 per cent. The comparative figures for fuel consumption therefore appear to be as follows:—

Vertical retorts without steaming	28·0	Pounds per 1000 cubic feet.
Carbonizing chambers	26·5	
Vertical retorts with steaming (Delbruck's figures + 2·44 per cent.)	29·9	
Vertical retorts with steaming (Geipert's figures + 2·44 per cent.)	23·8	

The last-named figure represents the latest achievement of the vertical retorts; but it must not be supposed that the carbonizing chambers have not also made progress. At Vienna, horizontal chamber settings are in course of erection for which the fuel consumption is guaranteed not to exceed 12 lbs. of dry coke per 100 lbs. of coal carbonized. This is equivalent to 22·6 lbs. of coke per 1000 cubic feet of gas made. The guarantee applies to small coke, which has only one-half the value of large coke in Vienna. Moreover, the fuel guarantee refers to a whole year's working of the chambers, and not merely to a supervised trial of one or two days' duration.

In regard to the labour required, the make per man per shift with vertical retorts is put at 600,000 cubic feet. But this refers only to retort-house labour proper, and 14 per cent. of the make is water gas, which may be regarded as produced by the boiler attendants instead of by the retort-stokers. Hence the make per stoker per shift becomes really 515,000 cubic feet. At Hamburg, the labour for a make of 3½ million cubic feet with the chambers is guaranteed at not more than ten men, of whom five may be regarded as furnace men and five as employed on the chambers on the same basis as the labour is reckoned for the vertical retorts. Hence the corresponding figure for the chambers is a make of 705,000 cubic feet per man per shift. The inclined chambers at present in use in Vienna make 307,000 cubic feet per man; but when they are provided with self-sealing lids, so that luting is no longer necessary, the make per man will be at least 565,000 cubic feet. Hence the large carbonizing chamber need not retire before the latest type of vertical retort-setting. The large charge makes for economy of labour. The charge per chamber is 6 to 9 tons; that of three retorts (charged simultaneously) in the setting of eighteen verticals, about 1½ tons. Hence the number of charges is with chambers a fourth to one-seventh that with vertical retorts. It is interesting in this connection to remember Mr. E. Körting's statement that the Men's Union at Genoa has settled that 17 men shall be engaged per 24 hours on the setting of 60 vertical retorts there, as compared with the six men required for 120 to 180 retorts in Berlin. As the retorts are charged twice in 24 hours, each man at Genoa accomplishes only 7·12 retort-charges, against 60 charges in Berlin. It is much easier for a workmen's union to enforce an increase of the staff employed with vertical retorts than with chambers, having regard to the smaller number of charges with the latter and the fact that all the charging is done in the day time. In the speaker's opinion, the chamber not only is not inferior to the vertical retort, but is destined to have the future to itself.

Herr Bennighoff, of the firm of Aug. Klönne, of Dortmund, was the next speaker. He said that his firm had erected three types of chamber settings—viz., horizontal, inclined, and vertical—all of which had now been in use for a long time; but the results had taught that the horizontal were the simplest and the best. The horizontal chambers as erected at Rotterdam two years ago had been copied, after inspection, at Padua, Rixdorf, and Frankenthal. At Padua, Holmside (Durham) coal was used; at Rixdorf, a mixture of New Levenson and Upper Selesian; at Frankenthal, Saar coal; and at Rotterdam, English and Westphalian. The makes quoted by Herr Peischer were not high for Saar coal; but, owing

to the elevated position of Innsbruck, he probably found it necessary to manufacture gas of high calorific power, and be content with a comparatively small make. At Frankenthal, Saar coal in the horizontal chambers, has given considerably higher makes—*e.g.*, on May 18 last, 12,810 cubic feet per ton, the gas having a gross calorific power of 587 B.Th.U. per cubic foot; on May 19, 13,491 cubic feet, of 590 B.Th.U.; on May 20, 13,617 cubic feet, of 603 B.Th.U.; and on May 21, 13,129 cubic feet, of 599 B.Th.U. With these high makes, the fuel (coke) consumption was naturally rather high—*viz.*, 14.5 to 15.2 per cent. by weight of the coal carbonized. The horizontal chambers at Padua, on a six days' trial run, showed a make per ton of 12,200 cubic feet of gas, of 607 B.Th.U. gross calorific power, and 14.5 per cent. of coke consumed in the furnaces; those at Rixdorf, on a three days trial, a make of 12,020 cubic feet, of about 607 B.Th.U., and 12.5 per cent. of fuel consumption. A four-weeks' trial run of the inclined chambers at Königsberg showed an average make of gas of 12,200 cubic feet of 607 B.Th.U., with 15 per cent. of fuel consumed. A vertical chamber setting at the Dortmund Gas-Works had been in use for 480 days; but it was worked with ten settings of Dessau vertical retorts, and the results could not be exactly ascertained for it alone. In a short time, however, this would be possible. The fuel consumption had, however, repeatedly been found to be 14 per cent., as compared with 18 to 19 per cent. for the vertical retort-settings.

The speaker had some doubts at first as to the results of entrusting the chamber settings at Padua to the care of the Italian workmen; but his doubts were quickly set at rest, as the installation was soon worked by them in a most exemplary manner. Ten minutes were occupied in charging a chamber; and the rate of production of gas was very uniform. With a make of 705,000 cubic feet per diem at Padua, the difference in the make per hour in the most extreme cases was only 7050 cubic feet. The speaker showed by a diagram that the calorific power of the gas was also very uniform. He had just returned from a three days' trial of the Padua settings in which observations made of the illuminating power of the gas, according to the French method, had been at intervals of ten minutes. The results had not been properly worked out yet; but the speaker could say that, with a make of gas of 12,020 cubic feet per ton, the quality varied from 110 to 60 litres per carcel—*i.e.*, from 2.52 to 4.62 candles per cubic foot. The figures quoted indicated that the large chamber was fully equal to the vertical retort. It was, of course, unfair to compare the labour required for an installation of chambers with vertical retort plant of double the productive capacity. The 1910 type of vertical-retort plant, of which one setting made 245,000 cubic feet of gas per diem, should be compared with a bed of chambers of similar capacity. Such chambers would be about 26 ft. 3 in. long; and three men would be able to make about 1,765,000 cubic feet with them, or nearly 600,000 cubic feet per man. The labour here taken into account was only that corresponding to the pure retort-house labour on which the calculations in regard to vertical retorts had been based—*viz.*, one man on the machine, one man on the top, and one man at the discharging side of the settings. Naturally the coal would be brought up to, and the coke taken away from, the settings by machinery. In Italy, more men were required than in Germany and Austria—partly owing to the climate, but partly also to their organization. At Padua, 62 men employed in the old retort-house had been displaced by 11 men, whose work included coal conveying, charging producers, clinkering, and all incidental carbonizing work; while the make of gas remained the same—*viz.*, 705,000 cubic feet per diem. All the chambers were charged between seven and eight o'clock in the morning, and two and three o'clock in the afternoon. There were three eight-hour shifts of two men each; and the other five men worked from seven to eleven o'clock in the morning and from two to six o'clock in the afternoon. Fewer men would be needed in Austria or Germany. The chambers were sound; and, as they worked under a positive pressure in any case, no flue gas was drawn into them. In order to adapt the working of large chambers to fluctuations in the demand for gas, the experiment was tried at Frankenthal of giving up Sunday work altogether; and the results had been quite satisfactory. The same experiment was about to be tried with the chambers at other places.

Dr. Strache, Professor at the Technical College at Vienna, said that vertical retorts and chambers must be compared on the same basis—either both without steaming or both with steaming. Also the make and calorific power should be stated at the same temperature and pressure for the volume of gas—Dr. Geipert took 0° C. and Herr Peischer 15° C. It should be settled once for all to what temperature the volume of gas in determinations of calorific power should be reduced. [This criticism does not generally apply to the abstract translations of German and Austrian papers in the "JOURNAL" since, whether the basis adopted in the original is 0° C., 760 mm., and dry, or 15° C., 760 mm., and saturated, the English equivalents are invariably reckoned to 60° Fahr., 30 inches, and saturated; so that all the figures given may be strictly comparable. In a few cases, a little uncertainty is introduced, through the authors not clearly stating whether the gas has been measured at 0° or 15° C., and whether dry or saturated. —Ed. J.G.L.] As to chambers and retorts, Dr. Geipert was not justified forthwith in condemning chambers because one trial which he had made had been unfavourable to them, while other investigators had obtained favourable results. The fact that ovens were preferred to retorts for producing metallurgical coke was a strong point in favour of the large chambers. The speaker

would be glad if Herr Peischer would give the relative cost of horizontal and inclined chambers. The former would be cheaper as regards the setting alone; but a discharging machine was required. Did the work of the latter tend to make the chambers unsound? Some figures had been quoted which showed a higher calorific power for the gas made when the chambers were new than when they had been in use some time. Was the falling off in calorific power due to leaks in the chambers?

Herr A. Weiss, the Manager of the Zürich gas undertaking, said that the make of over 212,000 cubic feet per man per shift obtained at Zürich with vertical retorts with steaming had been arrived at after including the labour required for charging and clinkering the producers, as well as clearing the take-off pipes and lubricating the levers. This applied to eight-hour shifts—at the works where ten-hour shifts were still maintained, the make per man per shift would be higher. The make of gas per ton of coal, in the vertical retorts without steaming, was found to be about 8 per cent. higher than in the old inclined retort settings. The fuel consumption had remained at about the same figure (15 per cent.) taking the water gas made into account, and was therefore lower than that of the horizontal chambers at Innsbruck. The Zürich figures referred to Ruhr coal. Saar coal as used at Innsbruck should give a higher make per ton; and the 11,050 cubic feet attained there must be considered a low make per ton for that coal. The reduction in the formation of scurf probably was due to its combustion by air, which passed in while the doors were open for 1½ hours for charging the chambers and burning out the ascension pipes. The regulation of the pressure in the chambers appeared to require nice and troublesome adjustment. The repairing charges upon the vertical retorts might be said to be *nil*. The settings at Zürich had been in use about 1000 days, and the only repairs executed had been the renewal of two top lids of the retorts. The settings themselves were in normal condition. In comparing the initial cost of the different types of carbonizing plant, it should be definitely stated whether the cost of a retort-house had been included in each case. The cost of five settings of ten vertical retorts, stated by Herr Peischer at about £16,875, included a retort-house. The settings alone would cost about 20 per cent. less; and the outlay per 1000 cubic feet of productive capacity per diem would be reduced to about £25 3s. 6d. The new settings of 18 vertical retorts would cost about 10 per cent. more. But their productive capacity would be some 30 per cent. greater; so that they would result in a further economy of 20 per cent. The cost of the carbonizing plant would therefore become about £20 per 1000 cubic feet per diem productive capacity, as against about £23 12s. for chamber settings. Different views might be held as to whether a house was necessary for vertical retorts or chambers; but the advantages gained by the men at one time of the year through its absence were largely balanced by the disadvantages at another time. In Switzerland, it could not be dispensed with.

Herr Koppers, of Essen-on-the-Ruhr, wished to ask Dr. Geipert why the fuel consumption for the vertical retorts had not been determined, like the make of gas, on a seven days' trial, and why the producers had not been fed with the coke from the retorts. A desire to avoid disturbing the stable condition of the furnaces was hardly a sufficiently plausible reason for using other coke. It seemed more likely that the coal which gasified most readily had been chosen for charging the retort; and good, hard coke from other coal preferred as fuel for the producers. The Vertical Retort Company took care, when its agreements provided for a 14-day trial with penalties for non-fulfilment of the conditions of supply, only to guarantee a fuel consumption of 17 per cent. The report of the Düsseldorf Gas-Works gave a fuel consumption of 16.2 per cent. for the vertical retorts, 14.18 per cent. for the horizontals, and only 13.2 per cent. for the inclined retorts there. The same report stated also that the make per man per shift with the vertical retorts was 69,400 cubic feet. As to the fuel consumption with vertical retorts, a few gross examples might be quoted, *viz.*: At the Mariendorf works at Berlin, it was 13.5 to 14 per cent.; at the Oberspree works, 16 per cent.; at Frankfurt-on-the-Maine, 16.9 per cent.; at Potsdam, 17.5 per cent.; at Charlottenburg, 19.5 per cent. No theoretical explanation that the fuel consumption with vertical retorts must be lower than with other types of setting could prevail in the face of these figures. After all, the fuel consumption depended on the efficiency of the recuperative system. At Düsseldorf, for instance, this was so low with the vertical retorts that the gases leaving the setting were taken to a boiler and gave a supply of high-pressure steam. It would be useful to have particulars of the temperature of the spent gases on the days when trials had been conducted on vertical retort-settings, as many deductions might be drawn therefrom. In regard to the investigations which had been made with a view to increasing the productive capacity of the vertical retorts, it appeared that in one case a large retort was tried, and in the other case three small retorts coupled together. It was found that the increase in the heating surface relatively to the amount of coal in the charge gave a higher efficiency. This conclusion was quite correct; but it applied only to vertical retorts. In carbonization, the gas passed away in the opposite direction to the inflow of heat—*i.e.*, to the heated walls, and then upwards. In vertical retorts, in particular, the column of coal or coke was enveloped by gas, which tended to resist the penetration of the applied heat. The larger the quantity of gas rising up between the charge and the heated walls, the greater would be its insulating effect, the higher would be the fuel consumption, and the

greater would be the pyrogenous decomposition resulting in the formation of much scurf on the walls, while the valuation figure—i.e., product of make and calorific power—of the gas produced would be lower than was otherwise attainable. With horizontal chambers, a heating surface of 36 ft. by 8½ ft. by 6½ feet sufficed for carbonizing a charge of 12 metric tons of coal in twenty-four hours. This was equivalent to 51½ square feet of heating surface per ton (English) of coal carbonized, which corresponded to a supply of heat of 1026 B.Th.U. per pound of coal. Taking the efficiency of the producer at 80 per cent., and the coke used as containing 10 per cent. of ash, the corresponding consumption of coke as fuel was equivalent to 10 per cent. of the weight of coal carbonized. These figures referred to horizontal chamber settings with regenerative firing as now employed. The settings of 18 vertical retorts, on the other hand, had a heating surface of 100·6 square feet per ton (English) of coal carbonized per twenty-four hours. Notwithstanding that the heating surface per unit weight of coal gasified was nearly double that in horizontal chambers, the fuel consumption was considerably greater than with the latter. The producers of the chamber settings, moreover, burnt breeze ranging from 0 to 1½ inches in size, which was of comparatively little value; whereas coke well-screened by forks was required for the vertical retort settings. At coke-oven works, the coals were valued according to an established distillation test in the laboratory; and the theoretical figures thus ascertained were usually reached in the works' plant, on the efficiency of which they afforded a check. The present gas-works settings were not so perfected that similar results could generally be attained with them. It should be the aim of constructors of gas-settings to ensure that the theoretical valuation figure of the coal should be reached in the valuation figures of the gas, the bye-products, and the fuel consumed. The large chamber settings already constructed by the speaker had fully reached the valuation figures for gas and bye-products. The horizontal chamber settings with regenerative firing now being erected at the Vienna Gas-Works would work with the theoretical quantity of fuel necessary, just as the coke-ovens erected by the speaker already did.

The next speaker was Herr H. Rauch, the Superintendent of the Munich Gas-Works, who presented the communication of which an abstract translation has already been given in the pages of the "JOURNAL" (*ante*, p. 262). At the conclusion of his remarks, the authors of the papers—Herr Peischer, of Innsbruck, and Dr. Geipert, of Berlin—replied to points raised in the discussion.

Herr Peischer said that he could definitely state that the gas made in the carbonizing chambers at the Innsbruck works was not partly flue gas but was pure coal gas. This was proved by its high calorific power. In regard to the fluctuations of the latter, Dr. Roth, of Zürich, had made an examination extending over two days, and had found that the fluctuations in calorific power were no greater than with vertical retorts. Moreover, it had never once been necessary to change from one gasholder to another because of the varying calorific power of the gas. They worked in and out of their large gasholder, and only changed over when the quantity of gas in it rendered a change imperative. The objections raised to the chambers, on the score of the fluctuating calorific power of the gas, were absolutely untenable. In regard to the cost of a retort-house, it was true that the costs of installation of plant per 1000 cubic feet of gas made, as referred to by the author, included the cost of a retort-house in the case of the vertical retorts, but did not include the cost of a house in the case of the large chambers. But if the contractors for vertical retorts said that a retort-house was necessary, while those for chambers guaranteed that a house was superfluous, this comparison seemed to the speaker quite fair. To his mind, it would be absurd to erect a house for the chambers—the work would only be rendered more arduous thereby. He had certainly contemplated putting a light roof over the bench, but he had not yet made up his mind that even this was desirable. Its cost would, however, be, at the outside, about £85, which was negligible in relation to the rest of the outlay. The estimate of the Vertical Retort Company, on which the speaker's calculations as to the cost of an installation of vertical retorts were based, was, moreover, low in comparison with later estimates which had come to his knowledge. In one case in which he was acting as expert adviser to a municipal gas undertaking, the estimate of the Vertical Retort Company corresponded to a capital outlay of £41 6s. per 1000 cubic feet of productive capacity per diem. With such huge differences in the capital outlay, the question of the provision of a retort-house became of no moment. In regard to the absence of scurf in the chambers, Herr Weiss had evidently been speaking under a misapprehension. Ordinarily, the ascension pipe of the chamber was opened for 30 to 35 minutes before charging commenced, in order to burn out the pipe. Any longer time was unnecessary. But nothing was opened on the chamber except the top lid. The air flowed thence direct into the ascension pipe; and it was inconceivable that it should pass down to the bottom of the chamber against the upward passage of the hot gases from the coke in the chamber.

Dr. Geipert said that the partisans of the large chamber settings had failed to give figures for their working with the fulness with which he had given them for vertical retorts. They were for the most part bald figures, without particulars of the experimental conditions which were essential to their proper appreciation. Only Herr Peischer had given details; and what he had given did not appear to the speaker to be favourable to the chambers. A make of 11,052 cubic feet of gas per ton for Saar coal was very

moderate, even taking into consideration the calorific value of 613 B.Th.U. gross per cubic foot for the gas. The fuel consumption of 16½ per cent., or 31½ lbs. of coke per 1000 cubic feet of gas made, was high. Owing to the unsoundness of the chambers, the working became very troublesome indeed. There was a pressure-gauge to be watched on each ascension pipe, hourly testings of calorific power were necessary for control purposes, and the pressure in the hydraulic main had to be regulated by hand according to the calorific value of the gas. Gasification ceased for an hour daily while the ascension pipe was burnt out; and this operation produced a great smother. This involved the loss of valuable constituents, which might be reckoned at at least 0·5 per cent. of the weight of the coal carbonized. Herr Peischer chose chambers mainly on account of the higher first cost of vertical retorts. The difference for the Innsbruck installation was about £4580, of which about £3330 would be for the retort-house. The increased cost for vertical retorts would therefore have been only about £1250, which would involve an annual charge for interest and redemption of about £75. But the vertical retorts would effect a much greater saving than this in respect of wages alone. Herr Peischer required eleven men for working his chambers. The small works of Oberspree and Weissensee, in Berlin, had installations of four and five beds of vertical retorts, having a productive capacity of 705,000 and 880,000 cubic feet per diem respectively; and they required only one man in each shift, or three men a day. The man charged and discharged the retorts, regulated the air supply to the furnaces, did the necessary cleaning, and all the work of attending on the settings. Once every 72 hours only he had an assistant for clinkering. Herr Peischer might therefore with vertical retorts have saved eight men, or at least £415 per annum. Moreover, he would have saved fuel also, and have had the benefit of a greater make of gas. The ammonia would also have been increased with vertical retorts. The speaker obtained 0·247 lb. of ammonia per 100 lbs. of Saar coal carbonized, as against 0·220 lb. obtained at Innsbruck. Secondly, Herr Peischer seemed to attach special importance to the limitation of work to the day time, though he admitted that, as a result, the calorific power of the gas made ranged from 393 to 640 B.Th.U. per cubic foot. Equalization of the quality of such variable gas could only be secured by having excessively great gasholder accommodation, the cost of which ought not to be ignored. Thirdly, he had spoken of the maintenance charges in respect of the settings; but Herr Weiss had answered this point by stating that the vertical retort settings at Zürich had required no repairs in the course of 1000 days' working. Fourthly, Herr Peischer had said it was an advantage of the chamber that it was free from scurf. Scurf was formed, however, just as much in the chamber as in the vertical retort; but the chamber was open for such a long time at each charging that the scurf was burnt off again each time. The chambers must thereby be considerably cooled.

There was no reason for assuming that the working at Innsbruck was worse than elsewhere, and, consequently, it must be concluded generally that vertical retort settings worked more economically than chamber settings. Herr Bössner had overlooked the fact that the speaker had throughout taken into account in the fuel consumption the quantity of coke used to produce water gas in the vertical retorts. Calculations, to which no exception could be taken, showed that only two-thirds as much fuel was required for the settings of 18 vertical retorts as for chamber settings. It must be remembered that in practice with a normal temperature in the chamber, gas of high calorific power would be produced, and this would be brought to a lower level by the addition of water gas. The calculations of Mr. Körting and the speaker assumed that the hot coke in the vertical retorts would be lowered about 360° Fahr. in temperature through the formation of water gas. The bearing of this on the advantages derived from steaming in vertical retorts had been discussed in detail by the speaker in a paper read the spring of last year ["JOURNAL," Vol. CVI., p. 296]. Herr Bennighof objected to the trials of fuel consumption of the vertical retort-settings with Silesian coal, on the ground that the coke from this coal was not used, but English coke instead. As a matter of fact, the coke employed was the ordinary works' coke, consisting of about 70 per cent. of English and 30 per cent. of Silesian coke. This was used merely as a matter of convenience. It contained 12½ per cent. of ash; while the coke from Silesian coal contained only 7 per cent. Thus it was not a better, but an inferior, coke which was used in the trials. The same speaker quoted very high figures for the make of gas in the chambers at Frankenthal. But he would probably find it difficult to maintain such results through a whole year, as it was likely that the settings had been worked at too high a temperature. But what object was there in his quoting figures which were not absolute working results? With reference to chambers, inquiry should be made as to how much nitrogen was contained in the gas from them. This information would be instructive in regard to gasification in chambers. Herr Koppers had declared that 6 per cent. of nitrogen was permissible. There might, however, be 50 per cent. and over of nitrogen in chamber gas. With vertical retorts, on the other hand, the nitrogen in the gas never exceeded 1·5 per cent. The view of Herr Koppers, that the gas in vertical retorts formed an insulating layer between the coal and the walls, had so little support that it need not be discussed. Professor Strache's impression, that the vertical chamber setting had not been properly tested, was ill-founded; and the speaker would merely refer him to his paper. In regard to Herr

Rauch's report of a make of 13,420 cubic feet (uncorrected) of gas per ton, the gas having a calorific power of 554 B.Th.U. per cubic foot, the speaker assumed that this result was obtained by twenty-four hours' working at a high temperature. The fuel consumption would therefore be very high, and the durability of the settings would be endangered. It would have been better if Herr Rauch had corrected his makes of gas to standard temperature and pressure, because at present they were in no way comparable with other figures. In regard to the statements that the figures quoted for vertical retorts by the speaker would be surpassed by chamber settings, he would only advise that when this occurred the duty of the chambers should be again checked by an impartial authority, especially in respect of the fuel consumption.

GAS OILS AND OIL GAS.

By Dr. H. HEMPEL, of Berlin.

(Continued from p. 326.)

EXPERIMENTAL APPARATUS AND MODE OF WORKING.

After various preliminary investigations, an experimental apparatus was devised for the gas-making trials. This is shown in section in figs. 1 and 2. The gasification chamber consisted of an inclined iron tube A, 40 centimetres (16 in.) long, closed gas-tight at the ends by the caps B. The gas exit pipe C passed through the lower lid of the chamber, and a Mannesmann tube E which passed through both lids contained within a porcelain capillary the thermocouple used for measuring the temperature. The oil was introduced through the branch F containing a spiral distributing trough J. The oil was vaporized in this branch, but

superheating of the vapours therein was avoided by protecting the branch with an asbestos jacket. The vaporized oil passed into the gasification chamber, which was maintained over a considerable length at a constant temperature by the use of six Pharos burners fed with air at high pressure. The air supply pipe K was fed from an equalizing holder of 600 litres (about 20 cubic feet) capacity supplied from a compressor and giving a pressure of 30 centimetres (12 in.) of water. Gas was supplied to the pipe L through a meter at ordinary pressure. The gasification chamber was covered with an asbestos-lined sheet-iron cover M with a lid N with three flues. The gasification chamber and its cover were supported on an iron stand O with six holes, through which the mouths of the burners projected into the combustion chamber. A sight-hole was provided at each end of the cover, for observing the flames. In order to prevent the flames striking-back in the burners through the radiant heat from the furnace when worked at high temperatures, a wire gauze was inserted in each burner tube, and in addition a circulating water jacket was placed round the tubes. By this means it was found that even when the temperature of the retort reached 1000° C. the flames did not strike-back in the burners. Separate tubes were provided for regulating the air and gas supply to each burner, and there was a collar on each burner for adjusting the secondary air supply. The adjustment of the gas and primary and secondary air supplies could be controlled so that a constant temperature was secured. The middle burners had a lower gas consumption than the end burners. The variation of temperature over a length of 10 inches did not exceed $\pm 4^\circ$ when the temperature was about 780° C. Radiation was restricted by the use of asbestos covers and screens.

Tar was extracted from the gas by means of a column packed as to two-thirds with glass beads and as to one-third with glass wool. This column was followed by a U-tube loosely packed with glass wool. The gas passed from this tube into a bell gas-

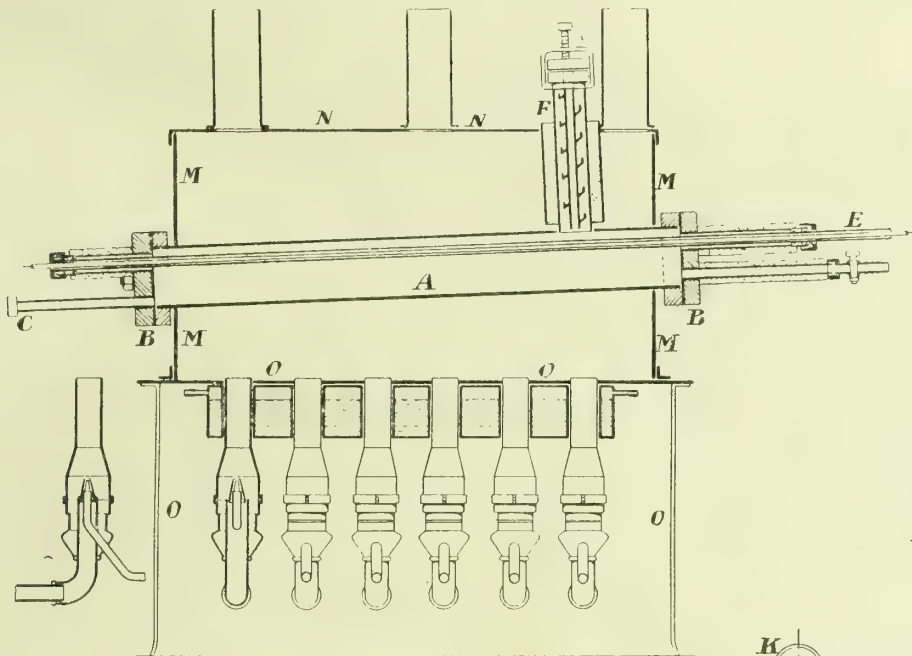


Fig. 1.

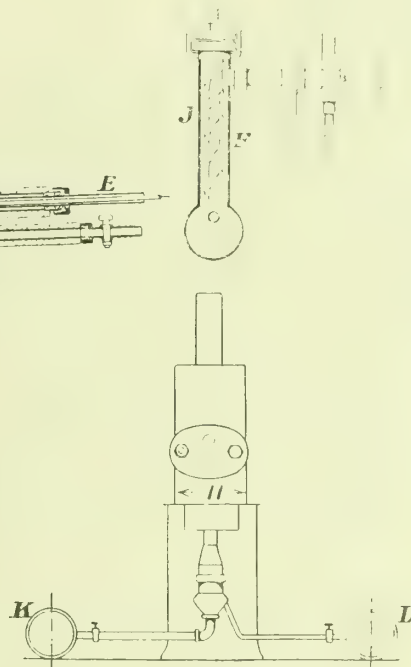


Fig. 2.

holder of 75 litres (2.65 cubic feet) capacity. The tank of the holder was of the annular type, in order to reduce the surface of water exposed to the gas, and thereby the absorption of the constituents of the gas by the water. Analyses showed that the gas remained unchanged in composition for three days. The holder was so constructed that the crown was almost absolutely emptied of gas when the bell fell to its lowest position. The holder was provided with a scale (graduated in litres) and a pressure-gauge, so that the volumes of gas in it could be read off at atmospheric pressure. A small holder with mercury seal was used to collect samples of about 4 litres (0.14 cubic foot) of gas for analyses and determinations of calorific power. The oil supply to the retort was maintained at a constant rate by means of a specially constructed dripping funnel, from which the oil dripped under a constant head into an inclined tube which led into the retort. When a gas-making test was about to be made, the furnace was raised to about the desired temperature, the necessary gas consumption for the attainment of which was known approximately from previous trials. The temperature became constant in about one hour. The temperatures were measured by means of a Le Chatelier thermo-element. The temperature at the oil-inlet end of the furnace was about 15° C. above that of the other end before the oil was run in; but as soon as the gasification of the oil was started, the temperature throughout the retort became uniform. The amounts of oil gasified and of tar extracted were ascertained by weighing. The oil was gasified at the rate of about 1.6 to 2 grammes per minute. The coke remaining in the retort was determined after the latter had cooled. The sample of gas

for analysis and determination of calorific power was collected after the gas had stood for three hours in the large gasholder. The illuminating power of the gas produced was ascertained, after it had stood for three hours, by consumption in a fishtail oil-gas burner at the rate of 35 litres (1.236 cubic feet) per hour. The specific gravity of the gas was ascertained by the Graham-Bunsen effusion method. The gas analyses were made in a Bunte burette with the precautions adopted by Haber. The olefines were determined by absorption with bromine, and the hydrogen by combustion over platinum sponge. The paraffins—methane and ethane—were determined by means of the amount of oxygen consumed. The total oxygen consumption of the hydrocarbons was also ascertained, in order to determine whether the hydrocarbons estimated by absorption with bromine contained benzene or homologues of ethylene in addition to ethylene. The gas was usually found to contain 0.6 per cent. to 0.8 per cent. of oxygen, which was doubtless derived from the air enclosed between the retort and the holder. The calorific value of the gas was determined by means of an apparatus devised by Stöcker and Rothenbach (see "JOURNAL" for April 14, 1908, p. 94), with which determinations can be made on as small a volume as 1 litre of gas with an error of only ± 0.5 per cent. The apparatus was modified by the author, and comparative tests with a Junkers calorimeter showed close agreement in the results.

GAS-MAKING TESTS OF VARIOUS OILS.

The author investigated, in the way described, the results of the gasification of four oils obtained by the distillation of shale or

TABLE I.—Gasifications of Various Oils in Identical Conditions. Temperature, 743° C. (1369° Fahr.).
(All the volumes of gas have been corrected to English standard conditions—viz., 60° Fahr., 30 inches, and saturated.)

Description of Oil.	Specific Gravity of Oil.	Percentage by Volume of Oil Distilling.			Gross Calorific Power of Oil. B.Th.U. per lb.	Gas Obtained per Gallon of Oil. Cubic Feet.	Illuminating Power of Gas. Candles per Cubic Foot.	Candles per Gallon of Oil.	Gross Calorific Power of Gas. B.Th.U. per Cubic Foot.	Calorific Valuation Number. B.Th.U. in Gas per lb. of Oil.	Chief Constituents of Gas. Vols. Per Cent.			Specific Gravity of Moist Gas (Moist Air = 1.000).	Tar Obtained. Per Cent. by Weight of Oil.	Coke Obtained. Per Cent. by Weight of Oil.
		Below 200° C.	200° C. to 300° C.	300° C. to 400° C.							Unsaturated Hydrocarbons.	Paraffins.	Hydrogen.			
Messel's shale gas oil, 1908	0.850	—	41.5	51.1	19,339	78.7	9.8	769	1297	11,929	36.61	47.26	13.27	—	27.12	1.90
Riebeck's lignite gas oil	0.873	2.1	68.2	24.0	18,806	72.1	8.0	578	1195	9868	30.42	50.75	15.59	0.725	44.50	2.83
Pechelbronner petroleum gas oil	0.817	—	56.0	44.7	19,588	81.1	9.7	784	1270	12,150	35.40	49.51	13.68	—	36.35	5.02
Galician gas oil A	0.877	2.1	19.0	70.4	19,418	80.6	10.6	851	1307	11,909	34.78	48.61	15.00	0.804	40.39	1.35
Galician gas oil B	0.870	5.5	30.2	58.8	19,331	79.7	9.7	771	1261	11,555	31.14	49.79	14.71	0.780	41.83	2.12
Roumanian gas oil A	0.879	—	80.0	11.2	19,301	73.8	9.0	665	1208	10,115	29.16	50.97	17.11	0.718	40.69	1.70
Roumanian gas oil B	0.886	1.1	67.6	21.1	19,172	71.1	8.9	632	1229	9813	30.24	51.14	16.55	0.747	48.87	1.74

lignite, five petroleum of German origin, and two Galician and two Roumanian oils, and one Borneo residue. In the first-named instance, all these oils, except the last-named, were gasified at the temperature of 743° C., and at approximately the same rate of flow and the same conditions generally. The principal figures obtained are shown in Table I., which is extracted from the more detailed tables given by the author. [The results for several of the oils of German origin have been omitted as of no practical interest to English gas men.]

It will be seen that the fluctuations in the yield of gas with the different oils were about ± 12 per cent., while the tar produced ranged from 27 to 49 per cent. of the weight of oil gasified. The poorer gas-making oils yielded most tar; but on the other hand the maximum make of gas was not necessarily associated with the minimum yield of tar. Oils of similar origin yielded approximately the same quantity of tar, even though the make of gas varied. The oils which yielded the most gas were, generally speaking, those which gave gas of the highest illuminating power and calorific value. The author considers that the results obtained with his apparatus at 750° to 800° C. conform pretty closely with the results obtained in the gasification of oil in retorts on the large scale. He quotes analyses by Scheithauer and Gräfe of oil gas made in technical apparatus, to show that the composition of the gas obtained in his experimental apparatus agrees closely with that of oil gas as made on a manufacturing scale. The gas contained only a moderate proportion (13 to 16 per cent.) of elementary hydrogen; the calorific power depended on the proportion of olefines and methane. The homologues of methane calculated as ethane amounted to 6 to 9 per cent. The fact that the oxygen consumption of the olefines and paraffins was constant in all the samples of gas shows that these hydrocarbons had the same composition in all the samples. Aromatic hydrocarbons did not occur in the gases. If the calorific valuation number is compared with Hirzel's valuation figure, it will be found that the latter has no claim to even approximate exactness. Helfer's valuation figure, on the other hand, is relatively useful, but does not attain the exactness of the calorific valuation number.

The author next proceeded to study the effect of change in the conditions of gasification, and especially of change of temperature, on the gas produced. In a preliminary series of experiments on Messel gas-oil, he varied the rate of flow of the oil as well as the temperature, and came to the conclusion that a fluctuation in the rate of flow amounting to 25 per cent. had practically no effect on the results. On the other hand, change of temperature appeared to have a very great effect. Between the temperatures 711° and 832° C., the yield of gas increased with the temperature, while the illuminating power and calorific value decreased. The calorific valuation number, however, was very little affected for the range of temperature 711-789° C. The illuminating power and the proportion of heavy hydrocarbons in the gas decreased very greatly as the temperature rose, and consequently Helfer's valuation figure varied very much for the same oil between the temperatures named. The total amount of olefines produced from the oil fell as the temperature rose, while the amounts of paraffins and hydrogen increased. The increase, however, could not be wholly due to the decomposition of the olefines, but the methane must be partially at least produced by direct splitting-off of methane from the terminal members of the hydrocarbons of the oil. If the methane were produced entirely by the decomposition of ethylene, the calorific valuation number would decrease, which was not found to be the case. Whereas the calorific valuation number was but little affected by the rise in the temperature of gasification from 711° to 789°, a further rise to 832° C. caused it to diminish considerably. The secondary decompositions then began to occur to a large extent, and hydrogen resulted from the decomposition of ethylene.

The next series of experiments related to the effect of change of temperature on the gasification of Messel gas-oil, while the other conditions of gasification remained unchanged. The oil was gasified at 744°, 785°, and 880° C. The change from 744° to 785° had no great effect on the calorific valuation number, but the latter fell very greatly when the gasification was carried out at 880° C., showing that the best conditions of gasification had been passed. The composition of the hydrocarbons in the gas made was shown to be altered by the rise to the higher temperature.

The oxygen consumption of the paraffins fell to that which practically corresponded to methane, while the oxygen consumption of the olefines increased, indicating that benzol or homologues of ethylene had been formed.

Another series of experiments with various gas-oils showed the same effects of temperature as the experiment on Messel gas-oil just referred to. In these investigations, extremely high temperatures were avoided—a difference of about 40° C. only being made between the lower temperature of about 743° C. and the higher temperature of gasification. All the oils examined had been gasified at the lower temperature, with the results shown in Table I.; and it was found they had the same values relatively to one another when gasified at the higher temperature. The splitting-off of terminal members of the hydrocarbons of the oil increased at the higher temperature. The decomposition of the oil was affected quantitatively, rather than qualitatively, by the change of temperature of gasification. The proportion of hydrogen in the gas increased as the result of secondary decompositions, and at the same time the yield of coke was increased. There was no definable change in the amount of tar produced. For the sake of comparison, a residuum or liquid fuel produced from Borneo petroleum was gasified at the higher temperature of 785° C. The yield of gas from it—viz., 8.68 cubic feet per lb. of oil—and the gross calorific power of the gas—viz., 1026 B.Th.U. per cubic foot—showed that the Borneo residuum was less valuable than the other gas-oils examined. The proportion of methane and its homologues in the gas from the Borneo oil was higher, and the proportion of olefines lower, than in the gas from the other oils. The total amount of hydrogen and methane produced, however, from a gallon of the Borneo residue was practically the same as the total amount of these gases from the other gas-oils; but the total amount of olefines was considerably less. It thus appeared that with all oils the production of methane and the secondary decompositions were practically the same, and that the difference between the oils was due to these of lower value being less capable of splitting-off chains of two members and upwards. The specific gravity of the gas from the Borneo oil was naturally lower than that made at the same temperature from the other oils, while the mean molecular weight of the hydrocarbons was higher—indicating the presence in them of the higher hydrocarbons (benzol) in addition to ethylene.

(To be continued.)

The Largest Spiral-Guided Gasholder.—The Oldham Corporation have decided to erect at their Hollinwood station a four-lift spiral-guided gasholder of 5 million cubic feet capacity, and have placed the order for it with Messrs. Robert Dempster and Sons, Limited, of Elland. The outer lift will be 210 feet diameter, and each lift 40 feet deep; and the holder will be erected in a concrete tank, 212 feet diameter and 40 feet deep, the order for which has been placed with Messrs. J. Partington and Co., of Middleton Junction. The cutting of the first sod for the tank took place yesterday (Monday).

Purifying Gas and Recovering Ammonia.—A patent has been taken out for the United States by Mr. F. J. Falding, of New York, for a process for purifying gas and recovering ammonia, &c., therefrom, and utilizing the bye-product metallic salts and ammoniacal liquor. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the gas is first subjected to a preliminary scrubbing with a wash liquor containing ferrous hydroxide, produced in a subsequent stage of the process, in order to free it from sulphur, cyanogen, and chlorine, and is then scrubbed with a solution of an iron salt—for example, iron pickling liquor—whereby a solution containing an ammonium salt and ferrous hydroxide is produced. This solution is treated with an oxidizing agent in order to convert the ferrous into ferric hydroxide, which is removed by filtration. The ammonium salt (ammonium sulphate) is recovered from the filtrate. Gas liquor is treated with a quantity of iron pickling liquor to precipitate its sulphides in the form of iron sulphide and sulphur, and after removal of the precipitate is treated with a further quantity of the pickling liquor, so as to produce a solution containing an ammonium salt and ferrous hydroxide, which is treated as described.

THE CHECKING OF WORKING COSTS
IN SMALL GAS-WORKS.

By JAMES DICKSON, of Forfar.

[A Paper read before the North British Association, July 28.]

In bringing this subject before you, the writer is aware of the impossibility of obtaining such complete details of working results in small works as are obtainable in connection with the costs of larger works; and he, therefore, wishes to confine himself mostly to what has come under his own observation.

In the smallest of works cost-keeping of a complex nature would be adding considerably to the already limited time of the manager; and as much of the work is often going on under his eye, very good results are in many cases obtained without keeping details of costs. Much depends upon the individual.

The plea, however, is put forward that it is better for one to know than to expect that things will turn out well at the end of a financial year. There can be no insurmountable difficulty, once a works comes up to the capacity of (say) 15 millions, to the keeping of fairly wide working details from day to day. A system once adopted becomes simple, and may mean only half-an-hour per day checking results, and making endeavours to improve to-morrow's, or those of the following week. The recent "Census of Production" schedule, which was issued to all gas-works, would have been filled up at random unless the statistics required had been regularly recorded and available at short notice.

It has been said that many works make profits by chance. This might have been true at one time; but now the tendency is all for progress, in whatever direction it may be necessary to go in order to cheapen the cost of production and place within the reach of

the public a gas supply that will compete in any of its manifold uses with all its rivals.

With a high selling price for gas, many little things that could effect a saving may have been for a time allowed to lie over; but with the price being steadily reduced, the margin between income and expenditure is gradually becoming less. The stress of competition in the larger towns has brought down the price of the commodity we sell; and smaller works adjoining them have almost inevitably had to follow suit. Most certainly the changed or changing conditions of gas supply have aided manufacturing costs; but very soon large reductions in the price of gas will no longer be possible. The price of coal is not likely to again touch the contract prices of last year; and as this item always figures as the most prominent in the revenue account of every gas undertaking, the need arises for the smaller concerns being alive to the fact that the greatest attention will require to be paid to the costs of production.

In connection with the question of cost of production, one has always to consider what the commodity is already costing before it is made; and in the case of gas-works, as in every other business concern, it is apparent that the proportion of capital charges in relation to the output must, in large measure, govern the selling price.

It is not possible to fix upon any figure as a standard for capital expenditure per 1000 cubic feet made, as this varies so much in different localities and circumstances; but the writer was induced to give the matter attention so far as it applied to Scotland. "The Statistical Report of the Gas Supply of Scotland," published annually by the Committee of the North British Association of Gas Managers in July, 1909, shows that out of 236 undertakings 151 sent particulars as to capital—i.e., in the case of companies share capital or money borrowed on debenture upon which dividend and interest are payable, and in the case of corporations the outstanding loan debt upon which interest and sinking fund

COMPANIES.						CORPORATIONS.					
Size of Works—Millions.	No. of Works.	Total Capital.	Total Gas Made.	Capital per Million.	Fixed Charges per 1000 Cubic Feet Made.	No. of Works.	Total Capital.	Total Gas Made.	Capital per Million.	Fixed Charges per 1000 Cubic Feet Made.	
					10 p. c. Basis.					6 p. c. Basis.	
Under 10	58	£145,919	269,125,080	£542	13'01d.	5	£28,295	29,258,000	£967	13'92d.	
Under 20 and over 10	26	165,102	345,057,100	478	11'48d.	2	38,427	32,973,000	1166	16'78d.	
Under 30 and over 20	10	128,275	260,799,090	492	11'80d.	4	88,209	102,079,000	864	12'44d.	
Under 50 and over 30	7	108,932	262,095,000	416	9'97d.	7	167,748	267,026,000	628	9'04d.	
Under 100 and over 50	6	199,500	417,145,000	478	11'48d.	10	440,716	733,146,700	601	8'65d.	
Over 100	4	298,678	568,508,000	525	12'61d.	12	6,046,476	11,629,858,000	519	7'49d.	

are payable. Analyses of these are appended showing the capital per million cubic feet made.

I have put down the standing charges on the foregoing capital debts in the case of companies on a 10 per cent., and in the case of corporations on a 6 per cent., basis; and if the number of undertakings sending in returns fairly represents the whole, and the above percentage returns on the capital are also average ones, the figures show the advantage in this respect to be in favour of corporation undertakings of over 20 millions, and on the side of works owned by companies under this output.

The capital expenditure on works erected within recent years has shown a tendency to come down through the adoption of columnless holders, a general tendency towards simplification of plant, the adoption of steel mains in long lengths, and the disinclination on the part of some to put in too large pipes—persuaded as they are of the advent of high-pressure gas. In addition to this, the equalization of working which now exists in gas-works to a much greater extent throughout the year, has resulted in the accepted practice of former years with regard to storage capacity now being inapplicable. A works in Fife, built within the past few years, capable of making 25 millions per annum, and presently producing 17½ millions, was put down for £7750—equal to £310 per million. Main and service pipes, by the time the above output has been reached, will have cost nearly £4000, or £160 per million, and meters approximately £2500, equal to £100 per million—a total of £570 per million—a figure which compares favourably with some of the older-established works. In the case of the last-named, it will be found that many of the small works have very low fixed charges, brought about by a liberal writing-down of capital and wise extensions out of reserve funds on the part of those who have administered the concern in the past. The writer has charge of an undertaking where the outstanding loan debt amounts to £15,187, and the annual make of gas is 42 millions—working out at the low figure of £361 per million cubic feet made.

These examples bear testimony to the fact that, in keeping down the capital account, the ultimate gain is the consumer's; and the judicious expenditure of capital during the early life of a gas undertaking will go a long way towards the realization of successful working results in after years. For, while one hopes that manufacturing costs are to still decrease, it would seem that more and more money will require to be spent in the outside department as time goes on.

If it be found that in gas-works varying in size from 30 millions down to 10 millions and under, it needs from 1s. to 1s. 5d. per 1000 cubic feet made to provide for interest and depreciation on

the plant, it is apparent that the greatest attention requires to be paid to the cost of manufacture; for little opportunity occurs in the course of a working year to remedy any great deviation from the straight line of rigid economy. Unfortunate results can be easier rectified in the larger works than in the small ones. In the latter, they often spell disaster. All of this naturally brings one to the matter of booking working results; for whether the standard charges be high or not, it is the aim of everyone to get the best possible returns out of the plant at his disposal.

COALS.

As this item occupies the most prominent position on the expenditure side of the balance-sheet, it ought on this account to receive first attention. The geographical position of the works will, to a large extent, always determine the price; the remainder rests with the individual and the special circumstances in which he may be placed. Generally speaking, gas-works in the vicinity of the coal-fields find the most suitable coal at their door—also the most economical; while others at considerable distances therefrom will use a good coking coal giving a larger yield of gas per ton, as in most cases the selling price of the gas in the last-named is such that the best return is obtained from this. In the other instance, it will pay to get a smaller yield of gas at a much less price per ton of coal.

Appended are the net costs of coal for two works—one situated in the centre of the coal-fields, and making 17½ millions, and the other 60 miles distant from the nearest pit, and making 42 millions.

(A) WORKS NEAR COAL-FIELD.

Gross cost of coal per 1000 cubic feet made	16'68d.
Less coke sales	4'1cd.
Tar and liquor sales	2'28
	6'38
Net cost of coal per 1000 cubic feet made	4'30d.

(B) WORKS SIXTY MILES DISTANT.

Gross cost of coal per 1000 cubic feet made	17'61d.
Less coke sales	6'55d.
Tar and liquor sales	3'02
	9'57
	8'04d.

"A" works produced per ton of coal carbonized 9647 cubic feet, and sold 6'25 cwt. of coke and 40 gallons of tar and liquor, &c., per ton of coal. The illuminating power of the gas supplied was 17 candles. "B" works produced per ton of coal carbonized 9918 cubic feet, and sold 11'44 cwt. of coke and 51'39 gallons of tar

and liquor per ton of coal. The illuminating power of the gas supplied was 20 candles.

A glance at these figures shows that the works in the coal-field had a good gas-producing coal lying at hand, while the other had to go further afield for a slightly better quality. This, however, increased the gross cost of the coal by almost 7d. per 1000 cubic feet made. The returns for coke and tar of the larger works show a gain of 3'19d.—not nearly sufficient to overcome the initial disadvantage under which it was placed. This difference would have been greater if the local circumstances of both works had been the same, as the comparatively low sale of coke per ton of coal carbonized in the smaller works is due largely (but not altogether) to the fact that there was only work in mid-winter for one setting of six and one setting of four retorts, and in mid-summer for one of four and one of three, as against fully employed settings of six in the larger works.

It is submitted that a monthly stocktaking of coal, coke, tar, and liquor, or sulphate is necessary in order to arrive at a just estimate of the behaviour of different coals throughout the working year; and the writer has found such particulars very useful to him in his duties. The sheet he uses states the various classes of coal delivered during the month; and the results from these are duly noted, and can be referred to at any time. The net cost of the coal is worked out in a manner somewhat similar to the foregoing, with the carriage paid on coke deducted from the receipts, and statistics of gas manufactured, produced per ton of coal, per stoker, average number of retorts in use, gas made per retort charged, gas made per mouthpiece per twenty-four hours, yield of tar and liquor, yield of coke per ton of coal, and percentage of cannell used attached; and the whole is compared with the corresponding figures of the previous year. In this way, results are kept up to "concert pitch."

PURIFICATION.

Purification costs are now in small works reduced to a figure comparable with the best obtainable, and need not be considered in this paper, except perhaps to advance the opinion that works purifying with oxide that is nearly spent are probably purchasing their low costs for material at the expense of increased labour bestowed upon its revivification and frequent cleaning of the purifiers; and here the actual cost can only be determined by subdivision of the wages-sheet. The method of revivification by blowing air through the mass after it has been removed from the purifiers, will reduce the costs of preparation considerably; and the total cost of purification, including labour, should not exceed, even in the smallest of works, provided with ample purifying area, ½d. per 1000 cubic feet of gas made.

WAGES.

Next to coals this usually forms the largest item in the balance-sheet of gas undertakings; and once more let me add that there is even more need for watching this item in small works than in large, as one man's wages very often affect the results to an altogether unlooked-for extent. The subdivision of wages to the proper heads is desirable, so that it may be found how and where shortcomings occur. In the smaller works—say, below 20 millions—the two chief component parts of the wages bill are those appertaining to stokers, and, if the district is a growing one, gas-fitters. In works above this size, yardmen, service-layers, &c., will be additional.

With regard to carbonizing (which includes all handling of coal and coke), the site of the works will play an important part in the economical working of the concern. A small gas-works, with a siding into it at a good height above the level of the coal-store, will be able to empty its coals as cheaply as any gas-works with machinery. Nuts can be emptied at the outside for 1½d. per ton, and large coal at 1¼d. While, if the siding should be on the same level as the coal-store floor, the costs are likely to be increased in both cases by ½d. per ton.

The more favourable of these compares well with the best results obtained by machinery; and the only way in which the figure might be improved would be by tipping the waggon on end (which is merely an extension of the law of gravity applied to the high-level railway and the lower-placed coal-store) or by the use of hopper-bottomed waggons. In both cases, however, the end of the shoot going from between the rails would be in a relatively lower position than the one used in hand emptying; and the method would have its limitations if the coal storage capacity was limited.

For filling into barrows once the coal has been placed in the shed, the simplest and speediest method which it has been the author's pleasure to see is one whereby the barrow was run under arches built on the coal-shed floor which abutted on a retort-house, and was filled in about twenty seconds by means of a shoot.

If a low-level siding is placed on the other side of the works for the despatch of the bye-products, no better form of site could be thought of; and coke can be forked from the railway bank at an average price of 3½d. to 4d. per ton.

Against these figures has to be placed the experience of many managers of small gas-works, who require to pay cartage on coal from the station to the works of from 6d. to 1s. per ton, and on coke to the station of from 9d. to 1s. 6d. per ton. If the circumstances for so doing are anything like favourable, it will always pay in these cases to put in at least one siding. The writer was in the position of having a branch line passing his works, and laid 175 yards of siding from this at a cost of £165. Interest and de-

preciation on this sum, at 10 per cent., amounted to £16 10s.; and now coal can be emptied for nine months of the year by the stokers, and the emptying contracted for during the months of December, January, and February, whereas under the former conditions it would have been costing to-day £45 per annum for carting coal into the works from the nearest siding.

Coming to the actual carbonization of coal, it must be said that the yield of gas per man in small works will never compare well with that attained by machinery where the stoker handles from 6 to 7 tons of coal per eight-hour shift, and makes from 50,000 to 60,000 cubic feet of gas. However, it occurred to me last autumn that better results might be got out of horizontal stop-ends than had been got; and after reading the various articles published at that time on heavy charges, I decided to adopt these in a modified form by using a smaller rake. I managed very well to get through the greater part of the winter with six-hour charges in place of the four-hour charges of the previous winter. Towards the week-ends, in the heavy part of the season, we had to go on 4 hrs. 48 min. duration of charge on account of the necessity arising for making gas quickly, in order to keep the holder on the lift for the purpose of actuating a street-lighting arrangement—an obstacle which, I may say in passing, has been surmounted by the installation of a compressor. But beyond this, we experienced no difficulty whatever. I found in working these heavy charges that one man could carbonize, approximately, 2½ tons of nuts, handle the residual coke, and make 27,000 cubic feet of gas per eight-hour shift with a fair amount of regularity; and I am of opinion that further experience will show me that this figure can be improved upon. The actual facts are that I was able, with a slightly increased output, to do with one man less. On four-hour charging in the winter previous, there were two men on each shift of twelve hours; and with the longer charging and higher heats, one man on each eight-hour shift took me through the winter comfortably. The make per ton increased over the year by 300 cubic feet working with exactly the same nut, the wages decreased, and the men had a shorter working day.

These results have convinced me that a larger yield of gas per ton can be taken out of horizontal retorts in small gas-works, and a saving effected in wages until such time as the experience gained with vertical retorts is handed down to us from the larger works, and that a wages cost of 2½d. per 1000 cubic feet made, inclusive of handling coal and coke, is one that can be generally looked for under the foregoing circumstances.

With regard to the wages of gas-fitters (which is a growing figure with progressive gas undertakings), I am afraid there is little hope of reducing this by any reduction of the staff, as an attempt at saving here might be no saving. It is needless for me to go into the various details of work done by gas-fitters, as this would occupy much time, and might not apply generally. I should like to mention, however, that I have found the card system very useful for keeping in touch with the progress of outside work. The gas-fitter on leaving for his jobs in the morning is given his particulars on the cards, all of which are handed in at night with a report as to defects found, and whether the work had been completed to the satisfaction of the consumer. If not, the card is put on a separate file and handed out again in the course of a week. A second visit is then paid, and yet another, if necessary, until the matter is effectually dealt with. In the smaller works, one card can serve for meter and stove fixing and complaints, with the respective entries made on both sides of the card according to the nature of the order. In the writer's estimation, when the number of consumers reaches 1500, with perhaps something like 1000 slot meters included in these, the cards form a very useful guide to the manager as to the work done outside, over which he cannot exercise so immediate control as he is able to do inside the works. Consumers are given the best possible attention, as a job is very seldom passed over until he or she is satisfied. The writer was not able to get his gas-fitters' wages much under 3d. per 1000 cubic feet made in a works making nearly 18 millions, or approximately ½d. more than stokers' wages; yet he thinks that it paid him in a rapidly increasing district, where this expenditure was mostly incurred in carrying out extensions, and the whole amount was charged to revenue. A cost book—containing the particulars of costs of main and service-laying (worked out to "per yard"), stoves, grillers, and meters at so much "per appliance," and meters surveyed and watered per day—has also been adopted by him with beneficial results. But he recognizes the limits of the use of this arrangement in the smallest of works, where the other duties of the responsible head of the concern are by no means light.

RATES AND TAXES.

It has been my misfortune (if such is the proper designation) to require to make during the past few years fairly large profits; and the rates and taxes upon these have accordingly been somewhat cumbersome—being not lower than 3½d., and as high as 5d., per 1000 cubic feet made. I have no doubt that many other works are placed in the same position. But the matter of valuation for assessment purposes was so ably dealt with by Mr. A. Yuill, of Dundee, in his St. Andrews paper, and has since been taken up in part by the Commercial Sections of your Association, that little of interest can be added by me. Judicious extensions of works and mains, and wise husbanding of capital, will materially help to reduce this imposing item in the balance-sheet; but the manager must also take a practical interest as to how the valuation is arrived at, as the matter is of great concern to him as the individual who is responsible for the results.

REPAIRS TO WORKS.

It is as often as not a sign of strength to see this item in the accounts of small gas undertakings exceed the figure of rates and taxes. It is the desire of everyone to keep the plant in the highest state of efficiency; and many improvements can be effected through this account that bring their reward tenfold.

REPAIRS TO MAINS, SERVICES, AND METERS.

The remarks upon the foregoing apply in their entirety here.

STATIONERY AND SUNDRIES.

These need not exceed $\frac{1}{4}$ d. per 1000 cubic feet of gas made in small works.

MAINTENANCE OF STREET-LAMPS.

Where the street lighting is under direct control from the gas-works, sheets showing the number of mantles issued each day, glasses and reflectors broken, and burners renewed, are necessary if one wishes to know whether this item in the accounts is a profitable one at the price received per lamp per season. No one can question the fact that, from a utilitarian point of view, well-lit streets are a very decided advantage to a gas undertaking in pushing its business; but it is as well to see that the work is undertaken with a reasonable margin of profit.

My experience has not enabled me to get through a lighting season of eight months with less than eleven mantles per lamp; and the expenditure for mantles, glass, lantern panes, reflectors, and all other renewals and breakages has averaged £42 per annum for 120 lamps, or 7s. per lamp. Lamplighting previously cost £32 per season, or 5s. 4d. per lamp; and an increased demand on the part of the contractor who did this work (to the extent of £16) induced the directors of the undertaking to put down an automatic lighting and extinguishing arrangement.

The cost of this was £115 23. 9d., interest, depreciation, and obsolescence on which came to £17 5s., or an additional yearly charge of 2s. 10d. per lamp. Men's wages attending to renewal of mantles and defective supplies cost £31 1s. 8d., or equal to 5s. 2d. per lamp. There was thus a total maintenance charge of 14s. 10d. per annum, exclusive of gas, which was estimated at 5415 cubic feet per lamp per season. The whole cost worked out as follows:—

5415 cubic feet of gas at 4s. 2d. per 1000 . . .	£1	2	6½	per lamp
Men's time attending to defects.	0	5	2	"
Mantles, glass, and other breakages	0	7	0	"
Interest, depreciation, and obsolescence, at 15 per cent.	0	2	10	"
Total cost	£1	17	6½	per lamp

The price received per lamp was £1 16s. 6d. In this case, therefore, the gas was being supplied at a rate under that charged the ordinary consumer, which is not uncommon, and perhaps to be recommended, if the reduction is not carried too far.

STANDING CHARGES A DRAG UPON SMALL GAS-WORKS.

The writer wishes, before going further, to dissociate himself from the idea that small works can do as well in most things as large. Better results may be obtained in some process of manufacture; but the size of the output always will influence costs. There is no necessity to labour the point further.

An attempt to draft an imaginary debtor side of the revenue account of a small gas undertaking would be futile, and would serve no useful purpose. So much depends upon the local circumstances—whether the undertaking is statutory or non-statutory, the restriction as to candle power under which it may or may not be placed, the distance it is situated from the coal-fields, and a host of other things that influence costs and the ultimate selling price of the products. The opinion is put forward, however, that many small works under 30 millions capacity in the neighbourhood of the coal-fields are making and distributing gas at from 1s. 9d. to 2s. per 1000 cubic feet made, and from 2s. 2d. to 2s. 6d. per 1000 cubic feet sold, after deducting the returns from residual products. The selling price then depends upon whether or not the fixed charges are excessive. It is apparent, however, that these charges are no inconsiderable drag upon the majority of small works in their attempts to sell cheaper gas. With a price ranging from 3s. to 3s. 6d. per 1000 cubic feet in the neighbourhood of the coal-fields, little can be done by way of pushing gas-fires. In fact, business is more hopeful in this direction with gas undertakings situated a fair distance away, as the price of coal to the consumers there as compared with the householder within easy reach of the coal-field may rise in greater ratio than the price of gas. In every other branch of our business, however, the public will be very well served by small undertakings catering for their needs at the foregoing prices, and offering differential terms to power users.

REDUCTION OF STANDING CHARGES.

The reduction of the standing charges is nearly always best accomplished by extending the demand for the commodity. Situated, as I have been until recently—in a new works, with a capital of £12,000, and an estimated first year's make when I undertook the management of 6 millions—it will be admitted that I have had to give the matter of costs my unremitting study. How far success attended my efforts to reduce the standing charges, may be judged from the fact that the capital is now £13,000, and the make 17½ millions; while the shareholders have been paid the standard dividend of 5 per cent. for each of the three years' working of the concern.

It is perhaps not given to everyone to find within a few miles of his area of supply other rising communities; but where they do exist, they open out a splendid opportunity for adding to the output, at a comparatively low outlay, by means of a high-pressure trunk main. An opportunity like this offered itself to the writer last autumn, when a private company asked a bulk supply for a village of 340 houses, with the almost immediate prospect of this reaching 500, and it was decided forthwith to instal a compressor and lay down a 3-inch high-pressure main at an estimated cost of £1052. The first year's consumption was reckoned at the safe figure of 2½ millions, and the ultimate needs of the district at from 5 to 6 millions. The actual cost was as follows:—

Compressor and steam-engine capable of passing 3000 cubic feet per hour against 2 lbs. pressure per square inch, along with all work preparing foundations and leading-up of steam supply	£146	9	3
4838 yards of 3-inch steel pipe with test-boxes, tobies, and expansion collars	507	6	10
Excavating and jointing	139	14	11
Carriage and cartages	11	12	5
Extras	20	4	8
	£825	8	1

Inclusive of the compressor, the above length of piping figures out of 3s. 5d. per yard; and if 1s. per inch per yard be taken as the basis of calculation for an alternative 6-inch low-pressure main (and the writer has always found it a safe and accurate one), the saving amounted to 2s. 7d. per yard.

Undoubtedly, the question of high-pressure gas transmission appeals to small undertakings, as the increased consumption often means a large percentage increase on the yearly make of gas, and has a very marked effect upon the working costs and standing charges.

In closing this paper, I should just like to add that the working results given therein are not put forward as being in any way out of the ordinary run of everyday practice. Conscious as I am of how much there is still capable of improvement in the field that lies before us, the sole idea that prompted my contribution to your "Transactions" was that, in directing attention to the "two points of decimals," it might prove useful to some in going into the commercial aspect of the business of manufacturing and selling gas.

Discussion.

The PRESIDENT, in inviting discussion, expressed the hope that the managers of small gas-works would come forward.

Mr. D. VASS (Airdrie) considered the paper was an exceedingly valuable one for managers of small works. It was, he said, important that they should have at their fingers' ends something by which they could compare their working of one year with that of another, or week by week, as they went along. When he was first appointed to a gas-works, he was both Manager and Secretary; and he found that there they had been in the habit of drawing up a monthly report. By going into the matter a little more fully than had been done, he developed this into a monthly balance-sheet. He would advise anyone who might take up the subject on the lines Mr. Dickson had shown them, to go into it on this line too, and to work out what were the actual profits for a month. Instead, for instance, of putting in the actual payments for the month, he took the average outlay per 1000 cubic feet, and charged only in each month the proportion of the rates and taxes falling due for that particular month. Almost all the other items coming within the scope of a small undertaking could be charged each month, bringing out the approximate profit for the month. In this way, they kept themselves and their Board in touch with any loss or fault in their results, and so saved themselves much trouble at the end of the year, if their results were shaping downwards. In the paper, and in the one which preceded it, there was a remarkable difference of opinion about the practice of charging against revenue amounts which should be capital charges. He did not agree with this in principle at all. Capital charges should be dealt with as capital charges, throwing the burden on the right shoulders; otherwise they would be taxing the present-day consumers to an extent to which they were not justified. Existing consumers were as much entitled to cheap gas as those in days to come.

Mr. J. CAMPBELL (Bo'ness) thought it was of the utmost importance, in even small gas-works, that they should check their working costs. If these were taken out regularly—say, once a month—any increase in costs which might be discovered could be promptly investigated, and, if possible, remedied, instead of waiting until the end of the year, by which time the figures might have assumed alarming proportions. He made out a monthly statement, showing cost of coal, lime, wages, and benzol, and receipts from coke and tar, worked out to "per 1000 feet made;" and also giving the quantity of coal used, coke and tar sold, &c. These figures he transferred to a yearly statement, showing the costs to date; and by this means, he knew exactly at any time during the year how they stood, compared with previous years. It was quite conclusively shown that a works having a higher make per ton did not necessarily have the lower cost. Mr. Dickson's figures fully bore this out. In his own case, there were coal-pits close to the works; and while they might not get a high yield per ton, still their costs were fairly low. Last year, the gross cost of coal per 1000 cubic feet of gas made was 10s. 5d. For coke, tar, &c., they received 7s. 16d.; leaving the net cost of coal equal to 3s. 4d. per 1000 cubic feet made, and 2s. 9½d. per ton. Regarding the figures of coke sold per ton, a good deal depended,

as Mr. Dickson said, on how they were situated with regard to shipping. He had at times to use a setting with a small number of retorts, which practically consumed all the coke it produced; but notwithstanding this, he sold 8 cwt. of coke per ton. There were some costs that Mr. Dickson might have included—such as watching in the case of main-laying, gas used in works, and leakage. There was a tendency in some gas-works at the present day to use gas rather freely; and therefore it was well to have works meters, as a check on consumption. Leakage was also serious in many cases.

Mr. J. B. SCOTT (Cowdenbeath) said there could be no question that the checking of costs in small gas-works was a very important matter. He did not know that he could claim having gone so closely into the subject as Mr. Dickson had, though he had given it a great amount of study. It was certainly interesting to be able to check working costs as they went along, and see from time to time how things were turning out. He did not see how they could ever expect to sell gas at 1s. 4d. for fires. Mr. Dickson seemed to prove that gas-works in colliery districts had an advantage from being in the centre of the coalfield. There was no doubt this was the case. The figures at Cowdenbeath were practically the same as Mr. Dickson gave—10'44d., as against 10'68d., for gross cost of coal; and the return from residuals, 6'33d., against 6'38d. But he had not taken cartage into account, which would make them about the same. Mr. Dickson's net cost of coal was 4'30d., as against his 4'11d.; but again the cartage would affect it. While, however, they in the coalfields certainly benefited from being able to buy coal much cheaper—in some instances he had been able to get coal put into the siding carriage free—there were also other things, as had been mentioned. They had the leakage bogey against them; and it was a very serious one. Last winter there was what the miners called a "sit" in a road at Cowdenbeath. In other words, part of the main road suddenly dropped down out of sight, taking a horse attached to a baker's van with it. Their main also went down. In another part of the town, one portion of a building parted from the other, with the result that the gas-pipes were torn from the meter. These things involved very serious costs. He would like to ask Mr. Dickson if 2½d. per 1000 cubic feet for stokers' wages was the average for the whole year, or for only a part when economical making was on. The lowest he had been able to reach was about 3d. per 1000 cubic feet. Of course, he paid very good wages. Mr. Dickson mentioned that he had put in a siding, 175 yards in length, at a cost of £165. He must have been very fortunate, because he (the speaker) knew of another gas-works in Fife, the manager of which approached the railway company to put in a siding, and the company wanted £1000 to be paid before they would break the main line.

Mr. A. REID (Breachin), alluding to Mr. Dickson's figures as to the cost of coal, said he took those in the lower table to refer to Forfar. Coke was said to yield 6'55d. per 1000 cubic feet of gas made; and the coke sold was 11'44 cwt. per ton of coal. He would like to ask if the figures should not be for coke made, as the coke sold appeared to be out of all proportion. His average was 8'24 cwt. of coke sold. The price in the paper worked out at something like 14s. 3d., while his own came to 15s.; and there was a difference of 7d. per ton in carriage between the two towns. They would agree that 11'44 cwt. of coke sold was a very large proportion.

Mr. R. W. COWIE (Dalkeith) stated that they did not go into the question of costs at all. As a matter of fact, consumers were supposed to buy their own meters, fix them, &c. He generally drew up, for his own satisfaction, a monthly statement of gas made, and coke, tar, and liquor sold—a very simple statement which, put together every three months, formed a quarterly statement which satisfied his Directors. But since going over Mr. Dickson's paper, he could quite well understand that, for his own sake at any rate, it would be advisable to go into the question of costs as fully as possible.

Mr. ALEX. WILSON (Glasgow) thought the author was on the right lines; and if it were a new subject with Mr. Dickson, the further he carried it out the better. The taking of costs was absolutely essential if managers were anxious to get the best returns. He supposed the matter was accentuated when they came to large works. In his own case, they not only made up statements every month, but they were tied down now to make them every week. It was necessary to check the smallest amount of leakage at once, if they wanted to maintain their standard. If they were to go on for a month without having a balance-sheet made up, they might find, by the end of that time, that much damage had been done. A month would be too long in a large works; and, if this were so, it was too much in a small works. There was no great difficulty in taking the costs week by week. If Mr. Cowie would only take out his figures week by week, he would find a benefit.

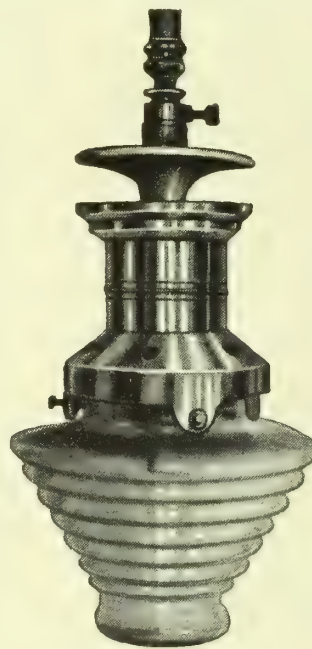
Mr. DICKSON, in reply, thanked Mr. Vass for his kind reference to the paper. With regard to capital charges being put down to revenue, in this respect his remarks chiefly referred to the wages of the permanent staff. He hoped he did not convey the impression that he was in favour, generally, of charging as much as ever he could to revenue which ought to be charged to capital. He thought he referred to the matter in the case of gas-fitters; and there, if the work had been contracted for, it would naturally have followed that the expense would have been charged to capital. But, with gas-fitters of their own working, the cost was all taken from revenue. He would like to congratulate Mr. Campbell upon

his results. He seemed to have a net cost of 3'14d. for coal, which was very good indeed. Mr. Scott referred to standing charges in small works being as large as what Mr. Napier proposed to sell gas at. This was no doubt true in many cases; but Mr. Napier would propose to sell gas only at that figure when it was required. He would remind them that the further they were away from the coalfield the better the price they obtained for gas for fires. As to the 2½d. per 1000 feet for stokers' wages, the figure they got was 2'8d., including emptying all coal and the filling into waggons of all coke which was going outside the district—everything from coal-wagon to coke-heap. This figure of 2½d., under the foregoing circumstances, was, therefore, one which might be looked for. As to the high yield of coke in one instance, along with such a small return in pence, there were particular circumstances affecting this case. The members would find, on looking over returns of municipal gas accounts, that these results varied very much. In this case, he might mention that the coke was taken away immediately it was stacked—it was taken away wet.

THE "PACO" INVERTED BURNER.

In choosing an inverted gas-burner, users who study their lighting arrangements are not to-day satisfied with only a high illuminating efficiency, but choice is also made of a type that gives promise of easily maintaining the high efficiency, and of presenting permanently a good appearance. Nothing vexes the eye of the gas man more than a lamp of dirty exterior; and what vexes him, will equally annoy other people. In the "Paco" inverted lamp, we have one that combines the features mentioned—high efficiency, easy maintenance of efficiency, and clean exterior—and, beyond, its parts are interchangeable if accident occurs. "Paco" is a title coined from the initial letters of the Company who are putting the lamp on the market—the Patent Appliances Company, of No. 15 and 17, City Road, E.C.

Looking at the lamp with an eye to its practical points, its



The "Paco" China-Burner.

design proves a complete recognition of requirement. The burner and body or casing are made separate; and, should trouble occur with either the one or the other, it can be independently replaced. Both are made of china, so that there is no possibility of discoloration or tarnishing; and the casing is as readily removed as the globe for washing. The casing being white surfaced, with gilt lines relieving it, it has a graceful appearance, and is suitable for almost any position. Let us take the bunsen tube first. It is of china, with, at the top, the brass fitting comprising the gas-nipple, and gas and air regulators. Forming a junction between this fitting and the bunsen tube is, as the illustration shows, a shield, which serves the dual purpose of a protector of the primary air admission-holes and a deflector of the uprising products of combustion—space being left between the shield and the outer casing for the dispersal of the products. By this deflecting arrangement, the primary air is kept uncontaminated; and the fitting to which the burner is attached is protected from any direct contact with the products. The primary air-holes of the burner are all protected by gauze; and the regulation is by means of a movable collar with a projecting piece for manipulation. The gas-regulator is very sensitive, and is ingenious. Briefly described, it is an arrangement of horizontal cones, which respond to the slightest turn of the regulating screw; and thus ensures a precise adjustment. Part of the way down the bunsen tube, there are three substantial lugs, flat-topped, which form the supports for the outer china casing, on the inside of which are projections formed with side pieces, so that, when seated on the lugs of the bunsen tube, there can be no danger of displacement. At the bottom of the bunsen tube, there is the magnesia nozzle (which is made exchangeable), formed with supports for the mantle. There is no danger of the nozzle dropping from the bunsen tube, as, owing to the thickness of the latter, a deep thread is permissible, and consequently a firm and secure grip is obtained. The outer casing is provided with air-holes just at the top of the expanded portion furnishing the support for the globe. A loose circular metal fitting is supplied for, if desired, supporting an inner glass cylinder. The globe shown in the illustration (Jena glass) has been specially designed, with a view to obtain as complete diffusion of light as possible, with the least deterioration of the candle power. But, of course, the burner will take any other standard size globe suitable for a 3¼-inch flange fitting.

Regarding the efficiency of the burner, the results of tests with

which we have been supplied show that it is notably high, even at the low pressures named:

Gas Pressure. Inches.		Consumption. Cubic Feet.		Candle Power.
1	..	2'45	..	80
14-10ths	..	2'80	..	85
18-10ths	..	2'97	..	110

These are high efficiencies, which we have not proved photo-metrically. But we can say that a burner which has been in use under observation gives a brilliant light, and all the other claims of the Patent Appliances Company have, during the period of use, been fully confirmed.

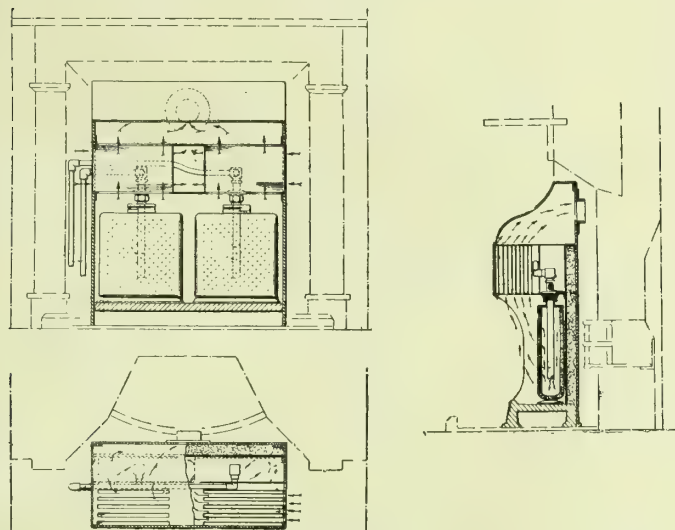
REGISTER OF PATENTS.

Regenerative Gas-Stoves.

SOLON, M. F., of Wilnecote, near Tamworth.

No. 12,606; May 28, 1909.

The special features of this invention are that the gas and air are heated independently prior to mixing, and that the air is admitted to the burner and led to the bunsen jets in such a manner as to traverse a maximum of heating surface in the minimum of space, and, further, that the gas is led in through a chamber heated by the burner, and is thereby heated prior to ignition.



Solon's Regenerative Gas-Stove.

As applied to a standard stove (as shown), the burner body may be in an elongated form with (say) the rear part hollow and packed with silicate cotton or other non-conductor of heat, and the front part made of fire-clay or other suitable material, and perforated. The burner bodies are arranged in a metal casing, which at its upper part contains a series of tubes through which the heat from the stove passes, and over which the air is drawn in entering the casing, or through which the air enters the casing while the heat plays on their exteriors. The gas supply pipe is arranged to pass into the stove through the hot-air casing, and then down into the space behind the perforated front of the body part. The hot-air casing is preferably closed on all sides except where the air enters.

Controlling the Supply of Gas to Burners.

NORTH, R. B., of Soho Square, Westminster.

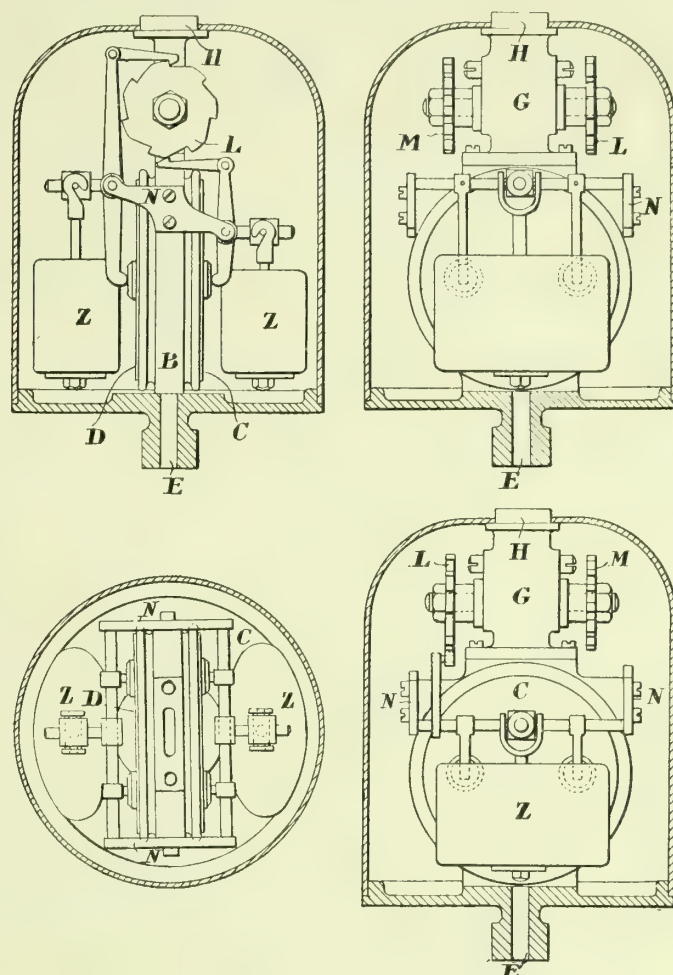
No. 15,768; July 6, 1909.

This invention relates to automatic apparatus for controlling the supply of gas to burners of the type where the automatic action of turning the gas-valve to raise or lower the lights is dependent upon variations of pressure set up in the system.

A diaphragm chamber—preferably consisting of a flat chamber both sides of which are expansible oppositely or outwardly—is arranged to operate upon two dissimilarly weighted pawl levers or two dissimilar weighted pawl levers; a preliminary or partial collapse of the diaphragm chamber causing one pawl lever to turn a ratchet wheel one step, a complete collapse of the diaphragm chamber causing the other pawl lever to turn the ratchet wheel another step, and the subsequent raising of the pressure resetting the pawls ready for the next reduction of pressure. The variations of pressure may be arranged to succeed one another, and be utilized in the following manner: Upon the gas pressure being raised to the normal, or abnormally, the pawls are reset; upon the pressure being then lowered to normal, or below normal, one of the pawls operates the ratchet wheel to turn on the supply to the burners; and upon then abnormally lowering the pressure, the other pawl operates the ratchet wheel to turn off the gas.

In the illustration, a bell-like casing is arranged (preferably centrally) with a flat circular chamber B the two flat sides of which are constituted by flexible diaphragms C D. The diaphragm chamber communicates with a gas supply connection E in the floor of the casing, and a valve casing G is bolted to the top of the casing with a discharge connection H arranged to just protrude through the top. The plug of the

valve which works in the casing G has spindle parts extending from respective ends and conveniently lying in about the plane of the diaphragm chamber. Upon one of such spindle parts, a ratchet wheel L is fixed, and upon the other part is a star wheel M, the points of which have twice the number of teeth upon the ratchet L—convenient numbers being seven upon the ratchet L and fourteen upon the wheel M. The plug in this case must therefore also have seven slots or ports if hollow, or seven cored passages if solid, for registering with the inlet and outlet ports in any one of the seven positions.



North's Gas-Light Controller.

Brackets or arms N are secured on the wall B of the diaphragm chamber, and, extending outwardly beyond the flat faces of this chamber, are adapted to support the pivots or shafts of two three-armed levers. The upwardly and downwardly extending arms in connection with the diaphragm D are of greater length than those in connection with the diaphragm C and the pawl L of the arm which takes over the top of the ratchet wheel, whereas the pawl of the shorter arm takes under the ratchet wheel, and is maintained in engagement therewith by any suitable means, such as a spring, not shown.

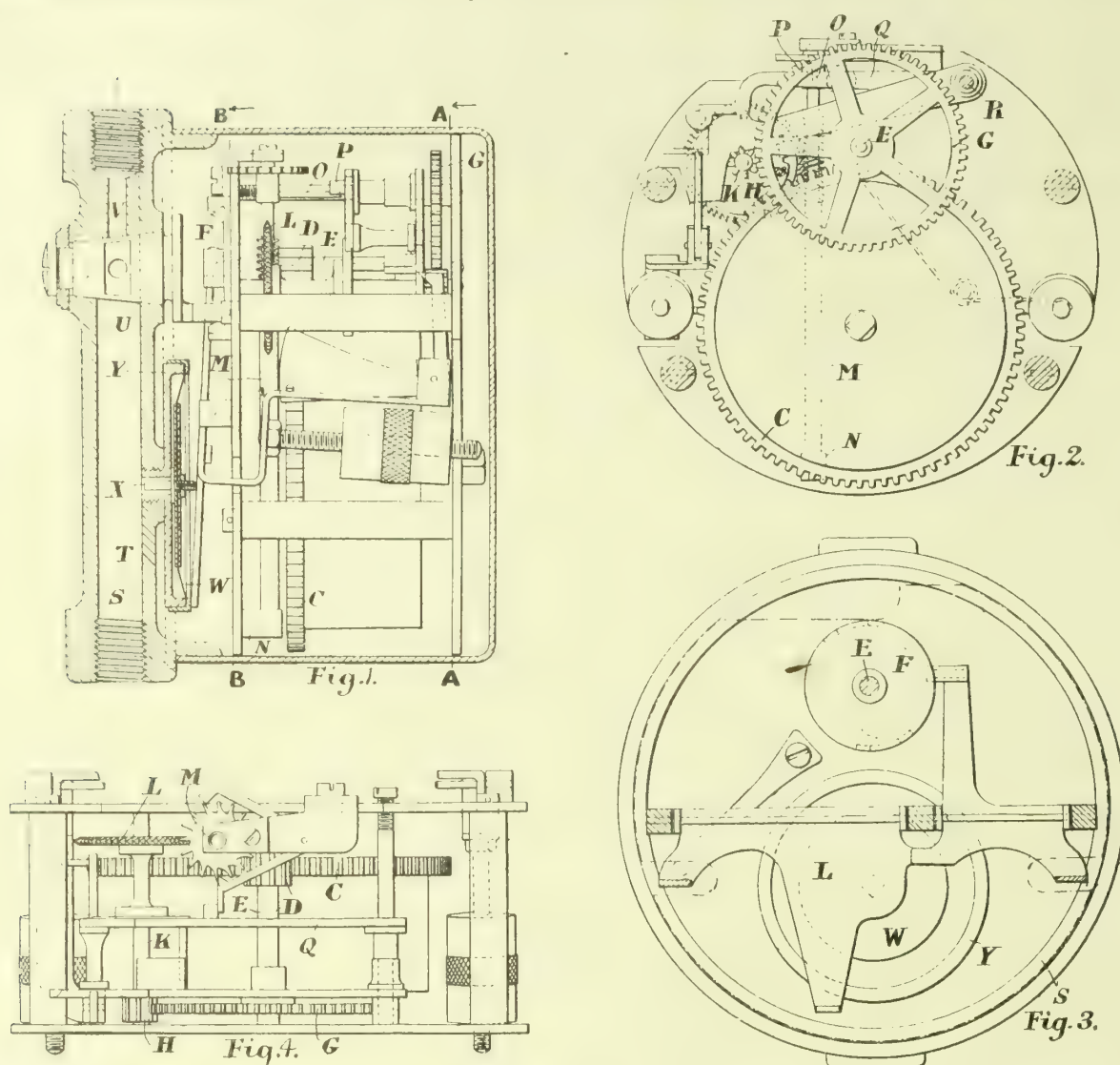
Suppose that with the parts in the first position the gas pressure is reduced, the diaphragm chamber will partially collapse, and will permit the weight Z to cause the pawl L to move an appreciable amount and to turn the ratchet wheel to the extent of (say) half-a-tooth, thereby turning the cock in the casing G to turn on the gas. During this movement, the lower pawl merely rubs against the circular portion of the adjacent ratchet tooth, and finally takes behind the more or less radial face of it. The amount of movement of the diaphragm, however, is insufficient to permit the smaller lever to give its pawl any driving movement. Upon further and abnormal reduction of the pressure, the weight Z is permitted to move the smaller lever to an appreciable extent, and the ratchet wheel L is at once turned to the extent of half, or the remainder of, a tooth; and the cock is turned to turn off the gas. When the pressure is again raised to the normal, or to an abnormal degree, the diaphragms C D will be again expanded or distended, and will reset the pawls in the first position shown; the pawl of the longer lever taking behind the tooth next to that which it last engaged, and the pawl of the shorter lever, after having ridden up the inclined portion of the next succeeding tooth, resting at about the commencement of the more or less circular portion of the periphery of such tooth. A click or detent is arranged to engage between the points of the star-wheel M above referred to; and this wheel M having fourteen points, its movement (and therefore the movement of the ratchet wheel L) will be arrested at each step-by-step movement of the latter.

Automatically Operating Gas-Burners.

ROBSON, G., of New Oxford Street, W.C.

No. 14,681; March 27, 1910.

This invention relates to apparatus (controllable from a single station, for automatically operating gas-burners) of the type described in patent No. 20,109 of 1907—i.e., the apparatus wherein two weights are adapted to act upon an expansible casing in such a manner that, upon a certain intentional abnormal increase in pressure occurring in the main, the casing expands to release one or more wheels of a train of clockwork,



Robson's Automatic Lamp Controller.

and then, on a subsequent decrease of pressure, the casing contracts to release a governing wheel and allow the clockwork to actuate the gas-valve. In the apparatus, also, the expansible casing is adapted to be relieved of the effect of one weight under certain conditions, to enable the variation in pressure required to control the operation of the clockwork for extinguishing the light to occur within a lower range of pressures than that required for the lighting operation.

The present invention has particular reference to the arrangement of the two weights and their operation by the diaphragm or other expanding chamber and the mechanism for locking and releasing the clockwork. The object is to so arrange the weights and the locking and releasing mechanism, and to so arrange the means employed for relieving the diaphragm of one weight, as to enable the degree or time of relief to be varied in order that the burner may be lighted or extinguished merely by an abnormal increase of pressure, instead of necessitating an abnormal increase and then a decrease as above referred to. This arrangement is sometimes preferable where the gas plant is normally worked at or about full load, "under which conditions it is difficult to obtain the requisite abnormal increase and decrease after the general lighting for an evening has been commenced."

Fig. 1 is a side elevation of one form of the apparatus. Figs. 2 and 3 are transverse sections on the lines A and B looking in the direction of the arrows. Fig. 4 is a plan of the greater portion of fig. 1.

A removable casing encloses the operating mechanism, which is preferably driven by a spring within a barrel, on which a spur wheel C engages with, and drives, a pinion D upon the shaft E, on the end of which is mounted a disc fitted with two single-stepped cams F. The shaft is also fitted with a spur wheel G, which engages with, and drives, a pinion H on the shaft K, which carries a worm wheel L the teeth of which are in mesh with the threads of a worm in a shaft M. This shaft is approximately vertical. Its lower end rests in a footstep N, while its upper end is fitted with the usual escapement and a pin O adapted to engage at the proper time with a stop P carried upon a horizontal lever Q fulcrumed on the frame at R. The operating mechanism thus far described is preferably carried upon a flanged plate S in any suitable way. The gas supply pipe T is fixed to, or formed integrally with, the plate S, and the gas under the control of the gas-cock U passes away to the burners by the pipe V.

The gas, before it reaches the cock U, is caused to act upon a diaphragm or movable part W of an expansible chamber Y by passing through an opening X, in communication with the interior of the expansible chamber. The diaphragm is adapted under the pressure of gas to move outward to actuate a system of weighted bell-crank levers, and to move inward to follow up a reduction of pressure by means of the weighted lever. The levers (partly in the form of plates) are fitted with adjustable weights, and one of them has one arm or member constantly in engagement with the diaphragm, while the other one has a short arm adapted to engage with a similar arm upon the first lever;

so that although the second lever is free normally to press upon the arm of the first one, and therefore upon the diaphragm, it is adapted to be moved away therefrom to lessen the weights on the diaphragm by means of the cam F, which engages with the third arm or lever integral with, or connected to, the second lever.

The disc carrying the cams is mounted upon the spindle E of the clockwork mechanism which is used to actuate the gas-cock, provided with the usual port; and the cam is preferably provided with a pin adapted to directly engage a pin on the end of the gas-cock. The arm of the weighted lever which is constantly in engagement with the expansible chamber carries a pawl formed on one arm of a bell-crank lever fulcrumed in lugs mounted on the first lever for raising the locking lever Q, which releases the clockwork mechanism. This lever (as before described) carries a stop P adapted to be moved into, or out of, the path of the pin O mounted upon the upper end of the worm shaft M controlling the clockwork mechanism.

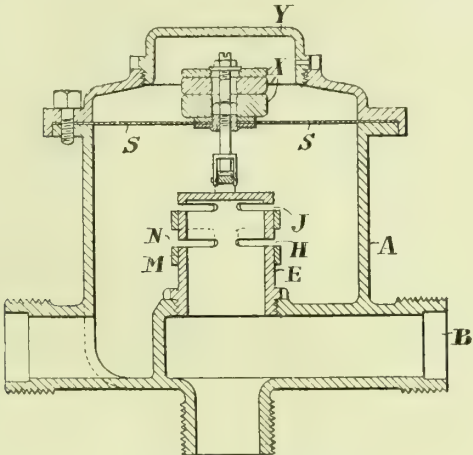
The cycle of operations is as follows: Assuming that the burners are all extinguished and the normal daytime pressure prevails in the mains, the pressure is raised to an abnormal degree when it is desired to light the lamps. The diaphragm expands against the action of the two weighted levers and raises the pawl to a position a little higher than that indicated in dotted lines, to lift the locking lever Q and release the clockwork, the shaft E of which carries a cam and operates the gas-cock so that it may pass gas to the burners as already described. During this movement, the action of one weight upon the diaphragm is removed by means of the cam F. In order to permit the tooth to drop at the proper time into the notch in the disc to allow the pin O to engage the stop Q, and thereby stop the mechanism, the pawl is removed laterally from the path of the pin by the action of a lever, which is raised just as the notch on the disc is coming round into position; so that the pawl is thrust backward and there will be nothing to prevent the tooth dropping into its notch. When the pawl moves inwardly again, it will come to rest, not beneath the pin, but against the end of it.

When midnight arrives, the pressure in the mains is reduced as usual. The action of the weight upon the diaphragm causes it to contract and lowers the pawl till it assumes the position shown in dotted lines, or even that in full lines—the lights remaining unaffected. When it is necessary to extinguish the lights, the pressure in the main is again raised to overcome the pressure of the one weight and raise the pawl to release the clockwork and actuate the gas-cock to extinguish the lights—both weights finally returning to duty. It will be understood that the reduction of pressure at midnight may be only just sufficient to bring the pawl under the pin, or it may be any degree lower than this; adjustment of the weights assisting this variation. By this arrangement, the clockwork is positively locked after lighting up is effected, and no movement of the clockwork occurs at the midnight reduction of pressure.

Gas-Governors.

NORTH, R. B., of Soho Square, Westminster.
No. 15,769; July 6, 1909.

These governors are of the type comprising a casing with an inlet and outlet for the gas and a flexible diaphragm mounted in the casing and connected with a valve adapted to close or reduce the aperture for the passage of the gas to the interior of the casing as the pressure of the supply increases. In such apparatus, it has been suggested to form the valve as a cylindrical slide-valve having its upper end closed and formed with ports the length of which was parallel to the axis of the cylinder. This valve was adapted to slide on the exterior of a similarly ported cylindrical extension of the casing which formed the inlet to the governor for the gas pressure. According to the present invention, the valve is constructed in the form of a ring having one or more series of slots or ports which are narrow in the direction of the axis of the ring and which extend for some distance around the periphery of the ring. The ports work in conjunction with a similarly slotted cylindrical portion in the casing. The ring valve has upwardly extending lugs, whereby the valve may be readily connected, through the medium of a rod and bridge-piece, to the diaphragm by means of which the valve is operated.



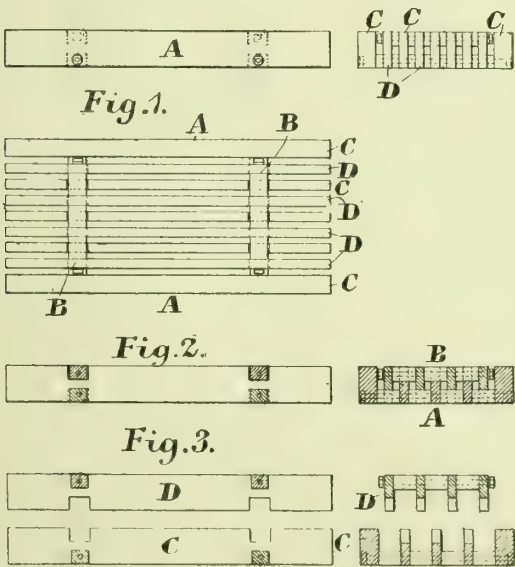
North's Gas-Governor.

In the central vertical section shown of a gas-governor constructed according to this invention, the pressure of the gas admitted to the casing A through the inlet B passes through the slots H, J, and N and raises the loaded diaphragm S, which lifts the ring valve M and moves the imperforate portions of it over the slots H J; so that the greater the pressure beneath the diaphragm the more the latter is distended, and the less will be the opening for the passage of gas through the governor. Similarly, the lower the pressure the more the diaphragm is collapsed, and the greater the opening for the passage of gas. It will thus be seen that, by removing the plug T from the cover, the weights X are readily accessible. By unbolting the cover, the diaphragm S and valve M may be removed to uncover the fixed cylindrical portion E, which can then be adjusted or unscrewed and removed as desired. The cylindrical portion, like the plug in the cover, may be formed with notches in its flange, in order that a key may be engaged with it to unscrew or screw up the part E.

Grids for Gas Purifiers.

CHANDLER, S. & J., of Brixton, S.W.
No. 18,656; Aug. 3, 1909.

According to this invention, the grid is constructed as usual, with the "important exception" that it is composed of upper and lower



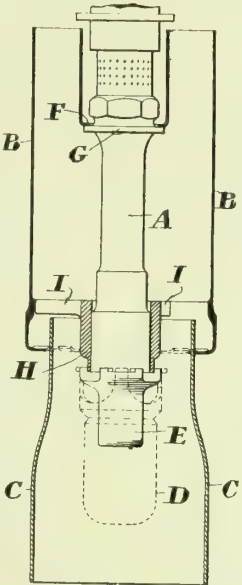
Chandler's Purifier Grids.

sections or members, which fit loosely one into the other and form a "compound grid." When it is necessary to clear the choked spaces between the bars, the upper member is removed; so that the spaces of both the lower and upper section are of a width which allows of their being easily cleaned.

Fig. 1 is a side view, end view, and plan of the grid; fig. 2 has longitudinal and cross sections; and fig. 3 gives views of the two parts of the grid separated. The member A is composed of a series of bars C united by cross-bars or distance-pieces; while the member B is provided with a series of bars D, also united by cross-pieces. Bolts are passed through the cross-pieces and bars for holding the respective sets together. The bars C are arranged at such distances apart that the bars D fit between them; the two sets of bars together making up the entire surface of the grid. The bars may be notched so as to receive cross-bars; but this is not necessary, as one set of bars may rest on the cross-bars of the other set.

Inverted Incandescent Gas-Lamps.

SOMERVILLE, J. M., of the South Metropolitan
Gas Company, Old Kent Road, S.E.
No. 11,258; May 6, 1910.



Somerville's Inverted
Gas-Burner.

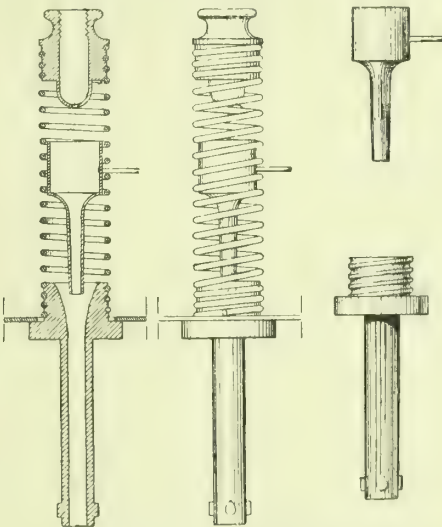
When inverted gas-lamps have a casing surrounding the bunsen tube and supporting the glass or chimney which encloses the mantle, there is some difficulty, the patentee points out, in maintaining the bunsen tube and its surrounding casing concentric; and his invention has for its object to provide means for securing this.

It will be observed from the engraving that the casing B is supported on the bunsen tube A at its upward end. The upper part of the tube passes through a hole in the transverse plate F, and the flange G on the tube (being of larger diameter) catches beneath the plate. "This method of support is a loose one, and by no means ensures that the bunsen tube shall remain central within the casing." According to the present invention, a device H is employed, which is preferably of clay, and has a cylindrical hub adapted to snugly embrace the lower end of the bunsen tube just above the nozzle E. On the hub of the device are radial arms I, of equal length and just sufficiently long to touch the interior of the casing when the device is in the position shown, and so maintain the parts concentric.

Inverted Incandescence Gas-Lamps.

GIORGI, A., of Florence, Italy.
No. 30,002; Dec. 22, 1909.

This invention is designed "to utilize the gas to the utmost extent by intimately mixing it several times with a uniform and regulated quantity of air to keep the fitting cool where the lamp is attached (although the upper part of the burner may be entirely made of a material which is a conductor of heat) and to prevent vibration of the burner itself."



Giorgi's Inverted Incandescent Gas-Burner.

There are interposed between the gas nipple or injector and the burner-tube adjustable funnels, forming air supplies, and serving to regulate the air and to direct the mixed air and gas to the burner-tube. The funnels are supported axially within a spiral spring, one end of which is attached to the gas nipple or injector, while from the other end the burner-tube is suspended. This spiral spring (practically forming part of the bunsen burner) not only serves to support each funnel in the position to which it has been adjusted, but also prevents vibration of the burner-tube and, at the same time, acts as a radiator—the entire burner constitutes an anti-vibration device. Upon the burner-tube (preferably at its upper end) is fixed a disc or deflector, so as to prevent the products of combustion entering the air supplies.

With a burner constructed as described and shown, the gas, on issuing from the gas nipple or injector, mixes with the air and passes into the central funnel; and, passing out of the funnel, it again mixes with the air prior to entering the burner-tube below, "thereby utilizing the gas to its utmost extent and delivering it in a suitable condition to ensure a better combustion." In the construction illustrated, the gas is mixed with air twice; but by employing additional funnels, it may be mixed several times with air.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Westminster Corporation Street Lighting Contract.

SIR,—On Thursday last, I took advantage of a lull in the rain storm to make a careful test of the illuminating power of one of the Aldwych gas-lamps. The figures are as under.

Standard of Light.

Osram lamp, 8·5 volts 2·1 amp., running off cells; 15-candle power corrected, standardized by the Harcourt pentane lamp, corrected as follows.

Wet bulb	65°
Dry bulb	59°
Barometer	29·75 inches
9·53 candles.	

Power of lamp, 50° angle	3712 candles
„ „ 20° „	4288 „

I would point out that, in future, the correction of the pentane lamp will be necessary for any street lamp tests made under stipulations for actual candle power. In ordinary gas testing, the relative conditions of the lamp and the test-burner render the correction superfluous; but in direct competition with electricity for street lighting, gas lighting must always be handicapped by its susceptibility to atmospheric conditions.

Earl Street, Westminster, S.W., Aug. 6, 1910. JNO. F. SIMMANCE.

Points on Gas-Works Transfers.

SIR,—We are a gas company with no Provisional Order or Act of Parliament. Our relations with our local authority are at the present very amicable; but the time may come when it would like to purchase the gas-works, &c.

Now on what lines would the award probably run—so many years' purchase of our profits? If so, large profits are the thing to aim at, and not cheap gas. Or would the value be based on our capital expenditure account? If so, this ought to be increased on every possible occasion. But a large capital expenditure account means more capital on which to pay dividend; and this is not conducive to cheap gas. Or would the valuation be on the sales of gas, irrespective of profit?

To provide cheap gas, it seems necessary to keep the capital expenditure account as low as possible—paying as much as possible out of revenue. But if ultimately this would be the worst policy for the shareholders, what is the best course to take?

DISSATISFIED,

[We give this letter from the Secretary of a Provincial Gas Company, anticipating that readers may possibly like to discuss some, at all events, of the several points on which our correspondent wants enlightenment.—ED. J.G.L.]

Coin Consumers' Agreement—Action as to a Gas-Meter Destroyed by Fire.

SIR,—I have noticed from time to time inquiries addressed to you in respect to the wording of agreements with coin-meter consumers. It has occurred to me that the enclosed case may assist your readers.

JAMES S. GARRARD, Secretary.

Eastbourne Gas Company, Aug. 6, 1910.

[ENCLOSURE.]

Early in the present year, a fire occurred upon the premises of a small shopkeeper at Polegate (one of the villages supplied with gas by this Company). A claim was made upon the consumer for the value of the meter, £2 3s. (the damage being restricted to the meter), and for the gas consumed, £1 13s. less 9s. recovered from the debris. In the end, County Court proceedings were taken. The case, which was undefended, occupied the Court on two occasions, June 2 and July 7. At the first hearing, His Honour (Judge Scully) offered judgment for the gas consumed, but refused it for the meter, on the ground that the agreement was not stamped. In the end, however, the case was adjourned to enable the Company to prove culpable negligence—agreeably with the section in the Company's Private Act which holds the consumer responsible in case of damage to the meter.

When the case was resumed, the Secretary to the Company, Mr. James S. Garrard, asked permission of the Court to put the agreement in again, and produced a letter from the Inland Revenue authorities of which the following is a copy:—

Inland Revenue, Somerset House, W.C.,

June 17, 1910.

Agreement No. 104 M. J. Fears.

Sir,—With reference to your letter of the 6th inst., I am directed by the Board of Inland Revenue to inform you that, if the payments for the gas are made only by coins inserted in the slot-meter, agreements similar to that forwarded with your letter are exempt from stamp duty under Exemption 3, sub. tit., Agreement in the First Schedule to the Stamp Act, 1891.

(Signed) H. F. CRUSE,
for Secretary.

The Secretary, Eastbourne Gas Company.

On this occasion, the defendant was represented by a solicitor, who asked his Honour to call upon the plaintiffs to prove culpable negligence; but, after discussion, his Honour held that the agreement must stand, and gave judgment for the plaintiff Company, with costs, upon the ground that Exemption 3 of the Stamp Act, 1891, relating to the sale of goods, covered the claim for gas; and Exemption 1 covered the

meter as being, with the fittings and cooker, of a less value than £5. The defendant's solicitor further argued that the Company had not proved that the amount due for gas had not been paid; but his Honour, after hearing the evidence of the fitter, who recovered and produced the index of the meter proving the quantity of gas consumed, held that the terms of the agreement disposed of this argument.

The agreement referred to is as follows:—

EASTBOURNE GAS COMPANY.

I—of—hereby agree to consume the gas and hire the under-mentioned fittings of the above Company, from the—day of—19— and to pay for the same in advance at the rate of—per 1000 cubic feet—this charge to include the sum of—per 1000 cubic feet for the rent of the meter, fittings, &c.

And I acknowledge that the following fittings, &c., are the property of the said Company:—

[List appended.]

And I undertake not to disconnect the meter, and to protect the same and the stove and fittings from damage of every kind, and not to remove or otherwise deal with the same in any way whatever without the consent of the said Company; and I further undertake that the said Company's officials shall at all reasonable times have access to the same for the collection of money, or any other purpose.

In case of any defect in the automatic arrangement of the meter, whereby gas can pass, or has passed, without the pennies being placed in the slot, I agree to pay for the gas consumed according to the registration of the meter's index, or if the gas-meter cease to register the quantity of gas delivered, the amount to be charged shall be the same as that of the corresponding period of the previous year.

And I agree to give the Company seven days' notice in writing, of my intention to discontinue the use of the same.

And I further agree that the Company shall be at liberty to remove the said meter and fittings on giving seven days' notice of their intention to do so.

As witness my hand this—day of—19—

Witness:

Signature

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Bills Royal Assented.

The House rose for the summer recess last Wednesday, on which day the following Bills received the Royal Assent:—

Abertillery and District Water Board Bill, Bradford Corporation Bill, Bristol Gas Bill, Cambridge University and Town Water Bill, Clydebank and District Water Order Confirmation Bill, Falkirk Corporation Gas Order Confirmation Bill, Fraserburgh Water Order Confirmation Bill, Fylde Water Board Bill, Gas Orders Confirmation Bills (Nos. 1, 2, and 3), Glasgow Gas Consolidation Bill, Havant Gas Bill, Little Hulton Urban District Council Bill, Middlesbrough Corporation Bill, Middleton Corporation Bill, Montrose Water, &c., Order Confirmation Bill, Mountain Ash Water Bill, Paisley Gas Order Confirmation Bill, Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Shirebrook and District Gas Bill, Slough Water Bill, Water Orders Confirmation Bill, Water Provisional Order Bill, Wemyss and District Water Order Confirmation Bill.

Both Houses will resume on the 15th of November.

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons, presided over by Lord MACDONNELL, resumed consideration on July 5 of the above Bill (see *ante*, p. 349).

Sir EDWARD H. FRASER, the Deputy-Chairman of the Derwent Valley Water Board and a Member of the Water Committee of the Nottingham Corporation, stated that the Corporation supply was obtained by pumping; whereas that of the Board was obtained by gravitation. The Corporation drew their water from the red sandstone. All their shafts, with the exception perhaps of one, were immediately surrounded by colliery works. In reply to the Chairman, who asked if they had found that any prejudicial effect had been exercised on their wells by the pumping of the collieries, he said the supply was not so good as it was formerly—the wells tended to diminish. In the county of Nottinghamshire, collieries were pumping enormous quantities of water to waste; while in other cases they were disposing of it. One colliery company supplied two townships with water; and another supplied water to a single township. These companies would not be subject to the provisions of the Bill. In or near the City of Nottingham, brewers, bleachers, and other manufacturers were pumping millions of gallons daily, and were doing quite as much damage to the underground water as the Corporation. Yet all these would be outside the scope of the Bill. The allegation that damage was done by the pumping was not well-founded. The drafting of clause 3 was extremely poor. It was difficult to understand what its meaning was. The words "notwithstanding anything contained in any Act of Parliament or Provisional Order" seemed to be mere surplusage. If the words gave retrospective effect to the clause, he would object to them. Both the Corporation of Nottingham and the Derwent Valley Water Board had spent enormous sums on their water undertakings. If the clause passed, the Corporation would be in the extremely serious difficulty that, in case of mishap to any of their wells, they would have to apply to Parliament. This would mean delay, possibly of a couple of years. He was not in favour of compensation being given in cases in which injury was done. The Corporation, however, did, in cases in which they injured wells, give a supply. This was a recognition of the principle of compensation. If the compensation

clause should be enacted, it would create special property in underground water, which was not now part of the law of the land. If the clause were made to apply generally and not merely to water undertakers, his objection to it would be diminished. There could not be property in underground water. He objected to the proposal to place the onus of disproof on the undertakers. It was impossible to prove a negative. If water were being taken from a distant area, the right of the people in the distant area should first be provided for; but that provision should be made when the powers were originally granted. Decision as to whether a supply should be given in transit should rest not with the Local Government Board, but with Parliament.

By Sir W. CROSSLEY: There was a certain equity in making good to a man the water that was taken from him. His principal objection to the Bill was that it proposed to legislate specially against water undertakers.

By Mr. HOLT: Clause 3 should only apply, if at all, prospectively; and it would be unfair if it applied to any sources but wells.

By the CHAIRMAN: The water supply of the country should be placed in the hands of National Trustees, a water board, who should supervise the method by which water was drawn from the earth and distributed.

Mr. LEWIS BEARD, the Town Clerk of Blackburn, gave evidence on behalf of the Association of Municipal Corporations. The total population of the boroughs that were represented by the Association was estimated by the Registrar-General in 1908 to be 19,997,556, of whom 16,660,191 were supplied by municipal corporations or joint boards; the remainder being supplied by companies. The Law Committee of the Association had passed the following resolution:—

That, in the opinion of this Committee, the proposals of the Bill, if carried into law, would place unnecessary and oppressive restrictions upon water undertakers, and would discriminate unfairly between public and private water supplies, and that they would thereby increase materially the difficulty and cost of securing an ample, pure, and wholesome supply of water for the population of the country.

Clause 3 was intended apparently to deal only with wells; but, as a fact, it would also apply to gravitation schemes. It would restrict the operations of such corporations as Blackburn—cases in which Parliament had sanctioned a progressive scheme and had left the details to be arranged later. Blackburn, under the authority of Parliament, had bought certain water; but if clause 3 became law, they would not be able to spend a few hundred pounds to carry out the necessary works (certain conduits) to get possession of it, without a further application to Parliament. The clause would also stop the operation of all authorities working under the Public Health Acts. It would have a retrospective effect; and it would stereotype the Lord Chairman's clause, and impose on undertakers the necessity of accepting it as it stood, without an opportunity being afforded them of being heard against it. The clause also discriminated between public and private supplies, and imposed on public water undertakers obligations which were not imposed on private supplies. Clause 4 also discriminated—it shifted the burden of proof, and it altered the general law with respect to underground water to the detriment of public undertakers. If the words relating to proof were deleted, and if the clause were made to apply all round, his objection to it would be minimized. Clause 5 would place an indefinite liability on undertakers—a liability not ascertained at the time that they arranged their scheme. Each scheme should, as in the past, be investigated by Parliament; and any claim for supplies *en route* should be made then. The first claim for a supply should rest with the district to which the water would have flowed naturally had it not been disturbed; the second with the undertakers, and the final with the authorities *en route*. Small bodies might be exempt from the operation of the Bill; and there would be no objection to giving them power to acquire land for water purposes by Provisional Order, provided the procedure was carefully guarded.

Mr. BEALE, the Chairman of the Water Committee of the Birmingham Corporation, and of the South Staffordshire Water Company, also gave evidence on behalf of the Association of Municipal Corporations. He stated that, as Chairman of the South Staffordshire Company, he had accepted the principle of compensation for injury to private water supplies. Clause 3 imposed an unnecessary obligation on small undertakers to go to Parliament. Of course, large water undertakings should apply to Parliament. Alternative and cheaper ways would be private agreement or Provisional Order. The local inquiry which preceded the grant of a Provisional Order provided all the publicity necessary. The retrospective action of clause 3 was very objectionable. There might be great confusion and litigation in determining whether earlier Acts had sufficiently specified works. There would be difficulty, too, in specifying details of proposed works. It would be possible for Parliament to state the maximum quantity of water that might be taken. It would, however, be a great evil to limit the quantity that might be taken. Such a limitation had the effect of driving undertakers further afield in order to obtain water, which meant that the consumer or ratepayer had to pay more. He objected to having to specify the works, but would not object to having to specify the nature of the works. He preferred that the Lord Chairman's clause should be inserted and modified, if necessary, according to the circumstances of each case, to stereotyping it in a Public Act. In the South Staffordshire Company's Act, there was a compensation clause; and as it had been made retrospective, the Company had had to deal with over a hundred claims. In most of the cases, however, they had not had any difficulty. In their Act, the limit of protection was $\frac{2\frac{1}{2}}$ miles. Many private water supplies were liable to pollution, and they were often intermittent. An arbitrator should therefore be directed to consider whether a supply in respect of which a claim was made was or was not effective. In South Staffordshire, they tried to put each claimant as nearly as possible in the position in which he was before the Company drained his supply. As a matter of fact, they invariably put him in a little better position than he had been in. With regard to giving water in transit, the result of clause 5 would be, in the case of Birmingham, that something like thirty authorities would have the right to demand water in bulk, and sell it in competition with them. This section should be limited. In the case of Birmingham, every water authority within 15 miles of the aqueduct had the right to a supply in bulk; but they only obtained that after 25 gallons per head per day was got for the Birmingham area.

They had applications from time to time from such authorities for terms; and then they weighed the cost of getting it from the Birmingham mains as compared with the cost of getting it for themselves. It was purely a commercial question. As to giving off water *en route*, he did not know that the people through whose district the pipes were taken had any particular right to obtain a supply; but all these cases should be decided judicially as they arose. It was impossible to lay down a general rule. With regard to the compensation question, until there had been a very wide inquiry as to the operations of water abstractors, there ought not to be general legislation.

By Mr. J. H. LEWIS: In many cases the South Staffordshire Company had paid compensation in money; but the amounts were not large.

Mr. JOHN BOND, the Clerk to the Kettering Urban District Council, stated that he spoke on behalf of the Urban District Councils Association, which represented 546 of the 815 urban councils of England and Wales. Clause 3 would prevent any urban district council from even sinking a well or driving an adit without obtaining an Act of Parliament. It would therefore prevent the councils of urban districts with small rateable values from extending their water supplies, inasmuch as an Act cost any amount up to £1000. The cost of an Act would in many cases be out of all proportion to the cost of the proposed water supply. These councils would therefore be seriously prejudiced in respect of their statutory obligations if the clause became law. Authorities supplying under the Public Health Act should be excluded from the operation of the clause; and the retrospective operation of the clause should be deleted. The Association also held that it would be impossible to specify works, in detail, when applying to Parliament. There was a great difference between enacting clause 3 as part of the general law and in dealing with it on its merits in connection with applications to Parliament. The clause ought not to be stereotyped. It would be an advantage if urban councils, especially the smaller ones, had power compulsorily to acquire water rights by Provisional Order. Urban and rural district councils in Ireland already possessed this power. The Association did not, as a general principle, admit that there should be compensation for damage done. They had the strongest objection to clause 4. It would alter the general law with regard to underground water. The clause would give rise to innumerable claims, and would result in endless litigation and expense. It would be acceptable if it were altered so that a water undertaker might claim compensation from a private individual abstracting water, and so that a claimant had to prove his case. The Association thought clause 5 went much too far. When a local authority went outside its district for water, the Association agreed that the district from which the water was taken should be entitled to a supply on favourable terms. They did not agree that any authority *en route* should be entitled to a supply. If such a supply were given, the receiving authority should furnish a portion of the capital cost. Otherwise the debt of the authority undertaking the scheme might be increased to such an extent that they might have to pay increased interest for loans.

Mr. SEYMOUR WILLIAMS, giving evidence on behalf of the Rural District Councils Association—a body which comprises 127 rural district councils—said it was the opinion of rural councils that they should be excluded from the operation of the Bill. A rural council had no power to apply to Parliament except in regard to certain specified matters in respect of which they could proceed by way of Provisional Order. They were under statutory obligation to give a proper supply of water; but if clause 3 were enacted, it would, in many cases, be impossible to fulfil that obligation. They often acquired land for the purpose of sinking wells; and if they could not acquire it by agreement, they acquired it compulsorily by means of a Provisional Order. They should possess similar powers with regard to the acquisition of water rights. Clause 3 would mean an application to Parliament in respect sometimes of trivial matters. The Association thought that if the compensation clause were made law, it would be such a hindrance to small authorities as to make it impossible for them to carry on the work of supplying water. The supply to a small rural parish might cost £100 or £200; and the compensation claims might amount to much more. Asked if he opposed altogether, on behalf of his Association, the grant of compensation, he said that was the view of a large number of Associations. Opinion on this point was, however, not unanimous. Where a district, in which a watershed existed, was tapped by an outside body, provision, on satisfactory terms, should be made for supplying the district with water.

(To be concluded.)

A WELSH WATER BOARD BILL.

It will be remembered that a Bill is before Parliament in which it is desired to constitute a Water Board consisting of representatives of the District Councils of Abertillery, Abercarn, Risca, and Mynyddislwyn. It first passed through the Upper House; and when before the Commons Committee, there was opposition from the Llewellyn Trustees and the Lancaster Steam Coal Collieries Company. The scheme provides for new works; and the necessity is established beyond question. The first-named opponents did not want the proposed new Water Board to take $\frac{1}{2}$ acres of a farm required for the works without purchasing the whole of their 42 acres. The Lancaster Collieries Company, it was alleged, were the cause of most of the local water difficulties. They were paid £7000 to refrain from working the coal under the Cwmillery reservoirs, and were to have 300,000 gallons daily compensation for loss of a stream that it was computed would turn into the reservoir 240,000 gallons daily. But they had worked the coal all round the reservoir to such an extent that it lost 90,000 gallons a day through leakage, and it was positively unsafe. The Company were also charged with wanting now to impose conditions upon the Board that would make working quite impossible. Engineers—Mr. Theodore Vachell, Mr. Baldwin Latham, and Mr. Henry Rofe—gave evidence of the peril that would be occasioned by attempting to maintain the full capacity of the reservoir. The Committee practically rejected the whole opposition—only giving to the Lancaster Company protection in relation to surface works.

LEGAL INTELLIGENCE.

THE WEST HAM CORPORATION AND THEIR FINANCES.

Illegal Overdrafts and Application of Moneys Borrowed.

In the Chancery Division of the High Court of Justice a short time ago, Mr. Justice Neville was engaged for some days in hearing an action brought by the Attorney-General, at the relation of the India-Rubber, Gutta Percha, and Telegraph Works Company, who are large ratepayers in West Ham, against the Corporation of the borough, their Treasurer (Mr. Patterson), and their Bankers (the London and County Bank), to obtain a declaration that certain overdrafts obtained by the Corporation from the bank for their electricity undertaking were unauthorized and illegal.

The statement of claim set forth (*inter alia*) that the Corporation's overdraft at the bank on March 31, 1908, was £90,949 on capital account and £44,952 on revenue account, and that, of these sums, £20,817 on capital account and the whole of the £44,952 had respectively been borrowed without the sanction of the Local Government Board, and were wholly unauthorized and illegal; that the Corporation's illegal overdrafts on capital and revenue account at the bank had been continuous and increasing during the three years ending March 31, 1908; that the bank had each year charged and paid themselves interest on these illegal overdrafts; and that these payments of interest were defrayed out of the fund or rate applicable to the general purposes of the Public Health Act, 1875, were illegal, and breaches of trust to which the bank were privy. The statement of claim further set forth that the Corporation kept one general account at the bank, which in fact comprised, and was an amalgamation of, ten different accounts in respect of separate undertakings under various Acts of Parliament; that the moneys received for each undertaking were held upon a separate and distinct trust from every other account of the Corporation, which the defendants well knew; that this amalgamated account had been wrongfully applied in reduction of illegal overdrafts during the period in question; and that the bank had paid themselves interest on these illegal overdrafts during the period in question to the extent of some £14,000. The plaintiff claimed (*inter alia*) declarations that the above transactions were illegal and *ultra vires*; and that the defendants Patterson and the bank might be ordered to restore to the funds of the Corporation the alleged illegal overdrafts and all payments of interest upon them. The defendants denied all the allegations of the plaintiff.

Sir A. Cripps, K.C., Mr. Macmorran, K.C., and Mr. Scholefield appeared for the plaintiff; Mr. Danckwerts, K.C., Mr. Morten, K.C., and Mr. Tomlin represented the Corporation; Mr. Buckmaster, K.C., and Mr. Methold watched the case for the bank.

During the trial of the action, the plaintiff and the bank came to an arrangement whereby, upon payment by the latter to the Corporation of £7000 in respect of the interest on the balances of overdrafts, and upon the bank agreeing to pay plaintiff the difference between party and party costs and indemnity costs of the plaintiff, further proceedings against the bank were stayed. The arguments involved the construction of various Acts of Parliament and the consideration of accounts of much complexity during the three years in question.

Mr. Justice Neville delivered his reserved judgment just before the rising of the Court for the Long Vacation. Having recapitulated and commented upon the allegations contained in the statement of claim, he said the Corporation appeared to have considered, and they certainly acted, as though they were entitled to use moneys borrowed under specific powers, not merely for the purposes for which the powers were bestowed, but for any purpose to which funds of the Corporation could lawfully be applied, so long as they kept proper accounts of the expenditure. He thought the correspondence and applications to the bank showed that they intended so to apply the bank's advances from the first—in fact, the overdraft was allowed on all the accounts, and a general balance struck daily upon them all. In his opinion, this view of the position of the Corporation was erroneous. He thought if they raised moneys under a borrowing power, they were bound to apply them for the specific objects indicated by the Statute. On this ground he considered that the obtaining of the overdraft was *ultra vires* of the Corporation. Upon the point whether, having regard to the statutory provisions under which corporations are enabled to procure the funds to discharge their liabilities, they were entitled to borrow money by way of overdraft for general expenditure—at all events, except under special circumstances—he reserved his decision. The impropriety of municipal corporations incurring large expenditure on capital account in anticipation of sanction for loans not obtained, was well illustrated in the case before him, where the Corporation failed to obtain sanction for a loan in respect of an expenditure of upwards of £10,000 on the electricity account, with the result that they were driven to make a levy for the amount—in his opinion an illegal levy, inasmuch as the proceeds were applied in payment of liabilities incurred more than six months before the levy was made. The bank having agreed terms with the plaintiff, he would refrain from discussing what, upon the evidence, their position would have been in respect of their advances. On March 31, 1908, the general account of the Corporation with the bank was largely overdrawn—to the extent of some £38,000, after deducting the amount due to the consolidated loans fund, but which had from time to time been paid into the account in reduction of the overdraft, in accordance with an arrangement with the bank. In his opinion, the application of the amounts due to the consolidated loans fund in reduction of the overdraft was illegal. Though plaintiff was not entitled to all the relief he claimed, he proposed to declare: (1) That the overdraft obtained from the bank for general purposes in respect of borrowing powers granted for specific purposes was *ultra vires* and illegal. (2) That the application of money due to the consolidated loans fund in repayment of such overdraft was *ultra vires* and illegal. (3) That borrowing of money from the bank for the purpose of the electricity accounts, otherwise than in the exercise

of borrowing powers with the sanction of the Local Government Board, was *ultra vires* and illegal.

The Corporation and the defendant Patterson must pay the costs of the action.

Mr. Danckwerts asked his Lordship to express the opinion that there was nothing to prevent the Local Government Board giving their sanction now to a loan. His Lordship replied that he thought this was so obvious that he ought not to say anything about it. Mr. Danckwerts pointed out that the Corporation would require some time to set matters straight, and asked that the operation of the judgment might be suspended till March 31 next year. His Lordship, however, did not think there were any means of doing this, as he had made a declaration, and not granted an injunction.

WATER SUPPLY TO FACTORIES.

An Important Decision.

In the Westminster County Court last Friday, his Honour Judge Woodfall gave judgment in the case of *Metropolitan Water Board v. Colleys Patents, Limited*, which had previously been before him. It was a claim for four quarters' water-rate in respect of defendants' factory in Marine Street, Bermondsey, S.E. The Board charged £21 4s. for a "domestic" supply of water, and defendants paid into Court £9 2s. 1d. for a "non-domestic" supply. The amount sued for was for water furnished since the Board's Charges Act came into operation; the defendants having previously been supplied by meter. Section 8 of the Act sets forth that the Board shall supply water for domestic purposes at a rate per annum that shall not exceed 5 per cent. on the rateable value of the premises; and section 25 defines the words "domestic purposes" as not including (among other things) water for a gas-engine or for any "trade, manufacture, or business." It was contended by Mr. A. B. Shaw, for the plaintiffs, that the supply to the defendants was for domestic purposes, being for drinking by the factory hands, and for lavatories, cleansing, &c. The water was also used for a gas-engine. Mr. C. A. M'Curdy, M.P., on the other hand, submitted, on behalf of the defendants, that the supply was for the purposes of trade only.

In giving judgment, his Honour said the point was whether the defendants were entitled to the exemption under section 25 of the Board's Charges Act, or whether they were bound to pay for a supply of water, under section 8 of that Act, on the rateable value of the premises. He had delayed giving judgment to see what the Court of Appeal decided in the London, Brighton, and South Coast Railway Company's case [see *ante*, p. 338]; but he did not derive much assistance, as the Lords Justices treated the matter entirely from a "railway purposes" point of view. In that case, which gave him no difficulty, his decision was upheld. In the present one, the water was supplied to the defendants for use in their factory, where they employed a large number of hands. No one lived on the premises, and they were in no sense a dwelling-house. The defendants were bound to have the supply of water to comply with the provisions of the Factory Acts, which compelled them to have sanitary conveniences for their employees; and it could not be said that the water was used otherwise, except a very small portion that was taken for a gas-engine. But defendants could not carry on their business without complying with the provisions of the Factory Acts; and he took the view that a domestic supply of water meant a domestic supply in the popular sense. It seemed to him contrary to common sense that a supply of water to a factory was in any sense a domestic supply within the meaning of the Act. He repeated what he said in the Railway Company's case—that, though flushing the sanitary conveniences was domestic in a certain sense, he did not think it was so to the extent of precluding the defendants from availing themselves of the exemption contained in section 25 of the Charges Act. He found that the water was supplied to defendants for the purposes of their business; and he entered judgment for them, with costs.

It was intimated, on behalf of the plaintiffs, that there might be an appeal.

AN UNSUCCESSFUL CLAIM BY A GAS WORKMAN.

At the Greenwich County Court last Friday week, a workman, named Henry Sharp, claimed damages against the South Suburban Gas Company for breach of contract. Plaintiff alleged that he entered into a contract of service with Mr. S. Y. Shoubridge on behalf of the Company for a definite twelve months "if he should remain sober, honest, and industrious, and able to do the work allotted to him." He complained that he was discharged within five months. His wages were 26s. 6d. per week; and he claimed £35 15s. 6d.

Mr. Whiteley, in the course of his opening, said that plaintiff took on a load of coke a couple of wheels to oblige another workman, named Key, supposing that they had been acquired honestly. He was "suspended," and afterwards was not taken back into the Company's employ. He was, however, given a testimonial describing him as willing, sober, and industrious.

Plaintiff, giving evidence, said he had been employed by the Company for nine years; and up to April 26 was paid his wages of 26s. 6d. a week. About the beginning of March, a fellow-workman, named Key, asked him to take to his home a pair of wheels; and they were placed on top of a load of coke he was taking out for delivery in the district. He did not know where Key got the wheels from; but he knew they were the Company's property. He expected Key had bought the wheels and paid for them. He gave the wheels to Key's wife. Later, when he was asked if he had taken a pair of wheels, he could not speak at first, and asked: "Do you mean two or three weeks ago?" Then he told the official he had taken the wheels for a

man he knew by sight, who had taken them from a scrap heap. He was thereupon discharged.

Mr. Gutteridge (for the Company): You knew that if you took anything out for a workman you would have to get a permit?—Yes.

When you got the pass for the coke, did it not occur to you that you should get a pass for the wheels?—I never gave a thought to it. I expected the man to bring it.

It is not the habit of your fellow-workmen to buy wheels and take them home, is it?—I have seen them take old packing cases.

Henry Key said he had been a fitter for ten years in the employ of the Company. He took the wheels off the scrap heap, as he wanted them to attach to a box to make a barrow for his child. The result of it was that he was discharged. He valued the wheels at about 8d. The Company first heard of the matter through an anonymous letter. One morning he asked Sharp if he was going to Forest Hill, and he said he was. He then gave the wheels to him to take to his (Key's) house. In reply to questions by the Judge, he acknowledged that he would not himself take them home, because he would want a permit, and Sharp also should have had one; so that he knew he might be getting Sharp into trouble.

Mr. Shoubridge, giving evidence, said that on April 26 he received an anonymous letter, and both the men came before him. He had already had a report from Mr. Whimster and Mr. Waller, assistant and foreman, and he told them he had had a letter to say the charges were admitted to be true. He said he was surprised that men who had been so long in the service of the Company had done anything of the kind. Key said he was sorry; he saw how wrong and foolish it was, but hoped mercy might be shown to Sharp, because he had led him to do wrong. Witness then asked Sharp why he took the wheels out; and Sharp said Key asked him to, and he thought Key had bought them. He said he did not take a pass because he did not think about it. He was told he must have known it was wrong to take anything from the works, without saying a word about it, to a workman's home. Witness told them that he had no alternative but to discharge them both. Key again begged witness to let Sharp remain. He did not care for himself, but he was very sorry for the trouble he had brought upon Sharp. Witness gave instructions that they should be paid off at once. He had never known of men purchasing such things as wheels. The only thing had been when they had been allowed to have some packing-cases.

Mr. Whiteley (for plaintiff) urged that no jury would find plaintiff guilty of "dishonesty" through the careless act which brought about his dismissal. All the evidence was to the effect that Sharp broke the rules; but there was no evidence of guilty knowledge.

His Honour, in the result, found for the defendant Company; giving judgment for them, with costs.

Liquidation of R. England and Co., Limited.

The Official Receiver in the Companies Winding-Up Division of the High Court of Justice has issued particulars under the liquidation of R. England and Co., Limited, of No. 59, Mark Lane, E.C. It appears that a statement of affairs has been filed showing gross liabilities as regards creditors amounting to £587, of which £464 is due to unsecured creditors. The assets consist of a patent, valued at £20, from which £13 13s. 1d. has to be deducted for the claims of preferential creditors payable in full; leaving the net assets at £6 6s. 11d., and a deficiency of about £458. As regards shareholders, the paid-up capital of the Company, which was formed with a nominal capital of £2000, in 1900 preference shares of £1 each and 2000 ordinary shares of 1s. each, to carry on the business of chemical and fertilizer merchants, and to work two patents relating to inventions for methods of treating sewage sludge for the production of manure and treating sulphate of ammonia, is £337, to which has to be added the above deficiency of £458; making a total deficiency as regards shareholders of £815. The Company carried on business at a loss; and no accounts have been prepared.

Suicide by Coal Gas.—As the result of nervous breakdown and sleeplessness brought about by overwork in his business, Mr. Charles Riby, a clothier, of Hesse Road, Hull, committed suicide last Thursday at Scarborough by inhaling coal gas. At the inquest, the Jury returned a verdict of "Suicide while temporarily insane."

Rochdale Corporation Gas-Coal and Oil Contracts.—At their meeting last Wednesday, the Gas Committee of the Rochdale Corporation accepted tenders for the supply of 55,000 tons of coal required at the gas-works during the ensuing year. The average price per ton is rather higher than was the case a year ago; but the difference is said not to be more than £1000. At the same meeting, tenders were accepted for 500 tons of oil for use in the manufacture of carburetted water gas; the prices being slightly more favourable than last year's.

Gloucester Water Supply.—The Gloucester City Council have lately discussed reports as to increasing the city water supply from the Newent works, and, as a preliminary, making a trial boring on land of the Corporation or other property at or near Kettford. It was stated that the Town Clerk (Mr. G. S. Blakeway) had suggested to Messrs. Hastie, Solicitors to Lord Beauchamp, that the Corporation should make a trial boring upon certain land belonging to his Lordship, and that the completion of the option of purchase should be deferred until the boring had been tested. Messrs. Hastie replied that before they could advise Lord Beauchamp to allow any trial boring they would require the Corporation to enter into a binding contract that in no event would they afterwards apply for compulsory powers in regard to any part of his property. The Estates and General Purposes Committee instructed the Town Clerk to inform Messrs. Hastie that, under the circumstances, the Corporation must proceed independently of Lord Beauchamp. The Council adopted a recommendation of the Committee to enter into agreements with Mr. Frank Ricardo, demising to the Corporation land at Kettford, with power to make a trial boring there, and giving them the option to purchase land and easements on terms similar to those provisionally arranged with Lord Beauchamp.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The One Hundred and Ninety-Seventh Half-Yearly Ordinary General Meeting of the Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster—Mr. CORBET WOODALL (the Governor) in the chair.

The SECRETARY (Mr. Henry Rayner) read the notice convening the meeting; and the seal of the Company having been affixed to the Register of Proprietors, the report (given in the "JOURNAL" last week) was taken as read.

FAVOURABLE RESULTS.

The GOVERNOR: Ladies and Gentlemen, It now becomes my duty to move the adoption of the report and accounts; and I think, in doing so, we may fairly congratulate ourselves upon the results of the half-year's work. Circumstances outside our control have favoured us. The prices of materials, for instance—both those which we have bought and most of those which we have sold—have been in our favour. But, beyond this, there is no slacking in the progress resulting from careful management and zealous work. For the first time, our accounts include those of the West Ham Company; but, thanks to Mr. Bevis, they are so compiled that comparison with last year presents no difficulty. As with the negotiations and the parliamentary settlement, so with the routine of the amalgamation—all has proceeded easily and pleasantly, both at Stratford and in London. We are making rather considerable alterations at the Stratford works, which will be completed in time for the coming winter, and which will add materially to the economy of production. The demand for gas in the West Ham area is increasing at a satisfactory rate. I am able to say without hesitation that the amalgamation is operating to the advantage of the allied Companies.

REPORT AND ACCOUNTS.

I turn now to the accounts; and I will deal, first, with the capital. So long as the number of our consumers increases, expenditure must also increase; but I am glad to point out that the additions from year to year are small. Of the £750,000 authorized in 1903, we have issued nothing; and of the credit balance in hand at the time of the passing of that Act, which was £844,920 in all, we have still left unexpended £411,640. In the half year, our expenditure for capital purposes was £53,060, of which more than £50,000 was upon mains, meters, and stoves. Depreciation amounted to £63,000; so that in the account period there is a credit balance to capital, apart from the contribution to the redemption fund. The £13,677 written off plant account represents certain buildings, &c., demolished—chiefly at St. Pancras and Haggerston, from which stations the manufacture has been transferred to Becton. The good effect of the careful nursing of capital is seen in the fact that the charge for dividend is less than it was five years ago by nearly 1d. per 1000 cubic feet sold, though, for the same period, the rate of dividend paid has increased from £4 8s. to £4 13s. 4d. per cent. This 1d. per 1000 cubic feet represents the handsome sum of £100,000 per annum. A most gratifying feature of the revenue account is the evidence of increasing business. Our output of gas is 1½ per cent. larger than in the June half of 1909; and the average on the year comes to about 3½ per cent. The reduction in the price made on Jan. 1 last meant a deduction from revenue of £54,000 on the half year. The actual loss was £25,891; the difference being made up by the increased sale. Against this reduction in revenue for gas, we have to set an increase in rentals for meters, stoves, and fittings, and also in each item of residual products—coke, breeze, tar, and ammonia. On balance, the reduction of the gross income is £3203 only. It will be noticed that there has been a transfer from the item of rental for fittings to that of rental for meters. Hitherto, no credit has been given to the latter for rent of automatic meters; this having been included with fittings. The change more correctly represents the allocation of the extra charge made for gas by prepayment meters. On the other side of the accounts, under the head of manufacture, every item is favourable. Coal and oil together have cost less by £99,970; coke for carburetted water gas, salaries, wages, purification, and repairs are all down; the total improvement on the corresponding half year being £117,270. The saving on coal and oil has been due to the lower prices paid, supplemented by further improved carbonizing. Distribution charges have been higher by nearly £40,000. Of this, about £10,000 is the consequence of increased work and reduced charges for maintenance of incandescent burners and mantles. The cost of this work is included under the heading of repairs of mains, &c.; and against this, the payments by consumers are a credit. We are desirous of getting all these burners under our inspection and maintenance. The advantage to the consumer far exceeds the payment he is asked to make; while, to the Company, every light burning at the highest efficiency is a valuable advertisement. The cost of maintaining meters and stoves must grow with the growth of the number in use. Of meters, we have 30,000 more than at this time last year.

ASSESSMENT.

There is a charge of £1388 on account of our expenses in connection with the quinquennial revaluation of the Company's property. This is a matter of the utmost importance to us, and is being gone into thoroughly before the various Assessment Committees in the Metropolis.

RETIRING ALLOWANCES.

The item of £10,500 for retiring allowances represents the amount paid to the West Ham Directors and Auditors, as part of the scheme of amalgamation. The total expenditure on revenue account has been £1,571,048, or £68,545 less than in the same period last year.

RESERVE AND OTHER FUNDS.

The reserve fund is invested in India 3 per cent. stock. The market value of this security has fallen since our purchase was made; and we have written-down the value in our books accordingly, and have brought from net revenue the sum of £10,000 necessary for the purpose. The reserve fund has been still further affected by the West Ham

amalgamation. That Company had a balance of £15,869, to be surrendered to us; but out of the joint fund £27,600 was devoted to the purchase of ordinary stock to be allocated to the shareholders as part of the purchase consideration. This accounts for the fact that the reserve fund account appears at a lower rate this half year than it did in the corresponding half year. From the same account (net revenue) we have taken further a contribution of £20,000 to the insurance fund; and the usual £10,000 has been deducted from the dividend, and put to the credit of the redemption fund. Each of these appropriations is, of course, a contribution to the financial strength of the Company. The outcome of it all is that, after paying all preference charges and the contributions to redemption, reserve, and insurance funds, we have a balance on the half year of £430,150. The carry-forward at Christmas was: By the Gaslight and Coke Company, £456,993; by the West Ham Company, £32,747—in all, £489,740.

DIVIDEND AND REDUCTION IN PRICE PROSPECTS.

The total sum available for distribution is thus £919,890. Out of this, the Directors recommend a dividend on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum, which will absorb £377,520; and will leave £542,370 to the credit of the current half year. A shareholder writing to me the other day commenced his letter by saying that the accounts appeared to him to be not unsatisfactory. In view of the figures I have given, I think we may agree that the writer's words of approval were not extravagant. The year on which we have entered will have to bear the burden of dearer coal. But, on the other hand, our purchases of oil have been at lower rates; and the value of residuals is so far well maintained. Looking at all the circumstances, I can safely promise that the price of gas will be again reduced from Christmas next.

STAFF TRAINING AND LADY DEMONSTRATORS.

Among the causes which have led to the improvement apparent in the Company's position, not the least is the better training and education of the outdoor staff and the more intelligent service of the public consequent thereon. During the summer term, the fitters are being thoroughly grounded in the simple principles of their work, and also taught how to reply to the inquiries of the consumers with whom they come into more intimate contact than do the inspectors and superior officers. The staff instruction in the winter is yielding increasingly good results, of which evidence is given in our own examinations, and in the success of our candidates in passing those of the City and Guilds of London Institute. Mr. Webber reports that the spirit of the young officers is excellent. A fresh batch of twelve apprentices were recently selected, making 54 in all who are now receiving a thorough practical training in the work and duties of fitters. The promise so far is very good. The service which was instituted some four years ago, of lady demonstrators, who call upon consumers to advise them and their servants as to the economical use of gas for cooking, continues to give great satisfaction, and is doing a very useful work. Instruction was given to 6420 consumers during the past half year; making a total of over 30,000 demonstrations since the institution of the system.

CO-PARTNERSHIP SUCCESS.

But beyond these aids, and applying to all branches and all grades of the service, is 'the stimulus of mutual interest and effort which has been advanced by co-partnership. We have now had a full year's experience of the system; and we are finding our hopes realized. One of the engineers explained to me a few days ago the remarkable success of the operations at his station by saying that all the men took keen personal interest in the work, and they desired to be kept informed as to whether they were holding their own in comparison with others. The number of co-partners is now 9090; and the total amount of their interest in the Company is £66,377.

PORT OF LONDON AND SMOKE PREVENTION BILLS.

Two Bills of a public character and affecting the Company's interests have been considered by Parliament. One—the Port of London Bill—was duly passed after prolonged inquiry. If, under the new authority, the Port of London receives the attention and the improvement which it urgently needs, London as a whole will greatly profit, and the Gaslight Company with it. Meantime, we must, with a hopeful mind, pay some duty, which we hope will be small, on coal imported from the North. The second Bill was intended to make more drastic the restrictions on smoke from factories. The proposals of the Bill would have seriously hampered the operations of the Company, although the quantity of smoke for which we are now responsible is small. Our efforts are constantly directed, and with increasing success, to making our works as inoffensive as possible to the neighbourhoods where they are placed. The stoking machines now in use do their work noiselessly; and the system of continuous carbonizing in vertical retorts, which we have adopted, will eventually do away with all smoke and practically all steam. Gas companies rightly claim to be smoke abatement institutions on a large scale, distributing, as they do, two smokeless fuels—gas and coke; and we shall be glad when our factories are an example to others on the same ground.

STAFF AND OTHER LOSSES.

My last words will be somewhat sad ones. We have to announce, with much regret, the death, on July 19 last, of Mr. G. C. Trewby, for many years a familiar figure at these meetings. He had been identified with the gas industry since 1853, when he became a pupil of the then Chief Engineer of this Company, Mr. F. J. Evans. With the exception of a few years' interval, Mr. Trewby served this Company from that date until the close of the year 1904, when he retired on an annuity. Much of Mr. Trewby's work was conducted at Beckton, when that station was, comparatively, in its infancy. From 1884 to the date of his retirement, he occupied the position of Chief Engineering Officer of the Company. As the result of an official visit paid by him to America in 1889, upon which I accompanied him, the manufacture of carburetted water gas was inaugurated in England by this Company. The loss of another old and esteemed officer has to be recorded in the death, early this year, of Mr. T. H. Solomon, after a service of forty years with the Company—the latter part in the important post of Superintendent of the Rental Department. Mention must also be made, with regret, of the death of Sir Robert Giffen, K.C.B.,

who, for thirteen years, acted as the Official Auditor (appointed by the Board of Trade) of this Company's accounts, and whose work as a statistician was so widely known and admired. He is succeeded in the duties of Auditor by Sir Alfred E. Bateman, K.C.M.G., whose signature appears for the first time on the accounts.

PUBLIC LIGHTING.

One point I have not dealt with, and that is the arrangement we have come to with the Corporation of the City of Westminster for the improved lighting of their district. We are very pleased to have the opportunity of showing what gas can do in the illumination of a large area, such as the City of Westminster is responsible for; and, judging by the work so far done, I feel sure that the effect will be such as to surprise the inhabitants of London generally. A similar arrangement has been made with the Corporation of Finsbury; but I have to report, with regret, that the Corporation of one of the northern boroughs have decided, in the interest of their own electrical department, to substitute electricity for gas. The tender of this Company would have given to the borough an amount of light 70 per cent. in excess of that which they will enjoy, when the change is made, and at no more cost. But these are considerations which do not weigh when the supposed interest of the electric department is considered. The work of negotiation with the different Municipal Councils has been carried out exceedingly well by our controller of gas sales, Mr. Goodenough; and we owe him our thanks for what he has been, and is, doing.

CONFIRMATION OF THE REPORT AND ACCOUNTS.

I now beg to move: "That this meeting do agree with, and confirm, the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 28th ult."

Mr. ULICK J. BURKE (the Deputy-Governor) had much pleasure in seconding the motion.

SHAREHOLDERS' REMARKS.

Mr. E. KIMBER said, before the motion was put, he should like to make one or two remarks. The Governor had told them that the amount carried to the redemption account was £10,000; but if this was compared to the capital of £27,000,000, it appeared to be very small, as it was only 1-247th of the capital. He understood the redemption fund had been instituted for the purpose of redeeming the whole of the capital; and he would suggest that, instead of redeeming the capital in 247 years, it should be done in half that time—say, 120 or 130 years. But what would be the state of the coal supply of the country at the end of that period? No doubt this question did not enter the minds of ordinary gas shareholders; but it must enter into the minds of trustees, who never died. It therefore behoved them to look to the far future. The anthracite coal in South Wales was said to be nearly exhausted.

THE GOVERNOR: Is it necessary to discuss the question of anthracite coal?

Mr. KIMBER said perhaps not; but there was a question whether gas coal would last for more than 60 or 70 years longer. It was very satisfactory to find that owing to the increase of the motor trade and the rubber business, the result had been to diminish the supply of stable manure, which would create a demand for sulphate of ammonia, and consequently increase the price of their residual products. The demand for oil, too, would increase the demand for tar. On the other hand, there were things militating against the progress of the Company—for instance, the increase in the rating. All rating authorities looked upon gas companies as fair game for rating. But they should fight them with their own weapons. Electricity companies had got their representatives upon the borough councils; and he could not see why gas companies should not do the same, especially as they were very large ratepayers and were quite as much entitled to be considered as electricity companies. Practically, the Gaslight and Coke Company had not a single representative on any borough council.

THE GOVERNOR observed that, as a matter of fact, this statement was not correct.

Mr. KIMBER said he was very glad to hear it; and he would like to know to what extent gas companies were represented on borough councils. He thought borough councillors imagined that, because electricity was a fine light, it was everything. But they knew nothing about the difference between the cost of producing electricity and gas. Consequently, he was glad to see a statement, which had been circulated by the Company, pointing out the difference. The circular had had a great effect upon many of his clients. He had also heard that electricity companies boasted that they had a lamp which would beat the whole of the gas companies in the Metropolis. He did not know whether this was true or not; but he should like to hear from the Governor if he had any information to give upon the point. One thing was true, and that was that the whole of the Metropolis had been most egregiously taken in by the electric light. He believed that the electric light was generally throughout the country receiving its quietus from gas companies; but, still, it would not do to remain quiet in the future.

Mr. W. A. HOUNSOM said his only regret was that the attendance of proprietors was so small when they were, for the first time, dealing with the result of the amalgamation. To his mind, the outcome was very satisfactory, especially remembering that they were dealing with only six months' working. It would have been quite possible for the accounts not to have come out so well; and he considered it was a great tribute to the foresight of the Board, as well as the way in which the work had been carried out in the interests of all parties. He also thought they might hope for happy results to take place from the amalgamation. While not inclined to forget the advantages they had, he did not wish to minimize the work the Company had to do in the future. At one time, they looked forward to a decrease in consumption owing to the introduction of the incandescent mantle; but the decrease had been supplemented, even if it had not been accompanied, by an increase in consumption. During the past half year, they had expended practically nothing on buildings and erections, which showed that the storage plant was sufficient. He did not forget

how much they owed to high-pressure distribution; but no doubt this enormously increased the work the mains could do. The progress which the Company had made might be summed up in one word, "sympathy"—sympathy between the shareholders and the Board, between the Board and its employees, and between the Company and its consumers. This was the greatest feature in the progress of the past few years; and he thought they should pay the tribute which was due to those who had taken hold of the possibility which had come to their hands. He did not very much believe, although it might be called rank heresy to say so, in either profit-sharing or the sliding-scale. It might bring the master and the man, and the Company and its consumers, into closer touch; but he thought these days had now gone by. Under existing conditions, they were approximating ideals in two great principles; and if they could go further on the line of co-operation of all parties connected with the gas industry, they need not take the somewhat pessimistic view the former speaker had taken. If the great principle of co-partnership were to be carried out, there must be sympathy between all parties. No human rule was perfect. Times might come when storm and stress would arise. Still, if they went forward and had a development of sympathy, they would find it best for all parties. It would come home to them in the shape of dividend, and it would be the best thing for all engaged in the commercial enterprise of the country.

Colonel RODNY MUNDY, referring to the harassing test which all gas companies had to undertake, said the object of the test was for light, not heat, and to see if the gas supplied possessed the necessary quality; but it appeared to him that the test would be more reasonable if it was for heating power. Gas was not now required so much for lighting purposes as it was for heating. With the incandescent mantle, gas was capable of giving an excellent light; but it was used more for heating than for lighting purposes. No doubt, they were constantly put to great expense in the testing of gas for lighting purposes, when really it was wanted only for heating; and he hoped some progress would be made in abolishing this troublesome test. The only other question he wished to ask was how far they were advancing towards paying off obsolete capital?

Mr. H. C. PELLY congratulated the Board upon the excellent report and statement of accounts, which he had studied very carefully; and he confessed that he was not at all disappointed. In spite of the large sum represented by the reduction in the price of gas, the income of the combined Companies was only £3000 less than in the corresponding six months; while there had been a saving of over £68,000. This was sufficient proof that the policy which prompted the amalgamation was a right and proper one, and that the hopes and expectations of every one were in a fair way of being realized.

THE GOVERNOR'S REPLY.

The GOVERNOR: If no other observations are to be made or further questions asked, I will reply to those already made. Beginning with the last question put, as to the test, as you are aware, this Company have made some advance in the direction of remodelling the test. When last we went to Parliament, we agreed to the calorific standard, which would determine the heating value of the gas and not the illuminating value. But, unfortunately, we were obliged to keep them both—we were not allowed to drop the illuminating power standard and accept the calorific one. We have led the way in this direction; and I trust that the anticipation of the honourable proprietor will some day be realized, and that the test for luminosity only will be abolished. There is, I think, no doubt that more than 90 per cent. of the gas sent out is used for purposes in which the luminosity of the flame is of no value. With regard to paying off the redemption fund, the sum which has been contributed by this means is now £120,000. The total amount to be paid off is £1,000,000; and the half-yearly contributions will grow as the price of gas comes down. Next year, we shall be paying, not £20,000 a year, but £30,000 a year. We have to day, as we always do, listened with great pleasure to the observations made by Mr. Hounsom; and, speaking as he did of the necessity for sympathy among all classes of those employed in the service as well as outside, he spoke of the days having gone by when the association between employer and employed was close, intimate, and sympathetic. I venture to say that the adoption of the system of co-partnership has done very much to bring back those days, the departure of which Mr. Hounsom deploras. First of all, the system of Committees at each of the works and stations of the Company, where the men assemble with their officers to discuss what is best for the Company and best for the advancement of the objects aimed at by co-partnership, and the less frequent meetings of the General Committee in this room, where we all talk over together these same questions, have done very much to bind closer together all those who are striving for the advancement of the interests of the Company. With regard to the observations of the first speaker, I cannot help feeling a little regret that, before painting so alarming a picture, he had not taken the trouble to call at the office in order to verify, if he could, a few of his statements. With regard to capital redemption, we are not aiming at redeeming the whole of the capital of this great Company. No period is attached to the life of the Company. It may go on for all time. The amount which we are seeking to redeem is one million sterling, which, as we stated when before Parliament, is not represented by assets, due to the closing-down of stations. This, as I explained on the last occasion, was in several cases more in the public interest than in the interest of the Company itself. We have a certain amount of capital which is not represented by assets. They have been wiped out; and what we are trying to do by this half-yearly contribution is to bring the amount down, which will effect a large saving in expenditure on capital. The first speaker said the ordinary gas proprietor did not recognize, as he did, the difficulties; but I think the ordinary gas proprietor is more nearly in the right than is the extraordinary shareholder. As to what will happen when our coal supply is exhausted, I think we may, for a few years, possess our souls in patience. With regard to almost every other observation made by the honourable proprietor, I think it is clear to the shareholders that the Company are doing everything that it is expected the Company can do in the direction he pointed out.

The resolution was then put to the meeting, and carried unanimously.

DIVIDENDS.

The SECRETARY read the following minute as to dividends:

- (1) That the sum of £10,000 be set aside out of the divisible profits of the Company for the half year ending on the 30th day of June last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903.
- (2) That a dividend as follows for such half year be declared—viz.:
 - On the 4 per cent. consolidated preference stock, at the rate of £4 per cent. per annum.
 - On the convertible 5 per cent. preference stock, at the rate of £5 per cent. per annum.
 - On the 3½ per cent. maximum stock, at the rate of £3 10s. per cent. per annum.
 - On the ordinary stock, at the rate of £4 13s. 4d. per cent. per annum.
 Subject to deduction of income-tax.

The GOVERNOR: I beg to propose that resolution.

Mr. ULICK J. BURKE: I have much pleasure in seconding that.

The resolution was carried unanimously.

The GOVERNOR: That concludes the business of the meeting; and I thank you for your attendance.

VOTES OF THANKS.

Mr. R. J. N. NEVILLE said he had been entrusted with what he thought was the most pleasant duty any shareholder could have been entrusted with; and that was to ask the proprietors to signify their heartiest thanks to the Governor and the Board for the splendid report they had presented. He was sure there was not a single proprietor who was not proud of the progress the Company had made under the Governor, and he did not think anyone in the room was more proud than the Governor himself. As one gentleman had said, sympathy was what was wanted; and if they had that sympathy to-day, it was not only because the public believed theirs was a business Board, carrying on a great business, not only in the interests of the shareholders but of the public as well, but it was owing to the action of the Board and to the support they had been able to get from those under them—viz., the officers of the Company and the whole of the staff who had co-operated so loyally in bringing about this result. He hoped the proprietors would give a hearty vote of thanks to the Governor and the Board of Directors for the report, of which any company might well be proud. He had great pleasure in moving the resolution.

Mr. E. KIMBER said he had great pleasure in seconding the motion. No doubt, some of his observations might be thought to be rather too critical on the Board; but that was not his object at all. His object was to support the gas industry. He thought the amount of capital to be redeemed might have been stated in the accounts; but if, as the Governor had said, it was only £1,000,000, the whole case was entirely altered.

The resolution was carried unanimously.

The GOVERNOR: On behalf of my colleagues and myself, I thank you very heartily for this vote. I think I may say that we are proud of the report; and I, personally, am glad to have an opportunity of acknowledging the cordial and sympathetic help and the loyal support which I have always had from my colleagues. With regard to the staff, I cannot speak too strongly; and I propose that our best thanks be given to them, one and all. It is a pleasure to attend all the meetings of this Company. I do not mean these public meetings when the proprietors are so friendly; I mean the meetings of the Court, the Committees, and the inspection of works. On all these occasions it is a pleasure to those who take part in them; and for this I am sure I have to acknowledge very largely the cordial and hearty way in which all the officers have worked together and have infused their spirit into the men working under them.

Mr. JOHN MILES seconded the motion; and it was carried unanimously.

Mr. D. MILNE WATSON (the General Manager): On behalf of my colleagues, myself, and the staff generally, I beg to thank you most cordially for the very hearty vote of thanks you have just passed. The responsibilities of our position are very considerable, and are not lightly undertaken; but so long as we have the confidence of the Directors and the proprietors of the Company, I can assure you we shall do our best. We have just now come to the end of a year of the co-partnership; and I, as one of the 9010 co-partners, can say we thoroughly appreciate what the Board and the shareholders have done for the working men in giving us this co-partnership. I feel sure that in the long run it will spell great success for the Company, and will infuse into all the members of the staff that enthusiasm and zeal which was not perhaps always present. One and all are working for the Company, and everyone feels that everything done tends to the success of the co-partnership which the Directors and shareholders were kind enough to bestow upon them. I thank you most heartily for the very kind vote of thanks you have just passed.

This concluded the proceedings.

Aldershot Gas, Water, and District Lighting Company.—The accounts presented at the half-yearly general meeting of this Company on the 29th ult. showed that the total revenue in the six months ended the 30th of June was £29,576, and the expenditure £21,355; leaving a surplus of £8221. The Directors reported that the business made excellent progress in the period named; sales of gas (exclusive of special contracts and works) having increased more than 10½ per cent. The wet weather during the half year interfered with the demand for water by the War Department; but otherwise the business generally had been very good. The Directors recommended dividends at the rates of £6 1s., £4 11s., and £5 per cent. per annum on the several classes of stock, all less income-tax. The Chairman (Mr. W. T. Robertson) moved the adoption of the report; and the motion was carried unanimously without discussion. In acknowledging a vote of thanks to the Chairman, Directors, and staff, Mr. Robertson made special reference to the General Manager and Secretary (Mr. R. W. Edwards), who, he said, was of the greatest assistance to the Directors. Mr. Edwards briefly acknowledged the compliment on behalf of the members of the staff, and personally thanked the Directors for the ready support they had always given to himself.

BRENTFORD GAS COMPANY.

A Gratifying Report and a Reduction in Price.

The Half-Yearly Ordinary General Meeting of the Company was held last Friday at St. Ermin's Hotel, Caxton Street, Westminster—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the report and accounts were taken as read. The report was to the effect that the statement of accounts for the half year ending June 30 showed the sum of £98,750 available for dividends. The Directors recommended the declaration of dividends, subject to income-tax, at the rate of 5 per cent. per annum on the 5 per cent. preference stock, at the rate of 12½ per cent. per annum on the consolidated stock, and at the rate of 9½ per cent. per annum on the new stock, 1881. It was stated that the business of the half year had again been very satisfactory; the increase in gas sold being 4.19 per cent. over the corresponding half year. Enhanced receipts from tar and ammoniacal liquor were also gratifying features in the account. The total number of consumers is now 87,885, as against 81,733 last year; and the use of stoves, both for heating and cooking, is largely extending. The Directors had much pleasure in announcing their intention to reduce the price of gas by 2d. per 1000 cubic feet, as from Sept. 29. The works at both stations are in efficient order, and will be able to meet any demands for gas required in the immediate future.

The CHAIRMAN, in moving the adoption of the report and accounts, said he regarded his task as being very much lighter than that which had confronted him on some previous occasions. He felt sure that the shareholders would agree with him that the report was a highly gratifying one, and that the accounts disclosed not only a good record of the past half-year's working but (what was exceedingly important) of a vitality that was full of promise of a growing prosperity. If they turned to an examination of the accounts, they would find available for dividend a sum of £98,750, as against £88,950 for the June half of 1909. This meant that, after paying the dividends as recommended on the three stocks—including that on the £30,000 of new stock issued in January last—they would have a surplus of £9638, which, added to the balance from the last account of £48,556, would make a carry-forward of £58,194—being in favour of this half-year's account as against that of the corresponding half year of 1909, by £8408. Well, the shareholders would ask perhaps how this satisfactory result had been arrived at. If they looked, then, into the details of the accounts, they would find an increase in gas, meter, and stove rental of £8181, in breeze of £122, in tar of £1523, and in ammoniacal liquor of £1650, while the only set-off against this good business return was on coke, which was £525 less. This was the epitomized story of the manufacturing returns. On general expenditure, there was perhaps not much to call attention to, except that coals, despite the increase in gas and products sold, had cost £3762 less. In wear and tear, both that in manufacturing and in distribution, there was no doubt an increase, as to which he might have a word to say later on; and the same remark applied to parliamentary charges. He thought he might say that all this made a very welcome record of the Company's affairs, and a record which justified the reduction of 2d. per 1000 cubic feet in the price of gas, which it was hoped to give the consumers the advantage of as from Sept. 29. Now in the item of parliamentary charges there was an increase of something over £400. The shareholders were probably all familiar with the Test Burner Bills which had been struggling through divers courses in Parliament. The Brentford gas was tested by a burner called the "Brentford" burner—a burner which fulfilled all statutory requirements, and which, he might also add, had been recognized as so fulfilling its obligations by the High Court. The "Brentford" burner, so far as the Company were concerned, was all they wanted. It was a very good burner; and therefore the shareholders might wonder why the Directors should have decided to spend money in going to Parliament to get it altered. The Board thought—and they were still of the same opinion—that it was really to the advantage of the gas industry generally, or at all events to the Company's consumers and all the councils which they were so much concerned with, that there should be a recognized uniform burner; otherwise it was very difficult indeed to make comparisons between one company and another. They were quite willing to go and carry a Bill through Parliament, provided it was not opposed, as it was to the advantage of the councils as well as to the Company—in fact, it was rather more to the advantage of the authorities than to the Company. However, several of the councils did not see eye to eye with the Directors, and they proceeded to oppose. This would have meant a long and expensive inquiry; and therefore the Board did not care to fight the matter. They preferred to have their own burner rather than to enter into a costly struggle which might have involved the Company in calorific tests and other things they did not want. The Bills were fought smartly in the Lords Committee first of all, and went through without any restrictions. The second reading was opposed in the Commons, to prevent the Bills being committed. However, they were committed; and, thanks very much to the excellent Committee who considered the measures, they were carried there again without any restrictions. He was sorry to say the third reading stage was not over yet; but he thought there should be very little further opposition. Of course, the Bills did not concern their Company much; but the Directors were anxious to congratulate the other companies who were interested on the masterly grasp of the case by the Chairman of the Committee and the opinions expressed. It was good for the industry. They might sooner or later have to go to Parliament; and he hoped that what had been done would be regarded as a precedent. It was always better for the consumer that the science of gas making and the evolution of its cheaper distribution should not be hampered by undue restrictions and interference of official bodies. He (already remarked that he rather felt his task on this occasion was lighter than heretofore; and this brought him to the question of wear and tear. Three years ago, when he first took the chair, he warned the shareholders that a great deal had to be done—a lot of money had to be spent; and it had been his regret, he believed, on every occasion he had spoken in that room to say that the time of expenditure was still upon them. Probably the proprietors had wondered when it was

going to stop. But they had waited patiently, and he thought now they had rather reached the time of their reward. These three years had been a period of most careful watching and strenuous work; and very gladly he gave credit for all this to their Engineer and Manager (Mr. A. A. Johnston) and to the staff generally, by whom the Company were very ably and loyally served. Mr. Johnston had furnished him with a summary of the work done during the last three years; and since it so justified the wisdom of the policy pursued by the Board, he would briefly refer to some of the leading points in this report. Mr. Johnston said that at the time of his appointment the capacity of the producing plant—coal gas and carburetted water gas—was, Southall 7,350,000 cubic feet per day, Brentford 3,600,000 cubic feet—making a total of 10,950,000 cubic feet per day. The maximum day's output at the time reached 11,087,000 cubic feet. By improved working, re-construction, and additions during the past three years, the capacity had been substantially increased; and excluding the horizontal at Southall, it was now approximately as follows: Southall, 10,300,000 cubic feet per day; Brentford, 5,100,000 cubic feet—making a total of 15,400,000 cubic feet per day. In bringing about this result, the only item charged to capital account was the sum of £5088 for the new carburetted water-gas plant at Brentford; and they had now sufficient producing plant to meet all likely requirements for some years to come—the maximum demand last year having been 12,215,000 cubic feet. Coal and coke handling plant was being installed at Southall; and new boilers had been provided at both Brentford and Southall, as well as new exhausters, condensers, tar-extractors, and station meters. With reference to distribution matters, Mr. Johnston pointed out that important developments had taken place with regard to the dealings with consumers. New show-rooms had been opened at Twickenham, Ealing, and Brentford, and depôts provided for the outdoor staff at Hanwell, Hounslow, and Twickenham, from which a saving of valuable time would result. Maintenance of consumers' burners had been undertaken, and a general fittings business established. "That the innovation," proceeded Mr. Johnston, "is appreciated by your consumers is, I think, conclusively proved by the improved lighting in your district, and the readiness with which the public avail themselves of our services." This record was not only gratifying to the Directors and shareholders, but was one of which the Manager and staff might justly feel proud. He hoped that all this expensive work was now practically completed, and that the reduction in price promised in the report would prove but an earnest of future similar concessions. He was not going to prophecy further reductions; but he thought they would be very likely to come about. Reduction in price was, and must be, a leading feature in the policy of every gas company; but he must not be taken to promise a period of too thrifty expenditure. Gas invention in all its branches was never still, and it ever behoved them to take all advantage of it, and to live up to the times. Even now, he might say, the Board had several big jobs under consideration. For instance, there was the dock at Southall. Then, again, high-pressure gas was coming more and more to the front; and they could not afford to neglect its advantages. It was extremely probable, therefore, that they would have to lay down a high-pressure main in part of their district. This would be, he should think, a capital charge, and thus it would not affect the revenue.

Mr. R. J. NEVILLE NEVILLE seconded the motion.

Mr. PFUNGST asked how it was there was an increase of nearly 18 per cent. in salaries and wages of officers under the heading of distribution. He also thought the £199 interest allowed by bankers, as shown in the profit and loss account, was rather small, in view of the large average amount of money that the Company must have on deposit over the half year. As to the investments, he suggested that the market value of these should be taken once a year—at the date of the balance-sheet—instead of putting them in at cost. So far as he could make out, the £43,000 invested only produced interest to the extent of £565, which worked out at 2½ per cent.

The CHAIRMAN replied that the question of bankers' interest did receive the careful attention of the Board; but it had to be remembered that their bankers were very good in meeting them in the matter of overdrafts when necessary. The question of distribution salaries and wages was dealt with by Mr. Johnston in the report he had already referred to, as follows: "Under the heading of distribution charges, salaries and wages have grown from £10,745 to £18,912. This is partly due to the fact that the automatic work formerly done by contractors has been undertaken by our own workmen, whose wages are included in this account instead of under wear and tear, as they would have been had the work been done by contractors. The addition attributable to this cause would be approximately £3000." This was on the year. The valuation of the securities was a point which had engaged their attention, as it had done that of the directors of many other companies. Securities did go down; and he supposed there should really be a system of writing-off. However, he was reminded that some of the securities they had bought would be paid off at par at certain dates. As to the interest return, of course they were limited in regard to the kind of securities which they could purchase.

The resolution was then carried.

On the proposition of the CHAIRMAN, seconded by Mr. NEVILLE, the dividends recommended in the report were agreed to.

Mr. THOMAS WILKINS proposed, Mr. HATCHWELL seconded, and the shareholders heartily passed, a vote of thanks to the Chairman and Directors.

The CHAIRMAN, when acknowledging it, suggested that a similar compliment was merited by the officials, to whom the Company were greatly indebted. Their zeal and attention to the work was beyond all praise.

Mr. NEVILLE seconded the vote, which was promptly carried.

Mr. JOHNSTON, in reply, said that he had had a great deal of hard work; but it had been a labour of love. He owed much to his staff, for the loyal assistance he had received from them.

Increased Water Storage for Shanklin.—The Shanklin District Council accepted last Tuesday a tender from Messrs. Streeter and Co. for the construction of a high-level reservoir at Chillerton. There were four tenders, and the lowest, for £1339 19s. 4d., was accepted; the highest being for £1489.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice convening the meeting; and the report and accounts were taken as read.

CONSUMPTION AND METEOROLOGICAL CONDITIONS.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Board were very glad to have this recurring opportunity of giving an account of their stewardship, especially when, as on the present occasion, the tale they had to tell was one of progress, almost all along the line. Six months ago, however, they were rejoicing in a substantial increase in the consumption of gas; but that day the figures exhibited a slight falling off, under circumstances which were entirely beyond their control, and showed how greatly gas consumption was affected by the weather, as a natural consequence of its extended use for heating purposes. During the first three months of the year, and particularly in February and March, the weather was comparatively mild; and the consumption of gas was adversely affected. Immediately, however, the temperature dropped below that of last year, the consumption picked up; and for the last three months of the half year, it presented a satisfactory increase, although not sufficiently large to counterbalance the earlier deficiency. Though an increase of consumption was always more acceptable than a decrease, it was satisfactory to know that the number of consumers had increased, and that there was no falling off in the demand for gas-heating appliances suitable to the season; for large numbers of additional cookers, hot-water circulators, and other similar appliances were fixed during the half year. This, as a matter of course, was being done with the object of increasing the consumption of gas; but it might also be claimed that, in thus seeking to extend their business, the Company—and gas undertakings generally—were performing an important public service, the value of which was recently acknowledged by the President of the Local Government Board, the Right Hon. John Burns, M.P. Replying to a deputation who waited on him with reference to smoke abatement, Mr. Burns drew attention to the work of the gas companies in promoting the use of gas-heating appliances, and was reported to have expressed the opinion that "the use of all this additional gas in lieu of coal must undoubtedly have reduced considerably the smoke nuisance in London." It was indeed beyond question that the purity of the atmosphere of London had been greatly improved by the extended use of gas for heating purposes; and the thanks of the gas industry were due to Mr. Burns for having drawn public attention to the fact. Shareholders might justly plume themselves upon their participation in this good work; and he hoped that their dividends would not be the less acceptable in consequence.

HIGH-POWER GAS LIGHTING AND ELECTRICAL FICTION.

As mentioned in the report, a further stimulus to gas consumption had recently been supplied by an adaptation of the inverted incandescent burner to high-power lamps, by which was meant lamps of from 200 to 500 and 1000 candle power. A considerable number of these lamps were fixed by the Company during the half year for outside shop and other lighting, and were giving great satisfaction. There appeared to be a large field for the employment of such lamps; and the officials might be relied on to cultivate this to the utmost. And here he should like to express the Board's appreciation of the excellent service which was being rendered by the Chief Inspector (Mr. Baldry) and the staff and employees with him in the Sales Department, who, under the direction of Mr. Shoubridge, were doing their best to promote the Company's interests in this department. Results of their work showed that, although it was not in the Company to command consumption, the very utmost was being done to deserve it. He might refer in this connection to a full-page advertisement which recently appeared in most of the newspapers, and was followed by a prospectus of which the proprietors had probably seen something, announcing the final triumph of electricity over gas, which, according to it, had no longer a chance of existence unless supplied at 7½d. per 1000 cubic feet. Why the odd half-penny was not quite clear; but perhaps they ought to be grateful for it. He might say, however, that the Board were not greatly perturbed by the prospect thus held out to gas undertakers, nor would it be worth while to take notice of it, were it not for the opportunity it afforded of placing before consumers that which was a true statement of the case. The only foundation for the statement in question appeared to be the further one that a "brilliant" light could be maintained for forty hours by electricity at the cost of a penny. The candle power of this so-called "brilliant" light was not stated, though obviously this was the *crux* of the whole matter as regarded comparison of cost. Giving, however, to the amount of electricity used at 3d. per unit, the exceptionally high efficiency claimed for it—viz., 1 watt per candle power—this could not be more than 8 candles; whereas the present price of this Company's gas (2s. 5d. per 1000 cubic feet) was equivalent to the maintenance with inverted burners of a light of fully 20 candles for the same number of hours, and at the same cost. So far, therefore, from gas being reduced to the necessity of eking out a scanty pittance of a few pence per 1000 cubic feet, it was actually, at its present price, two-and-a-half times cheaper than electricity at its very highest efficiency; and even if charged for at the high price of 6s. per 1000 cubic feet would still be as cheap—light for light—as such electricity at the very low price of 3d. per unit. Nor did the advantage of gas over electricity end here, for the cost of maintenance had to be considered. This could not be less than three or four times as much for electricity as for gas, because electric lamps at about 3s. each did not last many more hours than incandescent gas-mantles at 4d. or 6d. each. These figures related to gas supplied under ordinary pressures for domestic and other similar lighting. For street and other lighting where high pressure could be employed, the candle power might be doubled; so that high-pressure gas, which was now coming to the front, if supplied at 12s. per 1000 cubic feet, would be as cheap—light for light—as electricity at its very best, and supplied at the unusually low price of 3d. per unit.

CARBONIZATION AND RESIDUALS RETURNS.

Turning now to a more congenial task, the accounts which were before the proprietors revealed, he ventured to say, the strength and solidity of the business of a gas undertaking. They showed that the deficiency in revenue caused by the reduction of price which was made last year, and, in a lesser degree, by a slight falling off in consumption, had been more than made up by improved working and better prices for residuals; and that, in addition, they had been able to meet exceptionally heavy expenditure on repairs and maintenance, due to the necessity for replacing and modernizing certain retort-house and other machinery. As the result of this expenditure, the works would shortly—for the work was not quite finished—be better equipped than ever for the economical production of gas. The fruits of the Board's policy in this direction, acting on the advice of their able Engineer, Mr. Shoubridge, were already apparent in the increased production of gas per ton of coal carbonized; this having now reached the high average for the half year of nearly 11,700 cubic feet, or 370 cubic feet per ton more than for the same period of last year, representing a saving of 1939 tons of coal. He (the Chairman) need not point out how great an advance this production was upon the old and almost stereotyped returns of 10,000 cubic feet per ton; the fact being that freedom from the shackles of high and, under modern conditions, wasteful illuminating power—for which freedom the gas industry was primarily indebted to the prescience of the Company's late Chairman, Sir George Livesey—had made possible improvements in carbonizing methods which otherwise could not have been attempted, and with the happiest results to all concerned. The old saying that dividends were made in the retort-house still held good, in the sense that it was mainly there that the possibility of saving in working costs existed; and the great amount of attention which was being directed to the subject of carbonization at the present time bid fair to result in a further cheapening of carbonizing costs which, in the case of this Company, were already among the lowest in the kingdom. The return for residuals showed a substantial increase for both coke and sulphate of ammonia. Residuals, as the proprietors were aware, formed a most important source of the revenue of a gas undertaking; and when these were doing well as to prices, it was safe to say there was not much amiss with the general trade of the country. There was a substantial improvement in the return for sulphate of ammonia which was partly due to higher prices, but chiefly to a larger yield of ammonia per ton of coal carbonized. Coke had fetched about £2000 more, although less was made for sale owing to the smaller quantity of coal carbonized. There had been a falling off in the yield of tar; but values had kept up, and were improving, owing mainly to a continuance of the demand for pitch, which was its most bulky constituent. In addition, however, there was a very fair and increasing demand for tar for road-making purposes, which already, it was estimated, absorbed 10 per cent. of the total gas-works production.

HIGHER COAL PRICES.

After payment of dividends at the same rates as those of last half year, the amount carried forward would be increased by about £1200. This increase would add strength to the position in the event of their being less favourably situated next half year, which was possible, seeing that they had been greatly helped in the accounts under consideration by the reduction in the price of coal obtained last year, and that this had now come to an end, and an advance in price had had to be submitted to. For this advance there did not appear to be any justification in the general condition of the coal trade; and it might be regarded as a direct outcome of the operation of the Mines Regulation (Eight Hours) Act, which was ushered in by considerable disturbances in the mining districts. These had, however, now settled down; and there was no present reason why coal prices should not follow suit.

THE WORKERS' BONUS.

Full provision had been made in the accounts for the payment of the bonus to the employees which was due under the provisions of the co-partnership scheme. This, at 6½ per cent., amounted in the aggregate to the largest sum ever paid by the Company since the formation of the scheme—a result which might be regarded as most satisfactory, because the holdings of the employees in the Company's stock would thereby be substantially increased. The gradual increase of these holdings was a chief cause of the success of the scheme, since the larger his stake in the Company, the greater must be the interest of the employee in its success. Co-operation was thereby increasingly promoted; and, as stated in the report, it was largely to this co-operation that the Board attributed the continued success of the undertaking. He might say that the average holding of stock by co-partners was now £50, and that there were now 39 who held £100 and upwards. While on the subject of co-partnership, with which Sir George Livesey's name was inseparably connected, he might mention that the Livesey Memorial Professorship at Leeds University had now been definitely established by the handing over to the University Authorities of the amount subscribed, which was between £10,000 and £11,000, on terms which had been approved by the subscribers, of whom the Company were one, and that a thoroughly representative Advisory Committee had been formed to secure the due administration of the fund.

THE STANDARD BURNER BILLS.

This concluded all that it might be necessary for him to say upon the report and accounts; but he should like to refer to a recent event of considerable interest and importance to all gas shareholders—viz., the passage, so far, of the Gas Companies' Standard (Burner) Bills, in which a member of the Board—Mr. Charles Carpenter—took a leading part. These Bills were, as the proprietors probably knew, promoted jointly by some forty or fifty gas companies, with the object of extending to them the use of the test-burner known as the "Metropolitan" No. 2. This burner was accepted some years ago by the Gas Referees for the testing of London gas, and had since been extensively adopted by gas undertakings—this Company among the number—under the authority of Parliament. It gave a fairer value to the gas than could be obtained by the old test-burners, and, what was of the utmost importance, was entirely free from the depreciating effects upon gas having a lower quality than 16 or 17 candles, which was a most serious defect in the No. 1 "London" argand. It was, in fact, admitted on all sides to be the most accurate scientific instrument for gas testing. It was the invention

of Mr. Carpenter, who devised it as complying with the provision in the London Gas Act, 1905, that the burner used for testing should be such as would develop the greatest amount of light from the gas, and be suitable for use by the consumer. The effect of this combined action on the part of the companies was to bring into the field against them all the forces of reaction, so that the result was all the more conclusive on the side of progress. He might mention that the second reading of the Bills in the House of Commons was strongly supported by, among others, their friend Sir Fortescue Flannery, who made, if he (the Chairman) might be allowed to say so, a very convincing speech in favour of it. Mr. Carpenter was the principal witness for the Bills; and it was not too much to say that he bore the brunt of the long conflict in Committees, and that, as the bone of contention was his burner, so also was the victory his. He (the Chairman) was sure they all congratulated him very heartily upon it, and for having so successfully sustained the fortunes of the industry. Further opposition to the Bills was threatened on their reaching the final stage in the House of Commons; but it could hardly be supposed that Parliament would reverse the decision of the Committees of both Houses.

Mr. ROBERT MORTON, in seconding, said he was sure the proprietors had listened, as he had done, with very great interest to the lucid explanation of their Chairman of the affairs of the Company.

The motion was unanimously carried.

The DEPUTY-CHAIRMAN (Mr. Jabez Light) moved the declaration of a dividend for the half year of 5 per cent. on the preference stock, and of 5½ per cent. on the ordinary stock, less income-tax. He remarked that everything was in a gratifying condition. As one paragraph in the report stated, there had been an increase in the number of consumers in the half year, and a continuance in the demand for domestic gas-heating appliances, suitable to the season; while improved high-power lamps, fitted with inverted incandescent burners, were finding favour for outside shop and other lighting.

Mr. GEORGE ROSS (one of the Workmen-Directors) said it gave him great pleasure to second the resolution, especially as the employees of the Company participated in the profits. They were all indeed grateful for the late Sir George Livesey's system of co-partnership, and for the privileges it conferred.

The motion was unanimously adopted.

Dr. SIDNEY TURNER, in moving a vote of thanks to the Chairman and Directors, remarked that the Chairman had told them that, at the beginning of the year, the amount of gas consumed fell off; but, during the last three months it had increased, so that the average had only receded from the corresponding period of last year by less than 1 per cent. He was glad to hear this, because they had all noticed the character of the weather; and, as proprietors in a gas company, they had something to thank the weather for, seeing that, had it not been bad, the extra consumption would not have taken place. Having referred to the evidences of good management on the part of the Board, and to the excellence of the manufacturing returns obtained by Mr. Shoubridge, he turned attention to the question of smoke abatement, and said there was no doubt whatever that in the future the people of this generation would be looked upon as barbarians for using coal in the way they did. There was no question, in his opinion, that the time would come when gas heating would take the place of coal-fires; and then they would hardly know London. It would be an immense benefit to all to have purer air to breathe, and to have stopped the destruction of property resulting from smoke and sulphurous fumes. He noticed that the sale of residual products had increased very much; and he believed the increase would go on, seeing that the motor traffic had caused such a large demand for tarmac roads. He also alluded to the lowness of the item of unaccounted-for gas.

Mr. W. WARTH seconded the motion, which was heartily passed.

The CHAIRMAN, in responding on behalf of himself and the Board, said he hoped the proprietors would take to heart Dr. Turner's observations as to gas heating, and encourage the use of gas for this purpose as much as possible. Regarding the item of unaccounted-for gas, if they took (as they ought to take) the two past half years together, they arrived at the moderate figure of 3½ per cent. Proceeding, he said the efforts of the Directors would be of little avail if they were not supported—and cordially and zealously supported—by their officers and employees. It was his privilege as Chairman to propose a hearty vote of thanks to the officers, from Mr. Shoubridge and Mr. Ohren downwards to all the employees, for their devoted attention to the affairs of the Company.

Mr. T. GUYATT seconded the motion, which was supported by Mr. FRANK BUSH, who remarked that such a satisfactory balance-sheet could not have been presented had it not been for the officers. The Chairman had alluded to the fact that the co-partners had been paid 6½ per cent. He hoped that was an amount that would go on increasing. There was a splendid odour there of *esprit de corps*. It was a great pleasure to see so many workmen-proprietors present, and the two Workmen-Directors on the Board. That they were intelligent members of the Board he felt quite sure. Under all the circumstances, he was certain the success of the Company was assured.

The motion was cordially adopted.

Mr. S. Y. SHOUBRIDGE, on behalf of the engineering staff and the workmen, thanked the proprietors very heartily for their expression of generous appreciation of their services. The Board were at all times good to them, and supported and encouraged them in all they did—not only by means of the co-partnership scheme, but by the superannuation scheme, and in every possible way. At the present time, they were building an excellent recreation room for the co-partners; and in every manner there was encouragement to them individually and collectively to do their very best. They would be ungrateful indeed if they did not do everything possible for those who were so kind to them. He should like to take the opportunity of expressing his great indebtedness to Mr. Waller and Mr. Ross, the two representatives of the workmen on the Board, who had helped him wonderfully, and relieved him of a very great deal of anxiety. Their example and strenuous efforts on behalf of the Company had a notable effect on the whole of the employees; and he was sure a great deal of the success of the Company was due to their good example.

Mr. GHREN, on behalf of himself and staff, also expressed his sincere thanks for the vote and the kind remarks that had been made.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of the Company was held last Saturday, at the Works, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. E. Topley) read the notice calling the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the report and accounts were so satisfactory that he thought he would be well advised if he adopted the old proverb that "Good wine needs no bush," and leave them to speak for themselves. It might be his fortune to preside at a few more meetings of the Company; but he could hardly hope that he would ever be able to place a better record before the proprietors than he was doing on this occasion. They were a co-operative institution now—a tripartite alliance of consumers, shareholders, and workers, all interested in, and profiting by, the success of the Company. And he believed that the idea—the spirit of the idea—had taken full possession of them all, and to this was due, in some large measure, the success that had attended, and was attending, their operations.

CAPITAL AND INTEREST AND DIVIDEND.

They had in the past half year added £6374 to their expended capital. But in the same time the capital in proportion to the business done was still further reduced; and it was now at the lowest amount at which it had ever been in the history of the Company. It now stood at £431 per million cubic feet of gas sold. In an analysis of the cost of gas making and distribution, the charge for dividend and interest took an important place. A comparison with ten years ago showed that then the capital was £526 per million cubic feet; and the charge for interest and dividend was 8.75d. Now the same items were respectively £431 and 6.2d.; so that, while they had been increasing the amount of their dividend to the extent of about 16 per cent. in the ten years, they had at the same time reduced the charge as against revenue and against the consumers in the way described. The proprietors had, or would have, in inspecting the gas-works, an illustration of the necessity for watching carefully this question of capital expenditure. Gasholder No. 2, which was built in 1868, and which stood by the workshops, was being demolished, because the site would be of more use than the gasholder, which was too small and too light to be of further good service. This holder figured in their accounts at a value of £6000. They had written off in the past half-year's accounts £1000 of this amount, and commenced the formation of a redemption fund, to which they had carried £3000, towards providing for the balance of the £6000, and also for similar cases in future. The redemption fund was granted to the Company when in Parliament in 1906; but they had never yet taken advantage of it. Ordinary repairs and renewals were dealt with from year to year in the revenue account; but when they came to items like the one to which he had been referring, they were so large that it was impossible to provide for them in the current half year. So the fund was formed as a suspense account, in order to make provision in advance for such requirements as they arose. He need hardly point out to the proprietors the absolute necessity, if the undertaking was to be maintained in a healthy condition, of there being no risk of leaving in the capital account money represented by plant dismantled and abolished.

SOME RECORD ITEMS.

With regard to the revenue items, they were all of them favourable; and a few more records had certainly been established. The quantity of gas sold per ton of coal carbonized was more by something like 420 cubic feet than it had ever been before in the history of the Company. The carbonizing wages had been reduced to 1.5d. per 1000 cubic feet of gas sold, which was also the lowest amount hitherto reached. He desired to avoid the possibility of a mistake in this matter. The saving in wages was due, in considerable measure, to the adoption of machinery on the works. Of the labour reduced in the retort-house, some portion was transferred to the works of the manufacturers of the machines, and another portion was transferred to their own shops where the machines were repaired and renewed. The number of men employed by the Company was not reduced, but was steadily increasing. As the price of gas was lowered by the economies to which he was referring, so the demand for it increased; and a larger quantity of gas had to be made. So they had an advance in the number of men employed. He might say the character of the work grew less exhausting year by year; the atmosphere and surroundings in which it was carried on improved; and the average rate of pay to workers was also enhanced.

OTHER SAVINGS AND IMPROVEMENTS.

With regard to the cost of materials, it had been less than in the corresponding period of 1909 by £2082, while residuals had yielded a revenue £2579 greater. Another item in which there had been some saving effected had been in public lighting, through the automatic lighting and extinguishing of the street lamps, in the introduction of which system their Engineer (Mr. Broadberry) had long taken a leading part. The system had worked well, and had resulted in a saving of about £1500 per annum, which had inured to the advantage of both the Company and the lighting authorities.

FINAL RESULT, AND A PROJECTED REDUCTION.

After meeting all preference charges, and carrying £3000 to the redemption fund, and adding £1000 to the insurance fund, there remained £18,638 to add to the carry-forward of £20,682 from the previous accounts; so that they had £39,320 available for dividend. The Directors, as usual, recommended that the full amounts to which the proprietors were entitled be divided; and, if this was approved, they would have a balance to carry forward of £23,154. The accumulated funds of the Company now amounted to £62,118—another record—and a further reduction in the price of gas would be made at the end of the present year. Rejoice, co-partners! [Laughter, and "Hear, hear."] The market value of investments, representing the reserve and insurance funds, had fallen below the price at which they were purchased, and at which they had stood in the Company's books; and the difference would probably be made good in the current half year. They had already written-down these investments; and he was disposed to

say, "Happy are the companies who have their reserve funds in their own hands, and employed in their own works."

POPULARITY OF THE COMPANY'S STOCKS.

On March 1 last, £30,000 of the Company's stock was offered for sale by tender; and it was applied for three times over. Above £27,000 of it was allotted to present proprietors and to consumers in the Company's area of supply—the average price realized being £112 9s. 1d.

ELECTRICAL COMPETITION.

Since he came down to Tottenham that morning, he had been told they were to have a little more strenuous electrical competition in a part of their district. The North Metropolitan Electric Supply Company had taken over the Provisional Order of one of the urban districts; so that he had no doubt some vigorous effort would be made to capture some of the business in possession of which the Gas Company now rejoiced. They were, however, doing their best to make the merits of gas known in its various applications. They were just opening some new premises. Land had been bought at Southgate; and upon it they were going to build a local depot and district office. A new show-room would also be opened there; and he had no doubt whatever the Company would be able to hold their own pretty efficiently in the competition they had to face.

Mr. HENRY BAILEY seconded the motion, which was unanimously carried.

The DEPUTY CHAIRMAN (Sir Daniel F. Goddard, M.P.) proposed the declaration of the full statutory dividends at the rates of 7 per cent. per annum on the "A" stock and $5\frac{1}{2}$ per cent. per annum on the "B" stock. He remarked that this was the full amount of dividend they were allowed by law to pay, though the profits and working were good enough to pay more. Some people were inclined to criticize gas companies when dividends were increased; but it should be remembered that nowadays they could not increase dividends without enormously increasing the benefits to those who consumed gas. The Chairman had alluded to the fact that the amount of the dividends had increased about 16 per cent. during the past ten years; but the advantages to the consumers far out-balanced this. Putting the matter another way, the increase of dividend the proprietors obtained on this occasion amounted to about £352 for the half year, while the consumers received £3200 in the reduction of the price. These two figures ought always to be taken together, lest people imagined they were piling up dividends without giving a relative, or more than relative, advantage to those who consumed gas. One other remark. The report showed an increase in sales of gas of something like $5\frac{1}{2}$ per cent. over the sales of the corresponding half of last year. He would like to utter a warning against accepting too strongly the law of percentages. The law of percentages was in this instance a most dangerous and misleading one. The increase at the rate of $5\frac{1}{2}$ per cent. was much less than the increase in the corresponding half of last year. But it was an increase on an increase; and it tended to make the percentage lower than before. He believed the increase in the half year in the amount of gas sold was about 39 million cubic feet. Now supposing they did not diminish one little bit in the increased quantity of gas sold—advancing again by 39 millions, the percentage figure would not be $5\frac{1}{2}$, but only $5\frac{1}{3}$. It might be then said the rate of increase was going down, and that they were not doing so well. But they were doing just as well. It was on this ground that he asked them not to accept the principle of percentages too strictly as representing the expansion of business.

Mr. JAMES CLOUDSLEY seconded the proposition, which was unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. JAMES RANDALL, Mr. Bailey was re-elected to the Board, as was also Mr. G. T. Watson, on the proposal of the CHAIRMAN, seconded by Mr. J. EVE.

Mr. BAILEY having responded on behalf of himself and Mr. Watson, Mr. Chapman was re-appointed as an Auditor, on the motion of Mr. A. W. OKE, seconded by Dr. SCOTT.

Mr. CHAPMAN, in acknowledging his re-election, spoke of the indebtedness of Mr. Edward Crowne (his fellow Auditor) and himself to Mr. Topley for the clear way in which the accounts of the Company were kept.

Mr. H. D. ELLIS moved a vote of thanks to the Chairman and Directors; and, in the course of his remarks, he said the Company were indeed in a most enviable position. It was extremely satisfactory to know that the capital account was now down to £431 per million cubic feet of gas sold. A few years ago, even their Chairman might have thought it would be long—perhaps never—before they got the capital reduced to this point. The amount required for dividend was also very low; and the make of gas per ton of coal carbonized was likewise enviable. And as to the unaccounted-for gas, he did not think it quite touched 3 per cent. Nothing but delightful reflections were aroused by the accounts; and therefore they might heartily congratulate their Chairman and the Directors.

Mr. W. BROWN, in seconding, referred to the question of electrical competition; remarking that he could say from personal experience that electricity was not cheaper than gas for motive power. It might be quicker in starting-up; but he had always found that gas was very much cheaper.

The motion was heartily agreed to.

The CHAIRMAN, in his reply, said the Board were well satisfied with the progress the Company were making; and he thought he might claim that their works were an example to companies of their size in almost any place. Of the central office, their district offices, and, in fact, of all their property, they were proud, and satisfied they had good worth for the money spent upon them. Throughout the entire undertaking, there had been an utter absence of anything like starvation or even skimping; and it could be said that the whole property was in perfect and complete order. He had said that he felt very much the success that had attended the work recently had been due to the admirable spirit prevailing throughout the undertaking. He therefore desired to propose that their best thanks be given to Mr. Broadberry, Mr. Topley, and all the staff and workers of the undertaking. It was pleasant to hear Mr. Chapman's testimony as to the way the work of the office was done; and he (the Chairman) could testify as to the way the work of the Engineer was carried on.

Mr. CHAPMAN, in seconding, said the results of their working were extraordinary—make of gas per ton of coal carbonized, and production of sulphate of ammonia, tar, and coke. He was afraid that the time would come when there would not be the possibility of improvement, unless something remarkable happened.

The motion was cordially passed.

Mr. BROADBERRY, in responding on behalf of himself, his staff, and men, said that since he entered the Company's service (more than 31 years ago) as an apprentice, right down to the present time, his work had been absolutely a pleasure. He could not, in fact, conceive any more pleasant conditions of working than to be associated with their Chairman, the other Directors, Mr. Topley, Mr. Fisher (his chief Assistant), and his staff down to the lowest of the workmen. They were one and all working hard for one end—the true prosperity of the Company.

Mr. TOPLEY associated himself with all Mr. Broadberry had said; adding that it was a pleasant thing to him and his staff to hear the testimony of such an experienced man as Mr. Chapman regarding the efficiency with which their work was done.

[An inspection of the works by the proprietors followed.]

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday. Mr. T. G. CARTWRIGHT presided, owing to the absence, on account of ill-health, of the Chairman and Deputy-Chairman (Dr. H. M. Brewer and Sir Thomas Firbank, D.L.).

The SECRETARY (Mr. T. Hazell) having read the notice convening the meeting, the report of the Directors for the six months ended the 30th of June, with the accounts for this period, was presented. The latter showed a balance of £8302 on the half-year's working, and a sum of £9913 available for distribution; and the Directors recommended the payment of the statutory dividend. The Engineer and General Manager (Mr. Thomas Canning) reported that the works were in a state of efficient repair and in highly satisfactory working order.

The CHAIRMAN, in moving the adoption of the report, said the Company had not progressed very much in the period covered by it. In regard to the capital account, the shareholders would remember that the Directors offered for subscription £16,000 of consolidated stock; and it was all taken up at satisfactory prices. This, he thought, showed how well the Company's stock stood with investors. Passing on to the revenue account, he said he was sorry there had been one or two slight drawbacks. One thing was that it was not exactly gas weather—not foggy and cold; and another was the unfortunate labour dispute at the docks. But he was glad to see there was a general movement by capital and labour to submit these disputes to arbitration, instead of having strikes and lock-outs. Then they had been unable to get any relief in the price of coal; but with Eight Hours Bills and expenses going up in every direction, it was difficult for colliery proprietors to make a reduction in prices. The Company had had better results from their residuals; and the price of gas had been maintained. There had been a decrease in the public lighting; but this was entirely due to the action of the Electric Lighting Committee of the Corporation in taking away from the Company 200 lamps. They looked at it from a ratepayers' point of view, and maintained that the ratepayers should light the town with the cheapest form of illuminant, which the Company said was gas. The net result of the half-year's working was that they were able to pay the interest on their debentures and consolidated stock, and carry forward an amount next year, without having recourse to their reserve fund. This was satisfactory, especially as they had been obliged to write off £939 from the value of their Consols; this being the difference in the price at which they bought them and that at which they stood now. The general business of the Company was satisfactory; and they were well served by their efficient staff.

Mr. C. D. PHILLIPS seconded the motion; and it was carried unanimously.

The dividend recommended was then declared; the retiring Directors and Auditor were re-elected; and a cordial vote of thanks was passed to the Directors and officials.

The CHAIRMAN having acknowledged the vote on behalf of the Directors,

The SECRETARY replied for the officials. He said he thought it satisfactory that while the public funds had been going down in value the Company's were going up. The Company's additional consumers in the last three years numbered 1472.

The ENGINEER, in returning thanks, mentioned the advance made in the lighting qualities of gas; stating that now a consumer could get as much light from one cubic foot of gas as used to be obtained from 4 or 5 cubic feet. Consumers had profited very much by the newest inventions in gas. Speaking generally, gas lighting held 90 per cent. of the public and private lighting in the kingdom.

Increase of Assessments in South London.—Readers of the "JOURNAL" may remember that just before the rising of the Courts for the Long Vacation judgment was given in a case bearing upon the assessment of licensed public-houses. The effect of the decision has been that the aggregate assessment of these houses in the borough of Camberwell has been reduced by £15,000 in the provisional valuation list just completed. As a result, the "South London Press" states, the next half-year's demand on ratepayer will, it is feared, show an increase of 3d. in the pound. The Assessment Committee have raised the assessment of the South Metropolitan Gas Company's premises by £11,000. This appreciation of value does not take effect until the Lady Day quarter; and even then the extra burden on the ordinary ratepayer will be 1d. in the pound. Assuming that similar reductions take place in the other South London boroughs, there will be an increase in the rate in Lambeth of 1½d., in Bermondsey of 1½d., and in Southwark of 1½d.

CHESTER UNITED GAS COMPANY.

The Ordinary General Meeting of this Company was held last Wednesday—Mr. J. G. FROST in the chair.

The Directors, in their report for the half year ended the 30th of June, stated that the balance to the credit of the profit and loss account, after providing for interest on the debenture stock and dividend on the preference stock, was £5325; and they recommended the declaration of an interim dividend on the ordinary stock at the rate of 2½ per cent. for the half year.

The CHAIRMAN, in moving the adoption of the report and accounts, said the balance of profit was very much the same as last year. They had already appropriated £1000 to alterations of the purifiers. This work was in hand, and was going on satisfactorily. Coal and wages were rather more than last year. There was an increase in the cost of coal, accounted for by the difficulty experienced with the quality supplied; and the wages were higher, owing to the fact that some of the furnaces in the retort-houses had required renewing. These points had received the Directors' constant attention. They had the necessary repairs in hand. The coal purchased for the current year had been of a better quality—in fact, now they were obtaining results equal to those of former years. The sale of gas was something less than last year; but at the same time they had 198 more consumers and 156 more stoves connected. The diminution was principally attributable to a smaller average consumption the early part of the year; and he feared this arose largely from the quiet trade of the city at the time, though it was partly due to the continually increasing use of incandescent gas-burners, which recently had achieved most remarkable economies. Indeed, considering that with a modern incandescent burner a brilliant light could be obtained for seven to nine hours with a consumption of only one pennyworth of gas, it was surprising that it was not more generally used.

The report was unanimously adopted, the dividend declared, and the Directors and officials thanked for their services.

CAMBRIDGE GAS COMPANY.

Success of the Co-Partnership Scheme.

The Half-Yearly General Meeting of the Cambridge University and Town Gas Company was held last Tuesday—Mr. W. B. REDFERN (the Vice-Chairman) presiding, in the absence of Mr. E. H. Parker.

The SECRETARY (Mr. A. E. King) having read the notice convening the meeting, the report and accounts for the six months ended the 30th of June last were presented. The latter showed a balance of £6452 carried to the profit and loss account, compared with £6093 for the first half of last year, and a sum of £21,778 available for distribution. The Directors recommended the payment of dividends at the maximum rates, less income-tax.

On the motion of the CHAIRMAN, seconded by Mr. FOSTER, the report was adopted.

The CHAIRMAN then said he had a statement to make to the shareholders; and he thanked the staff for supplying him with much information in connection with it. First of all, he thought they might congratulate themselves on the increase of business which had taken place during the past year. There was a slight diminution in the receipts, owing to the price of gas having been reduced 1d. per 1000 cubic feet since last year; but this was compensated for by a reduction in the price of coal and the general economic working of the Company. Having given particulars to show how the business had increased, especially through the use of gas-stoves and slot meters and cookers, thanks in a large measure to the Company's excellent show-rooms, he said the result had been that 6 million cubic feet more gas had been made. Passing on to refer to the Gas Companies (Standard Burner) Bills, he reviewed the proceedings upon them in Parliament, and said it was a little difficult to understand the reason for the opposition they had met with, as they were in the best interests of the consumers of gas. The new test-burner had been prescribed by the Metropolitan Gas Referees for the London Companies, and had been in use by them for the last five years. It had been adopted by the Board of Trade on the recommendation of their technical advisers; and it was the test-burner inserted in every Gas Provisional Order made by the Board of Trade. It had also, under the authority of Parliament, been incorporated in the Model Clauses for gas testing; and altogether there were some 100 companies and local authorities who were now using it. Therefore the adoption of a standard test-burner was clearly in the interests of uniformity, and strictly conformed to the decision of the Gas Referees, the Board of Trade, and Parliament. Referring next to the Company's co-partnership scheme, which he said had been promoted by their excellent Chairman (Mr. Parker), in conjunction with the Engineer and Manager (Mr. J. W. Auchterlonie) and the Secretary (Mr. King), the Chairman explained the basis of it, and said that though it was not actually started till the beginning of the year, it was made retrospective, and the bonus was given to the men as from July 1, 1909. Altogether, there were 161 co-partners. Of these, 25 had already qualified to become shareholders; and there were 20 others whose bonuses were within a few shillings of the required amount. He was given to understand that practically all of these would pay in the amounts, so that they might become shareholders at once. The Directors had every reason to hope and believe that co-partnership would be a great all-round benefit to the Company, as it had proved to others. They considered it would be an inducement to the men to feel that they were benefited by the work they did.

The retiring Directors (Messrs. Darwin and Heycock) and Auditor (Mr. Tansley Witt) were then re-elected; and the proceedings closed with a vote of thanks to the Chairman, Directors, and staff.

The Directors of Messrs. C. & W. Walker, Limited, have decided to pay an interim dividend for the six months ending July 31, at the rate of 5½ per cent. per annum, less income-tax, on the cumulative preference shares; and on the ordinary shares at the rate of 10 per cent. per annum, less income-tax.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report that the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit of £74,451 9s. 9d. for the half year, which, added to the balance of £31,739 18s. 9d. brought forward from last year, produces a net revenue balance of £106,191 8s. 6d. Deducting therefrom £9082 12s. 6d. for interest, there remains standing to the credit of the net revenue account a balance of £97,108 16s. available for dividend. The Directors recommend the payment of dividends at the rates of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. The Directors have reduced the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet as from the taking of the Midsummer indices.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 30th of June amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed, out of the £550,000 authorized. Capital account receipts amount, with premiums, to £2,606,065 4s. 5d. The expenditure stands at £1,447,007 4s. 3d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,659,819 14s. 3d. There is consequently a balance of £53,754 9s. 10d. carried to the balance-sheet. The net expenditure on capital account in the half year was £3240 (£3487, less £247 received for meters sold), apportioned as follows: New and additional mains, services, &c., £1338; stoves, £1582; prepayment meters and fittings, £567. The reserve fund amounted at the close of June to £34,969; and the insurance fund to £31,495. The following is the

REVENUE ACCOUNT.

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£84,569	11	9
Salaries of Engineer and officers at works	2,804	0	0
Wages (carbonizing)	12,108	16	10
Purification, including labour	1,542	2	10
Repair and maintenance of works and plant, materials and labour (less £501 18s. 3d. received for old materials)	29,803	12	2
Profit sharing			£130,826 3 7
			2,836 9 1
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£4,840	8	6
Repair, maintenance, and renewal of mains and services, material and labour	6,964	1	5
Repair and renewal of meters	2,008	0	7
“ “ “ “ stoves	8,087	2	3
“ “ “ “ prepayment meters and fittings	10,912	8	11
Incandescent mantle maintenance	620	2	8
			33,452 4 4
Public lamps—lighting and repairing			2,491 15 2
Rent, rates, and taxes			12,756 17 9
Management			
Directors' allowance	£1,250	0	0
Company's Auditors	75	0	0
Salaries of Secretary, Accountant, and clerks	1,352	10	4
Collectors' salaries and commission	1,740	17	1
Prepayment meter collection	2,958	13	11
Stationery and printing	913	19	1
General charges	1,591	10	3
			9,882 10 8
Bad debts			685 6 3
Law and parliamentary charges			346 18 11
Superannuations and allowances			1,213 4 7
Official officers, &c.			160 4 5
			11,407 10 6
Total expenditure			£194,651 14 9
Balance carried to net revenue account			74,451 9 9
			£269,103 4 6

Receipts.

Sale of gas—			
Common gas per meter at 2s. 6d. per 1000 cubic feet (100,694)	£193,184	11	10
Public lighting and under contracts, common gas	5,666	10	8
	£198,851	2	6
Less discounts and allowances	3,938	4	3
			£194,912 18 4
Rental—			
Meters (23,599)	£2,814	6	11
Stoves (61,013)	9,734	6	5
Prepayment meters (76,325)	12,718	18	4
Incandescent mantle maintenance	626	1	6
			25,923 13 2
Residual products—			
Coke, less £3573 18s. 6d. for labour	£28,336	17	2
Breeze, less £1125 17s. 10d. for labour	1,644	14	4
Tar	8,113	17	1
Ammoniacal liquor and sulphate of ammonia	10,115	4	6
			48,210 13 1
Miscellaneous receipts—			
Rent receivable	£28	5	0
Transfer fees	27	15	0
			56 0 0
Total receipts			£269,103 4 6

The following are the statements relating to the manufacturing operations of the Company in the half year :—

Statement of Coals and Oil.

	In Store Dec. 31, 1909.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1910.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	29,712	89,738	93,519	579	25,352
Oil—gallons	468,279	1,238,916	1,338,134	..	369,061

Statement of Residual Products.

Description.	In Store Dec. 31, 1909.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1910.
Coke—tons	1,232	57,280	11,884	44,102	2,525
Breeze—tons	3,947	9,713	..	10,284	3,376
Tar—gallons	554,286	1,119,068	..	1,115,285	558,069
Ammoniacal liquor—bbls of 108 gallons	10,279	33,087	38,074	..	5,292
Sulphate of ammonia—tons	130	1,209	..	1,259	80

Statement of Gas Made, Sold, &c.

Quantity Made.	QUANTITY SOLD.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands. 1,706,462	Thousands. 36,650	Thousands. 1,551,899	Thousands. 1,614,146	3913

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows : Coal, oil, &c., £20,521; coke and breeze, £1665; tar, ammoniacal liquor, sulphate of ammonia, &c., £7505; sundry stores, £32,866—total, £62,557. The figures this time last year were : Coal, oil, &c., £26,129; coke and breeze, £2738; tar, ammoniacal liquor, sulphate of ammonia, &c., £7418; sundry stores, £35,012—total, £71,297. A sum of £16,073 stands in the balance-sheet as employees' bonus and savings, compared with £19,126 at the end of June, 1909.

BROMLEY AND CRAYS GAS COMPANY.

The Modernized Works and Concentrated Plant.

The Half-Yearly General Meeting of this Company was held last Thursday, at the works—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended June 30, was presented. The profit on the half-year's working was shown to be £10,922, and the amount available for distribution £11,842. The Directors recommended dividends at the rates of 6, 4½, and 5½ per cent, per annum on the different classes of stock, less income-tax. These would absorb £9261, and leave £2581 to be carried forward. It was stated in the report that most satisfactory results continued to be obtained from the concentration of the manufacturing plant at the Bromley works.

The CHAIRMAN, in moving the adoption of the report, said the object of holding the meeting at the works was to give the proprietors an opportunity of inspecting the plant. As they knew, the works had been recently adapted to meet the enlarged requirements of the amalgamated districts, at an outlay of some £20,000; and it occurred to the Directors that the shareholders might like to see the works with the alterations. He hoped that those of them who were present might have availed themselves of the opportunity. If they had done so, he was sure they had noticed the great alterations and improvements which had been effected within the course of the last fifteen years, and their thoroughly up-to-date condition, as well as their substantial character—features which should be most gratifying, he was sure, to every proprietor. The works had been accurately and technically described in the "JOURNAL OF GAS LIGHTING;"* therefore he did not propose to enter upon details. He would only add this—that, after reasonable trial, the Directors had so far found no reason to be other than satisfied with both works and plant, and also with the economical advantages already realized and in course of development by the unification scheme. Having dealt with several matters incidental to the working in the half year, the Chairman said the variations which had taken place had not imperilled in any way the Company's financial position, as the undivided profit balance carried forward was nearly £200 more than it was this time last year; a sum of about £7000 having meanwhile been written off in part payment of the outlay upon the unification of the works. He doubted if the proprietors could have anticipated any statement more, or so much, to their satisfaction. This satisfaction should be shared by the consumers, whose prospects were thus being so greatly enhanced by everything the Directors did in embodying in the undertaking all modern scientific methods of manufacture, and ensuring its adequacy to meet their ever-growing demands. After some further remarks, the Chairman said he thought it was not necessary to review in very great detail the fluctuations of income and expenditure during the half year. The reduction of income in consequence of the reduced price of gas, and the less quantity of coke and sulphate of ammonia sold, was *pro tanto* set off by better sales of tar and increased income from fittings and stoves. Yet there was a net disadvantage of

£1852. On the other hand, the saving by the more favourable purchase of coals, by reduced manual labour, and in other ways, yielded a net advantage in expenditure of £2046, which thus provided them with the additional balance of just about £200 to be carried forward.

The DEPUTY-CHAIRMAN (Mr. Bertram H. Latter) seconded the motion; and it was carried unanimously.

The dividends recommended having been declared, it was resolved, on the motion of Mr. A. WRIGHT, seconded by Mr. A. DICKSON, jun., that the remuneration of the Directors be £1430 per annum, until otherwise terminated in general meeting.

Mr. W. B. BRYAN proposed a vote of thanks to the Directors and officers, for the able manner in which they had conducted the Company's affairs during the past half year.

Mr. J. T. ARNAUD seconded the motion; and it was carried.

The CHAIRMAN briefly acknowledged the vote.

GLASGOW CORPORATION GAS SUPPLY.

The Rates Fixed.

At a Meeting of the Glasgow Town Council held last Tuesday, the Gas Committee submitted the following table of charges for gas for the year ending the 31st of May next; the subject having been deferred from the previous meeting.

Within the City Supply District.

- I.—Lighting and domestic purposes—
 - For quantities of less than 500,000 cubic feet 2s. 0d.
 - Beyond 500,000 cubic feet up to 6,000,000 cubic feet 1 11
 - Beyond 6,000,000 cubic feet up to 10,000,000 cubic feet 1 10
 - Beyond 10,000,000 cubic feet 1 9
 - II.—For power and manufacturing purposes—
 - For quantities of less than 20,000 cubic feet 2 0
 - Beyond 20,000 cubic feet up to 500,000 cubic feet 1 8
 - Beyond 500,000 cubic feet up to 6,000,000 cubic feet 1 7
 - Beyond 6,000,000 cubic feet 1 6
 - III.—For hotels, clubs, and institutions, other than for lighting purposes—
 - For quantities of less than 100,000 cubic feet 2 0
 - Beyond 100,000 cubic feet up to 500,000 cubic feet 1 8
 - Beyond 500,000 cubic feet up to 6,000,000 cubic feet 1 7
 - Beyond 6,000,000 cubic feet 1 6
- Consumers will only be entitled to be charged the rates under Scales II. and III., as and from the date of application therefor.
- The above rates to be applicable only for gas consumed in one and the same premises, and such supply to be measured by a separate meter.
- IV.—Supply through prepayment meters 2s. 7d.
- Public lamps 1 9

Within the Supplementary Supply District.

- I.—With the exception of the parish of Old Kilpatrick, 1s. per 1000 cubic feet extra on the above-mentioned rates.
- II.—Within the parish of Old Kilpatrick, 2d. per 1000 cubic feet extra on the above-mentioned rates.

If the whole of the above rates are adopted, the estimated deficiency at the end of the year will amount to about £18,000.

The matter was considered at the meeting of the Council on Thursday. Mr. M. W. MONTGOMERY, the Convener of the Gas Committee, moved the adoption of the rates. He said they had been fixed in virtue of the powers under the recent Act, and he hoped by them to secure some new customers and retain the old ones. With regard to the extra charge for the parish of Old Kilpatrick, he explained this was made to preserve their right as to the district being within the supplementary area of supply.

Bailie PAXTON, the Sub-Convener of the Committee, seconded the motion.

Mr. COSH said the net cost of gas was 1s. 11½d. per 1000 cubic feet. The proposal of the Committee was to reduce to 1s. 8d. the rate for power and manufacturing purposes for gas supplied beyond 20,000 cubic feet. Last year in this section the Committee lost to the extent of £8000. The manufacturer, as soon as he consumed £20 worth of gas, was to be entitled to a rebate of 4d. per 1000 cubic feet; whereas the person using gas for lighting and domestic purposes in quantities in excess of 500,000 cubic feet was only to be allowed a rebate of 1d. In the recent propaganda against black smoke, it was emphasized that the domestic fire was the greatest sinner, and householders were recommended to adopt gas. Yet they went to these people and said, after they had run up an account of £50, they were to get a reduction. Let them think of the proposal as applied to a two-room and kitchen house. He could not understand how such a proposal ever emanated from a committee of business men. Mr. Cosh also called attention to the statement of the Committee that the substantial increase in the sale of gas last year was largely due to the extended use of it for domestic purposes, and also to the rapidly increasing demand for gas on the prepayment system. He calculated the profit on the latter at £10,000; and yet they proposed to charge for the gas 7d. more than to the people who were paying the ordinary domestic rate. He supposed they would be told that the price of meters accounted for the increase. Yet the people who contributed this profit were the people who were to get no consideration. He imagined that the reason a reduction was not made was because the people affected were poor, and were not able to pull the strings like the large manufacturers. He moved, as an amendment, that the matter should be remitted, and that the Committee should consider the advisability of reducing the prepayment rate from 2s. 7d. to 2s. 5d.

Bailie ALSTON seconded the amendment.

Mr. MONTGOMERY said the charge for the prepayment meters had been very carefully calculated. In Edinburgh, the difference of charge between ordinary meters and the prepayment meters was 1s. 2d.; in Glasgow, it was 7d. The table of rates was, he admitted, largely experimental, and he hoped the Council would accept them, so that at the end of the year they would be able to see the result.

The motion was carried by a large majority.

* Descriptions of the alterations carried out at the works by the Company's Chief Engineer, Mr. William Woodward, will be found in the "JOURNAL," Vol. CI., p. 22, and Vol. CIX., pp. 794, 869.

SULPHATE OF AMMONIA COMMITTEE.

Report for the Past Financial Year.

At the Annual Meeting of the Sulphate of Ammonia Committee, held recently, the Executive Committee submitted the thirteenth report, together with a statement of accounts for the year ended the 30th of June last, and an estimate of the probable expenditure to June 30, 1911. Mr. W. G. Blagden, who had been Chairman of the Committee since its formation, found it imperative to relinquish the position; and his resignation was accepted with the utmost reluctance and regret. Mr. Milne, of the Gaslight and Coke Company, who had for some years filled the office of Deputy-Chairman, was unanimously elected to succeed Mr. Blagden. We have received from the Secretary (Mr. A. Dawson) a copy of the report, the principal portions of which are reproduced below.

As a result of interviews with the representatives of the Continental makers of sulphate of ammonia, the Executive Committee resolved to carry on more vigorous propaganda both at home and abroad; and, with a view to meeting the new burden thereby entailed, it was decided to take powers to levy an increased subscription limited to 8d. per ton, and for the present fixed at 7d. per ton.

The Committee decided to engage a new official to superintend the extended experimental work of the new home propaganda; and, after interviewing various candidates, the Executive Committee, at a meeting held on Oct. 15, 1909, appointed Mr. W. Popplewell Bloxam, B.Sc. (Lond.), F.C.S., F.I.C., who has held several important official appointments under the Admiralty and the Governments of Madras and Bengal, and finally under the Government of India. Shortly after his appointment, Mr. Bloxam visited Germany, and made himself familiar with the most successful German propaganda, which has disposed of the total annual production of sulphate of ammonia of that country for the benefit of German agriculture. The German system, involving the delivery of lantern lectures to farmers, discussion after lectures on matters agricultural, and the subsequent establishment of small experimental plots, seemed admirable and well adapted to British requirements.

After making careful inquiry, it seemed at first impossible to carry out plot work on any large scale in this country, owing to the impossibility of supervising the plots with only the services of our limited staff. Certain Professors at Agricultural Colleges, however, were kind enough at this stage of affairs to recommend men (graduates or diploma men in Agriculture) to act as "local supervisors." This suggestion was followed up, with the result that some thirty duly qualified men, widely distributed over the country, were appointed to act as "local supervisors." Each of these gentlemen is responsible for the supervision of at least twenty one-tenth-acre plots, for the choice of the plots, measuring out, manuring and harvesting of the crops, and the provision of detailed reports.

The scope of sulphate of ammonia having been somewhat unduly restricted in the manurial experiments of former years to roots and potatoes, in the new series of plots (of one-tenth of an acre), some 700 in number, the beneficial effect of sulphate of ammonia as a manure is being submitted to tests in the case of the following crops: Cereals—barley, oats, and wheat. Roots—mangels, swedes, turnips, and Kohl Rabi. Grass—hay and permanent pasture. Also with potatoes and cabbage. These plots are distributed over fifteen counties in England, five in Wales, and three in Scotland. For these, the manures are provided by the Committee carriage paid to the nearest railway station to the plots. The Committee are also responsible for all expenses of supervision and report. A new feature of the plot work is the erection of enamelled iron placards on the experimental plots. These placards are lettered "MANURED WITH SULPHATE OF AMMONIA," in blue on a white ground, and are backed with wood and attached to wooden up-rights 9 feet in height.

The opinion was strongly held that the power of the farmer to experiment on his own land with crops of his own choosing, employing sulphate of ammonia in association with potash and phosphoric acid, under conditions involving no loss to himself, cannot fail to establish a strong demand throughout the country for the use of sulphate of ammonia on a large scale. By the employment of the local supervisors, it is possible to get experiments made and supervised on farmers' own land on a scale which will fairly bear comparison with the results of the German field experiments, which have, however, the palpable advantage of the services of a large permanent staff and of an annual expenditure of £20,000.

Mr. Bloxam prepared a suitable course of lectures, new lantern slides were made for the purpose, and a lantern and accessories purchased.

Arrangements were made with the Secretaries of Agricultural Societies, Farmers' Clubs, &c., with the result that 24 lectures were delivered in the following places and in the order named, commencing on Jan. 24 and ending April 30: Billericay, Ripon, Rotherfield, Wadhurst, Puddletown, Epsom, Wigan, Liverpool, Atherton, Leigh, Blandford, Newport (Isle of Wight), Snaith, Darlington, Wareham, Framlingham, Thorpe-le-Soken, Bishop's Stortford, Reading, Stockton-on-Tees, Aspatia, Tadcaster, Usk, and Carlisle. The audiences varied in number from 20 to 150. The greatest interest was taken in the discussions, and good reports were furnished by the Provincial Press. Many one-tenth-acre plots have been laid down on the farmers' own land; and reports subsequently made have shown that the local sales of sulphate of ammonia have uniformly increased throughout the districts where lectures were given—the local sales being stated in certain cases as twice or thrice as great in 1910 as in the preceding year.

Two points in connection with local sales deserve, as Mr. Bloxam suggests, special attention on the part of subscribers to the Sulphate of Ammonia Committee: (a) The advisability of makers in agricultural districts holding stocks of sulphate of ammonia to meet the strong demand of the early spring months. (b) The necessity for producers to quote a favourable price for sulphate of ammonia to dealers and manure merchants of their districts; such prices to allow a sufficient margin of profit to induce the dealer to devote himself seriously to the sale of sulphate of ammonia.

The great value of the agricultural competitions which had been carried out for some years previously for the Committee's prizes was fully recognized; and their continuation on an extended scale has been decided on. It was decided to express the value of the crop increases obtained year by year in the agricultural competitions by the use of sulphate of ammonia not only in weights and measures as formerly, but as crop profits, showing the money gain obtained per acre. Accordingly, taking the results of the competitions of the season 1908-9, these were reduced to sterling values, and then showed profits varying from £27 per acre in the case of potatoes to £6 per acre in the case of yellow turnips. These statements of crop profits have been widely circulated among the subscribers and farmers, and have been shown on the screen at all lectures, and it is considered that they constitute one of our strongest holds upon the farmers of this country; for these competitions are carried out on the farmers' own lands by the farmers themselves, on a scale of one to three acres, and the decisions as to crops and prizes are made by judges of acknowledged standing in the districts in question.

The foreign propaganda referred to in the last annual report is being energetically carried on by the Committee in the following countries, in association with the Belgian, French, and German sulphate of ammonia makers: Denmark, Southern Sweden, the Baltic Provinces of Russia, and Finland, Switzerland, and Spain. On the 13th of May last, a conference of British sulphate of ammonia makers was called together in London for the purpose of meeting and discussing matters of mutual interest with the representatives of Sulphate of Ammonia Associations of Germany, Belgium, and the United States of America. It was there disclosed that the foreign Associations were all receiving from their respective subscribers a much more liberal measure of support than is being extended to our Committee by British makers, as the following figures, which speak for themselves, will show:—

	Gt. Britain.	Germany.	U.S.A.	France.	Belgium.
Production, tons	348,000	322,000	109,000	54,000	35,000
Home consumption	85,000	330,000	149,000	65,000	55,000
Contribution to propaganda, per ton	7d.	2/-	10d.	1/7	1/8
Contributing percentage of total production	60	90	100	90	90

A report of this meeting was circulated among all the British makers of sulphate of ammonia (subscribers and non-subscribers), together with an appeal to the latter to join the Committee. This appeal had the effect of inducing some most important makers to become subscribers, while others of equal importance have promised to give the matter their careful consideration, with, as is anticipated, favourable final results.

The Committee have to report the accession of sixteen new subscribers during the past financial year, with an estimated total production of about 13,000 tons. The subscriptions for the year again reveal an increase in the total tonnage of subscribers; but as practically all the new members have only joined as from the 1st of July, their estimated production of 13,000 tons does not enter to any material extent into the following figures: July, 1908, to June, 1909, inclusive, 202,000 tons; July, 1909, to June, 1910, inclusive, 211,000 tons—increase, 9,000 tons.

Accompanying the report was the following

LIST OF SUBSCRIBERS TO SULPHATE OF AMMONIA COMMITTEE.

Abersychan Gas Company
Abingdon Gas Company
Albright and Wilson, Limited, Oldbury
Alliance and Dublin Consumers' Gas Company
Alloa Gas Commissioners
Alnwick Gas Company
Alva, Burgh of, Gas Department
Ambleside Urban District Council Gas Department
Andover Lighting and Power Company
Arbroath Corporation Gas Department
Atherton Urban District Council Gas Department

Bagley, Mills, and Co., Ltd., London and Alfreton
Bangor Corporation Gas Department
Barnet District Gas and Water Company
Barnstaple Gas Company
Bath Gas Company
Bearpark Coal and Coke Co., Ltd., Middlesbrough
Beccles Water and Gas Company
Bedford Gas Company
Bideford Gas Company
Bilston Gas Company

Birchenwood Colliery Co., Ltd., Kidsgrove, Staffs.
Bird and Son, Limited, Cardiff
Bishop's Stortford and District Gas Company
Blackburn Corporation Gas Department
Blyth and Cowpen Gas Company
Bodmin Gas Company
Bolckow, Vaughan, and Co., Ltd., Middlesbrough
Bolton Corporation Gas Department
Boston (Lincs.) Gas Company
Bournemouth Gas and Water Company
Bowes, J., and Partners, Ltd., Newcastle-on-Tyne
Bradford Corporation Gas Department
Braintree and Bocking Gas Company
Brentford Gas Company
Bridgnorth Corporation Gas Department
Bridgwater Gas Company
Bridport Gas Company
Brighouse Corporation Gas Department
British Gaslight Company, Limited (Etruria, Holywell, Hull, Norwich, and Trowbridge)
Bromsgrove Gas Company
Brown, John, and Co., Limited, Sheffield

Broxburn Oil Company, Limited, Glasgow
Brunner, Mond, and Co., Limited, Northwich
Burnley Corporation Gas Department
Bury Corporation Gas Department
Butler, Wm., and Co., Limited, Bristol

Calne Gas Company
Calverley and Horsforth District Gas Company
Canterbury Gas and Water Company
Cardiff Steam Coal Collieries Co., Limited
Carlisle Corporation Gas Department
Carnarvon Corporation Gas Department
Carlton Gas Company
Carlton Iron Co., Limited, Ferryhill
Carnbroe Chemical Co., Limited, Glasgow
Catchpole, E., and Sons, Rotherhithe
Chance and Hunt, Limited, Oldbury
Chard Corporation Gas Department
Chelmsford Gas Company
Cheltenham Gas Company
Chester United Gas Company
Chichester Gas Company

Chigwell, Loughton, and Woodford Gas Company
 Chorley Corporation Gas Department
 Christchurch Gas Company
 Cirencester Gas Company
 Coal Distillation Co., Limited, Middlesbrough
 Cochrane and Co., Limited, Middlesbrough
 Cockermouth Urban District Council Gas Department
 Colchester Gas Company [ment
 Colne Corporation Gas Department
 Coltness Iron Co., Limited, Glasgow
 Consett Iron Co., Limited
 Cork Gas Consumers' Company
 Coventry Corporation Gas Department
 Cowdenbeath Gas Company
 Crewkerne Gas Company
 Cromer Gas Company
 Croydon Gas Company

Dalmellington Iron Company, Limited
 Dalmeny Oil Company, Limited
 Daventry Gas Company
 Derby Gas Company
 Dewsbury Corporation Gas Department
 Dorchester Gas Company
 Dorking Gas Company
 Douglas (Isle of Man) Gas Company
 Drighlington and Gildersome Gas Company
 Drogheda Corporation Gas Department
 Droitwich Corporation Gas Department
 Dundalk Gas Company
 Dungannon Gas Company

East Grinstead Gas and Water Company
 Ebbw Vale Steel, Iron, and Coal Company, Limited
 Edinburgh and Leith Corporations Gas Commissioners
 Elland-cum-Greeland Gas Company [sioners
 Enfield Gas Company
 Exeter Gas Company
 Exmouth Gas Company

Farnley Iron Company, Limited, Leeds
 Faversham Gas Company
 Felixstowe Gas Company
 Fermoy Gas Company
 Filey Urban District Council Gas Department
 Fleetwood Gas Company
 Folkestone Gas Company
 Furnace Gases Company, Limited, Glasgow

Gaslight and Coke Company (The)
 Glasgow Iron and Steel Company, Ltd., Wishaw.
 Glastonbury Corporation Gas Department
 Glangarnock Chemical Company, Limited
 Glangarnock Iron and Steel Company, Limited,
 Gloucester Gas Company [Stevenston, N.B.
 Godalming Gas Company
 Gravesend and Milton Gas Company
 Great Grimsby Gas Company
 Great Western Colliery Company, Limited, Cardiff
 Great Wigston Gas Company
 Great Yarmouth Gas Company
 Guest, Keen, and Nettlefolds, Limited, Birmingham and Dowlais

Halifax Corporation Gas Department
 Halstead Gas Company
 Hampton Court Gas Company
 Harrow and Stanmore Gas Company
 Hartlepool Gas and Water Company
 Harvey, T. H., Portsmouth and Plymouth
 Hasland Coking Company, Limited, Chesterfield
 Hayward's Heath District Gas Company.
 Heath, R., and Sons, Limited (Biddulph Valley Iron Works), Stoke-on-Trent
 Hereford Corporation Gas Department
 Herne Bay Gas Company
 Heywood Corporation Gas Department
 High Wycombe Gas Company
 Hoddesdon Gas and Coke Company
 Horley District Gas Company
 Horncastle Urban District Council Gas Department
 Huddersfield Corporation Gas Department
 Hunt, J. T., and Son, Limited, Stratford, E.

Ilkeston Corporation Gas Department
 Inverness Corporation Gas Department
 Ipswich Gas Company

Jersey Gas Company

Keighley Corporation Gas Department
 Kendal Corporation Gas Department
 Kidderminster Gas Company
 Kildwick Parish Gas Company

Kilkenny Gas Company
 Kingston-on-Thames Gas Company

Lambton Collieries, Limited, Newcastle-on-Tyne
 Langley Mill and Heanor Gas Company
 Langloan Iron Company, Ltd., Coatbridge, N.B.
 Langwith Bye-Product Company, Limited, Sheep-
 Launceston Gas Company [bridge, Chesterfield
 Leicester Corporation Gas Department
 Leominster Gas Company
 Lewes Gas Company
 Lichfield Gas Company
 Limerick Corporation Gas Department
 Lisburn Gas Company
 Littleborough Gas Company
 Littlehampton Gas Company
 Long Eaton Gas Company
 Longford District Gas Company
 Longwood Gas Company
 Lord, J. E. C., Weaste, near Manchester
 Louth Gas Company

Mackey-Seymour Engineering and Coke Oven Co.,
 Maldon Gas Company [Limited, Leeds
 Malton Gas Company
 Malvern Urban District Council Gas Department
 Manchester Corporation Gas Department
 Mansfield Corporation Gas Department
 Manvers Main Collieries, Limited, Rotherham
 Market Harborough Urban District Council Gas
 Marlborough Gas Company [Department
 Maryport Urban District Council Gas Department
 Matlock and District Gas Company
 Melksham Gas Company
 Merthyr Tydfil Gas Company
 Middlesbrough Corporation Gas Department
 Middleton Corporation Gas Department
 Mid-Kent Gas Company, Snodland
 Miller, John, and Co., Aberdeen
 Mitchell Main Colliery Company, Ltd., Barnsley

Neath Corporation Gas Department
 Ness, Thos., Limited, Darlington
 Newcastle-on-Tyne and Gateshead Gas Company
 Newmarket Gas Company
 Newport (I. of W.) Gas Company
 Newton, Chambers, and Co., Limited, Sheffield
 Newtownards District Council Gas Department
 North Bitchburn Coal Company, Ltd., Darlington
 North Eastern Steel Company, Limited, Middles-
 Northwich Gas Company [brough

Oakbank Oil Company, Limited, Glasgow
 Omagh Gas Company
 Ormskirk Gas Company
 Otto-Hilgenstock Coke-Oven Company, Limited,
 Crigglesstone

Paignton Gas Company
 Pease and Partners, Limited, Darlington and Crook
 Perth Gas Commissioners
 Peterborough Gas Company
 Peterhead Corporation Gas Department
 Pilkington Bros., Limited, St. Helens
 Plumbe, W. A. (Sherwood Chemical Works),
 Mansfield
 Plymouth and Stonehouse Gas Company
 Pontypridd Urban District Council Gas Depart-
 Portadown Gas Company [ment, Treforest
 Powell-Duffryn Steam Coal Company, Limited,
 Prescot Gas Company [Cardiff
 Preston Gas Company
 Priestman Collieries, Limited, Newcastle-on-Tyne
 Pumphreston Oil Company, Limited, Glasgow

Queenstown Gas Company

Radcliffe and Pilkington Gas Company
 Ramsgate Corporation Gas Department
 Reading Gas Company
 Redcar, Coatham, Marske, and Saltburn Gas Com-
 Redhill Gas Company [pany
 Rhondda Urban District Council Gas Department,
 Richmond Gas Company [Pentre
 Riddings District Gas Company, Pye Bridge
 Ripon Corporation Gas Department
 Rochdale Corporation Gas Department
 Romsey Gas Company
 Ross, J., and Co., Falkirk, N.B.
 Runcorn Gas Company

Sadler and Co., Limited, Middlesbrough
 Salamon and Co., Limited, Rainham
 Salford Corporation Gas Department

Salisbury Gas Company
 Samuelson and Co., Limited, Middlesbrough
 Sandown (I. of W.) Gas Company
 Scarborough Gas Company
 Seaham Gas Company, Seaham Harbour
 Seaton Carew Iron Company, Limited, West
 Selkirk Gas Company [Hartlepool
 Shanghai Gas Company, Limited
 Shanklin (I. of W.) Gas Company
 Sheffield United Gas Company
 Shrewsbury Gas Company
 Silsden Urban District Council Gas Department
 Simon-Carves Bye-Product Coke-Oven Construc-
 tion Company, Limited, Manchester
 Sligo Gas Company
 Southgate (New) and District Gas Company
 South Metropolitan Gas Company
 South Shields Gas Company
 South Suburban Gas Company
 Spalding Urban District Council Gas Department
 St. Albans Gas Company
 St. Anne's-on-the-Sea Gas Company
 St. Austell Gas Company
 Stafford Coal and Iron Company, Limited, Stoke-
 Stafford Corporation Gas Department [on-Trent
 Stanley and District Gas Company
 Staveley Coal and Iron Company, Limited,
 Stirling Gas Company [Chesterfield
 Stobart, H., and Co., Ltd., Etherley, Durham
 Stockton-on-Tees Corporation Gas Department
 Stone and Tinson, Bristol
 Stourbridge Urban District Council Gas Depart-
 Stourport Gas Company, Limited [ment
 Strakers and Love, Newcastle-on-Tyne
 Summerlee Iron Company, Limited, Glasgow
 Sunderland Gas Company
 Sutton (Surrey) Gas Company
 Swanage Gas and Water Company
 Swansea Gas Company
 Swindon United Gas Company

Tarbrax Oil Company, Limited, Glasgow
 Taunton Gas Company
 Tavistock Lighting, Coal and Coke Company
 Tipperary Gas Company
 Tonbridge Gas Company
 Torquay Gas Company
 Tottenham and Edmonton Gas Company
 Tullamore Gas Company
 Tunbridge Wells Gas Company
 Tweedales and Smalley, Castleton, Manchester
 Tynemouth Gas Company, North Shields

Ulverston Urban District Council Gas Department
 United Alkali Company
 Uttoxeter Gas Company

Ventnor Gas and Water Company
 Vickers, Sons, and Maxim, Limited, Sheffield

Walker and Wallsend Union Gas Company
 Wallasey Urban District Council Gas Department
 Waltham Abbey and Cheshunt Gas Company
 Walton-on-Thames and Weybridge Gas Company
 Warminster Gas Company
 Warrington Corporation Gas Department
 Waterford Gas Company
 Wath Main Colliery Co., Ltd., near Rotherham
 Wedgwood (Representatives of the late John),
 Bignall Hill Colliery, Newcastle, Staffs.

Wellingborough Gas Company
 Wellington (Salop) Gas Company
 Wells Gas Company
 Westbury Gas Company
 Westgate and Birchington Gas Company
 Weston-super-Mare Gas Company
 Wexford Gas Consumers' Company
 Weymouth Consumers' Gas Company
 Whitworth Chemical Company, Ltd., Norman ton
 Whitworth Vale Gas Company
 Widnes Corporation Gas Department
 Wigan Coal and Iron Company, Limited
 Wigan Corporation Gas Department
 Winchester Water and Gas Company
 Windermere District Gas and Water Company
 Windsor Royal Gas Company
 Wisbech Lighting Company
 Woking District Gas Company
 Worthington Corporation Gas Department
 Worthing Gas Company

Yeovil Corporation Gas Department
 Young's Paraffin Light and Mineral Oil Company,
 Limited, Glasgow

In the course of the preceding report, reference is made to a largely attended meeting of British sulphate of ammonia manufacturers held in London for the purpose of discussing matters of mutual interest with the representatives of Sulphate of Ammonia Associations of Germany, Belgium, and the United States of America. It took place at the offices of the Gaslight and Coke Company, under the presidency of Mr. D. Milne Watson, the General Manager of the Company.

The Chairman opened the proceedings by introducing Mr. M'Ilvray, from the United States, Mr. Sohn, from Germany, and Mr. Kirkpatrick, from Belgium, and said the meeting had been called to hear what these gentlemen had to tell them. In the course of his brief remarks, he pointed out that in Germany very extensive propaganda work was being carried on, for which the manufacturers were contributing at the rate of 2s. per ton, whereas in England the amount was less than 1s. per ton. He then called upon Mr. Milne, who, as already

stated, is now the Chairman of the Sulphate of Ammonia Committee, to offer a few explanatory observations.

Mr. Milne complied with the request, and first of all offered, in the name of the Committee, a very hearty welcome to their friends from over the seas. Referring to the Chairman's remark about Germany, he said Mr. Sohn was the working head of the great German Syndicate; and he managed to get from the sulphate makers 2s. per ton on almost the whole of their make, while here we could get but 7d. per ton on only two-thirds of the make. This country was producing annually an increasing quantity of from 20,000 to 30,000 tons of sulphate. The same thing was being done in Germany, and practically the same in America. They had, therefore, to find new consumers for something like 60,000 tons per annum; and it was only right and proper that they should ask every maker to participate in this movement. Each one should go away with the intention of getting at least one maker to join in it. They should use every means to work together in each other's interests, for the increase in the consumption of sulphate in one

part of the world would benefit all other parts. Every maker should join the Association, so that they might get a larger amount of money through new subscribers rather than by increasing the subscription. In this connection, he must thank his Directors and General Manager for the generous way they had always supported the Committee.

Mr. M'Ilvray was the next speaker. He said that about eight years ago sulphate of ammonia began to be put on the American market by the coke-ovens in such quantities that the makers who had the larger part of the sulphate in the United States at their disposal came to his principals and asked them to sell it for them. At that time there was a production of 25,000 to 30,000 tons; but now there were about 110,000 tons—an increase steadily of about 12,000 to 15,000 tons a year. In taking the Illinois States, they tried to build up a trade round the coke-ovens. It was hard work, because nitrate of soda was supplying all the requirements. Their method of working was this. A representative would visit the experimental stations at least twice a year, and talk the matter over. In this way they had no difficulty in showing that by using sulphate of ammonia higher results by something like 10 per cent. could be obtained than with nitrate of soda. The farmers found that by using sulphate the grass grew up thick and strong; and the result was that nitrate was not able to compare with sulphate to-day. Then they went down to the South—to the cotton fields. Nobody wanted sulphate of ammonia; they were prejudiced against it, and would not give it a fair chance. So his principals made up their minds to go down and make experiments for themselves. The result was that sulphate of ammonia was now being used in preference to nitrate of soda. To-day they were paying in about 20 c. a ton, and spending it in propaganda work; and at the same time English people were selling in America about 40,000 tons of sulphate a year, and Americans were selling about 100,000 tons. They were thus spending the money and making a market for others. He therefore begged of the meeting to do as Mr. Milne had suggested—get every man who produced a ton of sulphate to join them; and if they would get the money for the Committee, he was satisfied they would use it in a judicious way. By the right kind of propaganda work, they could make a good market for sulphate of ammonia, and be able to realize, as time went on, even better prices than were being obtained to-day.

At the request of the Chairman, Mr. Sohn next gave the meeting an indication of what is being done in Germany. He pointed out that during the past ten years the development of the output of sulphate of ammonia had made great strides. In 1900, the world's total production amounted to only 495,000 tons; whereas it is now 961,000 tons, or just about double. He said it might be regarded as certain that this development would continue, even if prices should decline substantially. Up to now, the makers of sulphate had found themselves in a somewhat privileged situation, for, as a rule, the other nitrogenous fertilizers competing with it had been sold at a price keeping, comparatively speaking, far above that of sulphate. But the keen competition going on during the last few years, particularly on the Continent, between the two chief nitrogenous fertilizers had levelled the difference altogether in such a way that now the unit of nitrogen, either of sulphate or of nitrate, fetched the same price. He believed this result would not have been obtained had it not been for the very active propaganda they had devoted to the purpose. It was only a few years ago that the prices of nitrate of soda ruling on the Continent were 25 to 30 per cent. higher than those for sulphate of ammonia; and, notwithstanding this considerable difference, they were not able to sell their production entirely on the Continent, but were obliged to ship large quantities to foreign countries. Owing to the competition thus resulting between English and Continental makes, prices declined sometimes considerably. To-day, they in Germany had attained to such a state of things that in many regions farmers gave the preference to sulphate of ammonia, even if, comparatively, the price of the latter should be a shade higher than that of nitrate. Naturally it depended much on the way one carried on the propaganda. He had found that during the first years their methods were not the best. It was necessary to come into close touch with the farmer and the consumer; and they could not arrive at this simply by office work or by distributing pamphlets and making advertisements. They had established all over the country agencies managed by gentlemen who had had practical and scientific education, and who delivered lectures, and gave advice to farmers—showing them the best methods of using sulphate of ammonia, and establishing experimental plots or fields. The sums devoted to this purpose had, in his opinion, paid back more than a hundredfold their value. He thought it advisable that their system should be adopted for other countries—particularly for those in which good agricultural conditions already existed—*i.e.*, England, France, Italy, Spain, Sweden, Egypt, Portugal, Mexico, India, and later on China, South Africa, and Bulgaria. In conclusion, he expressed the opinion that even with a considerable increase in the output of sulphate it would be possible to maintain present prices, or at least such prices as were comparatively as high as those for nitrate of soda, as long as makers proved equal to their task—*i.e.*, were willing to increase their efforts for the sale and consumption of their product in the same measure that they augmented their output.

Mr. Sohn was followed by Mr. Kirkpatrick, who said that previous to the formation of the Belgian Syndicate in 1907, a number of makers had undertaken to organize a propaganda, which had since been carried on at a great expense. The result had been very satisfactory; the consumption of sulphate of ammonia in Belgium having risen from 19,400 tons in 1913 to 55,000 tons in 1909. This year it would probably be 65,000 tons, on account of the large consumption in the spring. The cost of their propaganda was 2frs. 10c. (1s. 8d.) per ton on the Belgian make and German sulphate imported. The work had been carried out by means of demonstration fields, lectures, newspaper articles, advertisements, pamphlets, posters, &c. Illustrated advertisements showed the good results they obtained. Pamphlets were written for agricultural labourers; others for lecturers and professors who had to teach the peasant. They were largely spread by the Syndicate, or by Agricultural Associations, merchants, and lecturers. They put advertisements on the walls of small towns where markets were held; and affixed labels on the bags, setting forth the advantages of sulphate and the best way of using it; also labels on railway trucks, so as to make the sulphate known, and not be mistaken for nitrate of soda. At the Brussels Exhibition, a special pavilion had been erected, and most of the lawns

had there been manured with sulphate. Upwards of 400 demonstration fields had been organized during 1908 and 1909. These fields were taken care of by local professors. Upwards of 100 lectures were given every year, especially in winter, by well-known lecturers, and mostly under the auspices of some Agricultural Association. Pamphlets and samples were distributed during the lectures. The Belgian Syndicate had done a great deal in the propaganda work, and trusted that even better results might reward their efforts.

At the request of the Chairman, Sir Samuel Sadler offered a few remarks. He said that in his visits to the States he had been surprised to find that the land was becoming very short of nutriment indeed; and this fact was evidently dawning upon the natives as well. He was looking forward to the effect part of America being the greatest consumer of sulphate of ammonia within the next twenty years. People in England were not doing what they should do. It was the greatest difficulty in the world to persuade the local farmer to use sulphate of ammonia. Here and there they found a man who thought and read, and who used sulphate of ammonia with good results. Beet and crops of this description increased in growth by the use of sulphate. In England, the idea was prevalent that it was not good for grass; but Mr. M'Ilvray had said it was. Of course, if they did not properly drain their ground, sulphate was of no advantage; but he (Sir Samuel) had found, in the course of his experiments, that with a proper mixture of sulphate and superphosphates a much greater crop could be grown. Sir Samuel concluded as follows: The question to-day is, Is sulphate being produced in excess? I think we can agree that to-day it is not; but what about the near future? Sulphate, if it is properly used, will enable the farmers to reap riches "beyond the dreams of avarice." If farmers use sulphate, we shall not have to depend on foreign countries for our food supplies. The production of nitrate of soda is over 2,000,000 tons a year; sulphate is not 1,000,000 tons. Unless, however, something is done in teaching gradually the people of the world the great value of sulphate of ammonia, it is possible we may arrive at a time when we shall be producing a certain excess of sulphate. This will not be the case if we awake to our possibilities, and join the forces of Germany and Belgium and the United States in one great propaganda, and teach men the advantages of sulphate of ammonia.

Mr. M'Ilvray then gave some statistics as to coke-ovens in America. He said that when the present ovens are replaced, they will be rebuilt on the bye-product method; and the United States will fifteen to twenty years from now be producing 600,000 tons of sulphate a year.

At this point, Mr. Milne said it had been mentioned to him that certain gentlemen present might think the Sulphate of Ammonia Committee had something to do with the regulation of prices. They did nothing of the sort. What they did was to try to increase the use of sulphate throughout the world. If they increased the consumption, the price would take care of itself. The speaker emphasized what had been said as to production and consumption. He pointed out that whereas this country is making 348,000 tons, we only use 85,000 tons of sulphate. Germany makes 322,000 tons, and uses 330,000 tons. This country carries on agriculture on similar lines to Germany, and yet we use one-fourth of our make, while Germany uses more than the whole of hers. He said that this was partly the result of spending only 7d. a ton a year; and this was the first year of spending even this. The Committee were working now on the lines of Germany, France, and the United States. They had organized, through their new Manager, 673 field experiments this year. If they obtained more money, they could do much more work. England spent 7d., Germany 2s., Belgium and France 1s. 7d. each, and the United States 10d. a ton. If these people thought it a good thing to spend money on propaganda, it would not be bad policy for Englishmen to do the same.

After a few further remarks by Mr. Sohn, and some observations by Mr. Page, of the Standard Ammonia Company, Mr. Hanbury Thomas, the General Manager of the Sheffield United Gas Company, said the meeting was indebted to their visitors from abroad for what they had stated. He did not think the Committee needed any converting as to the necessity for propaganda work. Their friends had put before them what had been subscribed in other countries. The Committee had had great difficulty in getting manufacturers to subscribe; and they had not been able to get funds enough to carry out the work they wanted to do. He hoped a report of the meeting would be sent round, so that they would see the importance of subscribing, even if it were up to 2s. a ton. He moved: "That, in thanking Messrs. M'Ilvray, Sohn, and Kirkpatrick for their presence and for the useful information given, this meeting expresses strong approval of the action of the Sulphate of Ammonia Committee in carrying on an energetic propaganda for increasing the consumption of sulphate of ammonia in this and other countries, and pledges itself, individually and collectively, to increase the membership by every means in its power to provide further sums, which are urgently required." Mr. Stanley (of the Simon-Carvès Bye-Product Coke-Oven Construction, &c., Company), in seconding the motion, endorsed the remarks made as to the usefulness of the meeting. The resolution was carried unanimously. The Chairman expressed the opinion that this was a very satisfactory result to arrive at. He added that Mr. Corbet Woodall, as the Governor of the Gaslight and Coke Company, took great interest in the welfare of the Committee; and that the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) had sent a message that he was entirely in sympathy with the object of the meeting. He thanked Messrs. M'Ilvray, Sohn, and Kirkpatrick for being present. He said it was necessary that all should share in the work the Sulphate of Ammonia Committee were doing, if they wished to widen the field for the sale of the article in which they were all interested.

Exmouth Water Scheme.—It was reported at a meeting of the Exmouth District Council last Wednesday that the Water Bill promoted by the Council had received the Royal Assent. The Sanitary Committee recommended that Messrs. Hill and Son, engineers, should be informed that the Council were desirous of proceeding with the scheme without delay, and that they should be asked to prepare the necessary plans and specifications with a view to inviting tenders. The recommendation was adopted.

MANCHESTER MUNICIPAL OFFICIALS' SALARIES.

Report Referred Back.

The report of the Special Committee appointed by the Manchester City Council to consider the conditions of service and salaries of employees of the Corporation came before the members of the Council last Wednesday. The report, covering 225 closely-printed pages, contained a good deal of information apart from the recommendations which have already been dealt with in the "JOURNAL." For instance, it is shown that the employees of the Corporation total 19,667, of whom 4594 are teachers, or other officials of the Education Committee, 4386 are engaged on the tramways, and 2384 are in the Gas Department. The report was subjected to a good deal of criticism by different members of the Council; and in the end it was referred back to the Committee, with instructions to fix a retiring age and a retiring allowance in every instance, and to consult the Employing Committee before bringing the document up again. This will mean, of course, a prolongation of the inquiry, extending over many months.

GAS FINANCES AT BELFAST.

When moving the adoption of the Gas Committee's minutes by the Belfast Borough Council, Mr. J. A. Doran remarked that the accounts for the year to March 31 last had now been completed. The gross profit on the manufacture and sale of gas and residuals was £51,078; being an increase of £6710 over the previous year. From the gross profit, they had to deduct the following: Cost of issue of redeemable stock, £1954; fees paid to gas experts and cost of borings, £1252; and loss on the working of the stoves department, £266—leaving a sum of £47,666. The net profit was £32,609; being an increase of £1546. To this they added the balance brought forward, which gave a total at the credit of the profit and loss account of £41,317, out of which the Committee had set aside the following: Sinking fund, £5664; interest on insurance suspense account, £680; leaving a balance of £34,973. Out of this amount, the Gas Committee had given to the Finance Committee in aid of the rates £15,000; while they had allocated for dividends and sinking fund on the new City Hall stock, £11,387—leaving a balance at the credit of the profit and loss account of £8586. In the year they carbonized 103,113 tons of coal—an increase of 3215 tons; and the price being 1s. 4d. per ton lower, they had reduced the expenditure on this item by £4234. Gas oil also being cheaper, they had a saving in this of £3243, though they used 101,562 gallons more. The total amount used was 2,278,564 gallons. The make of gas was 2,236,438,000 cubic feet, an increase of 96,522,000 feet, or 4.31 per cent. Of the quantity sold, 79.66 per cent. passed through ordinary meters, 9.98 per cent. through prepayment meters, 8.93 per cent. was used for public lighting, and 1.43 per cent. in works and offices. The revenue from the ordinary meters amounted to £183,459, an increase of £6818; but owing to the increase in discount of £7500, the net amount received was £680 less. In the prepayment meter rental there had been an increase of £3848. Owing to the reduction in the price of coke, the revenue had been reduced by £2211; but the labour had also decreased to the extent of £342. In the stoves department there had been an apparent loss on the year's working of £266. This was caused by the cost of the gas exhibition, which would, however, more than repay itself in the future by the increase in the consumption of gas, as they had now a total of 16,997 stoves on hire or sold, as against 14,517 last year.

The minutes were adopted.

GAS CHARGES AT BOLTON.

Position of Consumers by Prepayment Meters.

The Bolton Town Council, at their monthly meeting last Wednesday, spent some time discussing the question of making an alteration in the charge for gas to penny-in-the-slot meter consumers. The Committee had decided that they be in future charged 1d. for 27 cubic feet.

Mr. France moved, as an amendment, that the price be at the rate of 30 cubic feet for a penny in lieu of 25 feet as at present. He pointed out, in support of his amendment, that nearly 12,000 people were affected—the poorest section of the community; and he urged that they were not at present treated on an equitable basis. The price of gas, he said, was 2s. 6d. to ordinary consumers and 3s. 6d. to prepayment meter consumers—a difference of 42 per cent.; and he submitted that no honest argument could be advanced for any such disparity. It might be argued by the Gas Committee that the value of the meter should be taken into account; but this question was decided years ago, when it was agreed that the supply of the meter should be at the cost of the Corporation. It might also be said that extra labour was entailed with these prepayment meters; but he (Mr. France) denied that there was any, or very little indeed, because two-thirds of the meters were "drys," and only required monthly inspection. Robberies from these meters might likewise be adduced as an argument against the change to the reduced price; but he pointed out that during the past twelve months, though there had been 79 robberies in the borough, the loss was only £3 9s. What was more, the Gas Committee did not seem to be crediting the poor people with the advantage derived from cash payments. The speaker submitted figures to show that while in a number of towns around Bolton the average price of gas for ordinary consumption was 2s. 2½d., in Bolton it was 2s. 4d.; and for prepayment meter consumers the average was 2s. 8½d., against 2s. 9½d. if his amendment was carried.

A long discussion followed. Mr. Heywood informed the meeting that there were 11,661 prepayment meters in use in the borough; and the cash received from them during the last twelve months amounted to £13,429. The average amount of gas used for each meter

was 7000 cubic feet. What they proposed in reduction meant another £1020, which brought the extra cost down to less than £3000. The extra cost of prepayment meters above ordinary meters was £2857, which practically made the thing equal.

The Chairman of the Gas Committee (Mr. Webster) said that the price charged to the prepayment meter consumers was exactly the same as to the ordinary consumer, because there was the extra cost of the prepayment meters and repairs, which came to about 2½d. per 1000 cubic feet. The prepayment meters lasted about twelve years; the ordinary meters about thirty years. In the case of the former, a free grill was granted. Then it should not be forgotten that additional inspectors were required for prepayment meters, which, with wages and clothing, represented a considerable sum. Altogether the additional cost was 9d., so that there was no difference in the charges. Mr. Webster added—as another reason why there should not be any further concessions to gas consumers at present—that coal this year would cost them £2500 more than last year.

The amendment was lost by 57 votes to 6; but by a subsequent amendment the matter was referred back to the Committee for further consideration.

At last Friday's meeting of the Gas Committee, a letter was read from Mr. France requesting to be supplied with particulars as to the extra cost in connection with the supply of gas through prepayment meters, and also to be allowed to attend before the Committee. It was resolved that Mr. France be furnished with the information asked for, and that he be allowed to attend before the Committee as requested.

LISBURN GAS-WORKS PURCHASE.

The Umpire's Award.

In the last number of the "JOURNAL" (p. 343), we named the sum provisionally awarded by the Umpire (Mr. A. J. Ram, K.C.) in the arbitration proceedings in connection with the purchase of the Lisburn Gas-Works by the Urban District Council. The full text of the award has since been published. At the request of Counsel representing the two parties, it has been stated in the form of a special case; and the following are the terms.

It was contended before me by Counsel on behalf of the District Council as follows: (1) That although at the date of the notice to treat the undertaking was a non-statutory undertaking, and not subject to any legal restriction as to the amount of profit which could be divided, the Umpire and Arbitrators are bound to take into account the likelihood that the Company, if it had continued to exist, would have become a statutory Company, and to use their own judgment as to when that time would have arisen, and what restrictions, according to the practice of Parliament, would have been imposed; and (2) that, in fixing the purchase price, the maintainable profit as from that time should be taken at a sum not exceeding that which under statutory restrictions the shareholders would have been allowed to divide.

It was contended before me by Counsel on behalf of the Company that I ought not to have regard to the consideration set forth in the last preceding paragraph, but that in ascertaining the sum to be paid by the Council to the Company I ought to regard the maintainable profits of the Company existing as a non-statutory company.

The question for the opinion of the Court is as to which of the two contentions set forth in the two last preceding paragraphs is correct. If the Court is of opinion that the contentions put forward by Counsel for the Council are correct, and that I ought to take them into consideration, I find and award that the sum of £31,445 is the sum to be paid by the Council to the Company for the undertaking of the Company as defined in their Act. If the Court is of opinion that the contentions put forward by Counsel for the Company are correct, I find and award that the sum of £34,227 is the sum to be paid by the Council to the Company for the said undertaking of the Company so defined as aforesaid.

In the Gas Company's last published balance-sheet, its works, covered by the award, are returned at the value of £9733 7s. 5d. The amount offered by the Council before the arbitration was £24,000.

ELECTRIC LIGHTING DANGERS.

Fatality Caused by a Fused Wire.

Through the fusing of an electric wire, a disastrous fire occurred at a large drapery establishment in Church Street, Accrington, on Saturday week, the 30th ult. The premises, which were occupied by Messrs. Williams, Limited, employing 35 assistants, were gutted, and five people lost their lives—three female assistants and two lady customers. At the inquest last Wednesday, John Roberts, one of the shop assistants, stated that about a quarter to ten on the night in question, when the shop was crowded with customers, he heard the "clicking of the fuse" in one of the windows. He knew at once what had happened—it was an indication that the fuse was gone—and going to the window he found an electric wire on fire. He pulled the wire down; but before he had done so many articles in the window had been set on fire. Mr. Harold Gray, the Electrical Engineer to the Accrington Corporation, in his evidence, commented on the dangerous practice of putting flexible electric wires and lamps near inflammable material such as had been done in this case. He expressed the belief that in some shops goods were even pinned to the wires. After a long hearing, the Jury returned a verdict of "Accidental death."

The Town Council at Newport, Isle of Wight, have determined, at an estimated cost of £800, to replace the 6-inch water-main by a 10-inch main, in order to afford an adequate supply to the Royal Naval College at Osborne. There was some slight opposition to the proposal; but it was pointed out that unless the improvement was made £1500 a year would probably be lost by the Admiralty having a supply of their own, in which case the town water would run to waste.

PUBLIC LIGHTING OF THE CITY OF LONDON.

Annual Report of the City Engineer.

We have received from the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) his report on the works executed by the Public Health Department of the Corporation of London during the year ending Dec. 31 last. It is of more than ordinary interest, inasmuch as (in addition to information usually furnished) it contains the text of the conclusions arrived at by the deputation of the Streets Committee who visited some of the most important of the Continental cities for the purpose of inspecting the various systems of public lighting in use, together with the tabulated particulars of the lighting there and in the City of London which constituted so valuable a feature of their report, which was reproduced in the "JOURNAL" for July 20, 1909.

ORDINARY AND HIGH-PRESSURE GAS LIGHTING.

The number of gas-lamps (including experimental lamps) paid for by the Corporation at the end of the year was 2720; being a decrease of 10 in the twelve months. The larger proportion of the ordinary burners (1978) consumed 4.25 cubic feet of gas per hour; the consumption of most of the high-pressure lamps being 10 and 20 cubic feet.

On Oct. 15, 1908, the Court of Common Council agreed to the proposal of the Gaslight and Coke Company to relight Fleet Street and Chancery Lane experimentally by means of 17 high-pressure inverted gas-lamps of the Keith type, on brackets fixed to the house fronts, projecting over the footpaths, in lieu of the 36 double-burner (upright) incandescent lamps on the footways and the two high-pressure lamps on rests at the eastern and western ends of the thoroughfare and opposite Fetter Lane. This change necessitated the laying down of a 6-inch high-pressure main in the centre of the roadway, with branch services to each lamp-post. The pressure—54 inches water gauge, or 4 inches of mercury—was obtained from the Company's powerhouse in Essex Street, Strand. The gas consumption per lamp is at the rate of 25 cubic feet per hour, with an illuminating power of 1500 candles; the inclusive annual upkeep of the lamps, with gas at 2s. 5d. per 1000 cubic feet, being £16 10s. each. This charge was reduced to £16 0s. 10d. on the reduction in the price of gas in June, and further lowered to £15 2s. 6d. per lamp per annum at the Michaelmas quarter, when the price of gas was brought down from 2s. 4d. to 2s. 2d. per 1000 cubic feet; the Gas Company providing the necessary compressing plant, mains, services, brackets, and lanterns. The lamps, put into lighting on Dec. 24, 1908, were maintained during the year.

There are 102 other high-pressure Keith gas-lamps in the City thoroughfares; 42 upright single-burner lamps being fixed in the neighbourhood of Billingsgate on brackets. These lamps consume 10 cubic feet of gas per hour, and give an illuminating value of 300 candles each, at a cost of £6 13s. 6d. per lamp per annum. They are erected from 60 to 70 feet apart on the diagonal, at a height of about 12 feet from the pavement level, and are fixed to the house fronts; the roadway being about 50 to 60 feet wide. The lamps burn at 10 inches pressure from a special water-compressing plant placed in

the adjacent pipe subway. The Corporation provided the compressing plant, services, lamp-brackets, and lanterns. In Queen Victoria Street, there are fixed 45 upright two-burner lamps, each consuming about 20 cubic feet of gas per hour, and giving a light equal to 600 candles; the cost per lamp being £12 per annum. The lamps are fixed on columns on the footpaths, about 100 feet apart on the diagonal. The burners are 13 ft. 6 in. above the pavement; the street being about 70 feet wide. The lamps burn at 10 inches pressure from a high-pressure trunk main direct from the gas-works. The Corporation provided the standards and lamps. There are also several other Keith high-pressure lamps, fitted with upright two, three, four, and six burners, on rests at the junctions of roadways, of 1000, 1300, 2000, and 3000 candles—making 119 in all.

During the year a trial was made of the Carpenter inverted burner lamp in Cheapside and Paternoster Row. Two double-burner lamps were fixed on the rests at the eastern and western ends of Cheapside, and a single-burner lamp at the corner of Paternoster Row and Warwick Lane, with satisfactory results. The consumption per burner is 4 cubic feet per hour; and the duty claimed is 120 candles per burner, or an illuminating value of 30 candles per cubic foot of gas.

The number of low-pressure gas-lamps at the end of the year was 2651, principally consuming 4½ cubic feet of gas per hour each; the illuminating power being 65 to 70 candles. Owing to the narrowness of the streets, the lamps are chiefly fixed on brackets from 65 to 70 feet apart on the diagonal, at a height of about 12 feet from the pavement level to the burner; the annual cost of each lamp, with gas at 2s. 2d. per 1000 cubic feet, being £3 5s. 7d., which includes maintenance of mantles, &c., but does not cover capital charges.

The number of defective gas-lights observed and reported upon during the year was 1841—viz., 1495 ordinary and 346 high-pressure lamps. The details of the lighting defects in the ordinary incandescent lamps were: Feeble lights, 1276; lights failed, 20—total, 1296. In addition, 199 defects in lanterns, burners, &c., were reported to the Gaslight and Coke Company and rectified. In accordance with the general instructions in force for many years past, the public gas-lamps were lighted whenever fog or unusual darkness occurred. This happened on 38 days during the year, and entailed an additional cost of £150 14s. 4d.

ELECTRIC LIGHTING.

The lighting of most of the main thoroughfares by arc lamps was continued throughout the year. The number of the original type of "open" electric lamps in lighting at the end of the year, at a cost of £26 each, was 366, or a decrease of 32, accounted for by the substitution of new and cheaper flame arcs in the following thoroughfares: Old Bailey, Ludgate Circus, Ludgate Hill, St. Paul's Churchyard, and the southern end of New Bridge Street; also by the discontinuance of the lamp at the junction of Gracechurch Street and Eastcheap, and that at the northern end of Blackfriars Bridge. In addition to this number, there were 63 "Oliver" flame arcs (partly experimental) and 18 "Reason" enclosed arcs (experimental) in lighting during the year. These lamps were lighted on 18 days when fog or unusual darkness occurred, at a total additional cost of £198 0s. 5d. The number of defective electric lamps reported during the year was 52. For these failures, deductions were made from the accounts of the City of London

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 381.

Issue.	Share.	When ex- dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.	Apl.	p.c.				£ s. d.	£	Stk.	May	p.c.				£ s. d.
1,474,000	Stk.	July 14	5	Alliance & Dublin Ord.	80-82	-1	6 1 11	4,940,000	Stk.	Feb. 12	3	Imperial Continental	179-181	..	4 8 5
310,000	Stk.	July 14	1	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Feb. 10	3	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11
200,000	Stk.	May 12	7	Bombay, Ltd.	65-67	..	5 9 10	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	222-224	..	4 16 9
40,000	Stk.	..	7	Do. New, £4 paid.	48-51	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	219-221	..	4 10 6
50,000	Stk.	Feb. 25	15	Bourne 10 p.c.	29-30	..	5 0 0	718,100	Stk.	..	7	Do. B.	164-165	..	4 4 10
311,810	Stk.	..	17	mouth Gas B 7 p.c.	164-165	..	4 3 7	306,083	Stk.	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	Stk.	..	6	and Water Pref. 6 p.c.	15-15½	..	3 17 5	75,000	Stk.	June 29	6	Malta & Mediterranean.	410-414	..	6 4 8
380,000	Stk.	..	12½	Brentford Consolidated	252-255	..	4 18 1	560,000	Stk.	Apr. 1	5	Met. of ½ p.c. Deb.	100-102	..	4 18 0
330,000	Stk.	..	9½	Do. New	183-190	..	5 0 0	250,000	Stk.	Apr. 1	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	Stk.	Aug. 12	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	Stk.	May 27	3½	Monte Video, Ltd.	123-13	..	5 7 8
260,250	Stk.	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 28	4½	Newcastle & G'tesh'd Con.	101-102½	..	4 5 9
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	89-91	..	3 16 11
246,320	Stk.	..	18	Do. A Ord. Stk.	153-156	..	5 2 7	55,940	Stk.	Feb. 25	8	North Middlesex 7 p.c.	133-135	..	5 1 10
460,000	Stk.	Apl. 1	10	British	41-45	..	4 14 8	300,000	Stk.	Apr. 29	7	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Feb. 25	6	Bromley A 5 p.c.	120-122	+1	4 18 4	60,000	Stk.	Apr. 1	8	Ottoman, Ltd.	64-68	..	6 3 1
165,700	Stk.	..	4½	Do. B 3½ p.c.	90-92	+1	4 17 10	31,800	Stk.	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
82,278	Stk.	..	5½	Do. C 5 p.c.	107-109	+1	5 0 11	60,000	Stk.	..	12	Do. B.	126-128	..	5 1 7
55,000	Stk.	June 29	3½	Do. 3½ p.c. Deb.	85-87	..	4 0 6	100,000	Stk.	..	12	Do. C.	119-121	..	4 19 2
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	7-99	..	4 0 10	114,800	Stk.	..	10	Do. D and E.	100-102	..	4 18 0
100,000	Stk.	..	—	Cape Town & Dis., Ltd.	3-4	..	—	398,490	Stk.	Apr. 29	7	Primitiva Ord.	76-77	..	4 14 1
100,000	Stk.	..	—	Do. 4½ p.c. Pref.	54-64	..	—	296,980	Stk.	June 29	5	Do. 5 p.c. Pref.	54-55	-1	4 13 11
50,000	Stk.	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	483,900	Stk.	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	58-60	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	111-113	+2	4 8 6	250,000	Stk.	Apr. 1	9	San Paulo, Ltd.	154-164	..	5 10 9
1,513,280	Stk.	Feb. 25	5½	Commercial 4 p.c. Stk.	108-110	..	4 14 7	62,500	Stk.	..	6	Do. 6 p.c. Pref.	111-124	..	4 18 0
560,000	Stk.	..	5	Do. 3½ p.c. do.	103-105	..	4 15 3	125,000	Stk.	July 1	5	Do. 5 p.c. Deb.	49-50	..	5 0 0
475,000	Stk.	June 29	3	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	135,000	Stk.	Mch. 16	10	Sheffield A.	234-236	..	4 4 9
800,000	Stk.	June 10	5	Continental Union, Ltd.	90-92	+1	5 8 8	209,984	Stk.	..	10	Do. B.	234-236	..	4 4 9
200,000	Stk.	..	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	523,500	Stk.	..	10	Do. C.	235-235	..	4 5 1
492,270	Stk.	..	5½	Derby Con. Stk.	122-124	..	4 8 9	70,000	Stk.	May 27	7	South African	11-11½	..	6 1 9
55,000	Stk.	..	4	Do. Deb. Stk.	104-105	..	3 16 2	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	122-124	+1	4 8 2
147,995	Stk.	Apl. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	1,895,445	Stk.	July 14	3	Do. 3 p.c. Deb.	79-81	..	3 14 1
486,090	Stk.	July 14	12	European, Ltd.	234-24	-1	5 0 0	209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158	..	5 1 3
351,060	Stk.	..	12	Do. £7 10s. paid.	171-184	..	4 18 8	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	121-123	..	4 12 0
16,179,445	Stk.	Feb. 10	4½	Gas 4 p.c. Ord.	106-107	+½	4 7 2	60,000	Stk.	..	5	Do. 5 p.c. Pref.	121-123	..	4 1 4
2,600,000	Stk.	..	3½	light 3½ p.c. max.	89-91	..	3 16 11	117,058	Stk.	July 14	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,002,235	Stk.	..	4	and 4 p.c. Con. Pref.	104-106	..	3 15 6	502,310	Stk.	May 12	5	Southampton Ord.	110-112	..	4 9 3
4,531,795	Stk.	June 29	3	Coke 3 p.c. Con. Deb.	80-82	..	3 13 2	120,000	Stk.	Feb. 10	7½	Tottenham A 5 p.c.	139-141	..	4 19 3
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	..	5 5 3	483,940	Stk.	..	5½	and B 3½ p.c.	114-116	..	4 14 10
82,500	Stk.	..	6½	Do. do. 5 p.c.	117-119	..	5 9 3	149,470	Stk.	June 29	4	Edmonton 4 p.c. Deb.	57-59	..	4 0 10
70,000	Stk.	Apl. 29	11	Hongkong & China, Ltd.	17-17½	..	6 5 9	182,380	Stk.	June 10	8	Tuscan, Ltd.	9-9½	..	8 8 6
131,000	Stk.	Mar. 16	7	Ilford A and C	145-147	..	4 15 3	149,900	Stk.	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,780	Stk.	..	5½	Do. B	109-111	..	4 19 1	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,500	Stk.	June 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	255,636	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c.	139-141	..	4 15 9
								79,416	Stk.	June 29	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

Electric Lighting Company, amounting during the year to £12 9s. 2d. The number of public electric arc lamps in use on Dec. 31 was 447; the prices charged being £12 10s., £17 10s., and £26 per lamp per annum, according to the kind of lamp.

EXPERIMENTAL ELECTRIC LIGHTING.

In accordance with the resolution of the Court of Common Council of July 25, 1907, whereby the two Electric Light Companies having statutory powers in the City were permitted to experiment with the newest form of electric lamps for street lighting in the thoroughfares of Holborn, Holborn Viaduct, part of Old Bailey, Farringdon Street, and Cannon Street (between St. Paul's Churchyard and Dowgate Hill), the Charing Cross and Strand Electricity Supply Company continued the lighting of their portion—viz., Cannon Street—with eleven magazine flame arcs centrally hung, being suspended over the roadway by wires attached to the buildings on either side at a height of 28 feet above the roadway. One lamp, at the corner of Dowgate Hill, was removed during the year, owing to the rebuilding of the premises there. These lamps are charged at the rate of £17 10s. per lamp per annum for the experimental period. The Charing Cross and Strand Company make this price conditional upon their having not less than 250 lamps to deal with. The City of London Electric Lighting Company also continued their experiment with 21 "Oliver" flame arcs in substitution of a similar number of the original "open" arcs, adapting the existing columns in Holborn, Holborn Viaduct, and part of Old Bailey 20·5 feet in height, while in Farringdon Street 18 enclosed arcs of the "Reason" type, fitted up on special short columns 14 feet in height in lieu of the 12 open arc lamps and columns in that thoroughfare, were maintained during the year. The installation of these two areas was completed by Nov. 20, 1907. The maintenance cost of the "Oliver" flame arcs in the Holborn area is £17 10s. each per annum—being equivalent to the charge for similar lamps in Cannon Street; and the cost of the enclosed arcs in Farringdon Street is £12 10s. each per annum.

Further Borrowing Powers for the Bury Corporation.—At a recent meeting of the Gas Committee of the Bury Corporation, it was resolved that application should be made to the Local Government Board for power to borrow £60,000 for gas-works purposes. On the minutes of the Committee containing the resolution being submitted for confirmation at the meeting of the Council last Thursday, Mr. Riley remarked that the amount seemed rather large, and he asked if the Committee had good and sufficient reason for asking for sanction to raise it. The Town Clerk explained that the money was required to meet expenditure during the next ten years on mains, cookers, and structural alterations; and it was anticipated that the amount named would be needed. Alderman Butcher remarked that the sum was less than that previously spent during a like period. Mr. Riley said the explanation was quite satisfactory. The minutes were confirmed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

As will be seen from another column, the Corporation of Glasgow have not been long in bringing their new powers in the direction of differential prices into use. The proposed rates were criticized adversely in the Town Council, in the interest of a section of the community whose sponsors are not distinguished for the strict application of business principles to methods of promoting municipal enterprise. The policy of the Gas Committee being to promote the sale of gas by giving encouragement to the users to take more of it than they have been accustomed to, the unthinking devotees of class interests would, if we are to accept the dicta of Mr. Cook, who advocated their case, nullify the scheme by reducing it to the absurdity of giving greater advantages to those who scarcely use gas at all than to those whose increasing orders it was the object of the recent Act to secure. The Council are, as a whole, too level-headed to be influenced by such arguments as they were plied with; but they wisely—as they always do when a "man with a mission" urges them to do what would not be wise—listened to him patiently, and they then, following the lead of the Committee who had considered and brought forward the proposals, adopted them. The scale of charges, the Convener intimated, is only experimental, which makes the closer looking into the figures improper. It will be interesting to watch how the experiment results. On a scale of such magnitude, the lesson will probably be more striking than it would be in the case of smaller bodies. There is every reason to anticipate that the experience which the Corporation of Glasgow will obtain in the matter of differential rates will be, from the beginning, a happy one, and will prove an encouragement to them, and to others as well, to endeavour more than ever to popularize the use of gas.

Referring to the smoke abatement exhibition which is to be held in Glasgow from Sept. 16 to Oct. 8, a writer in the "Glasgow Herald" of last Tuesday states that the exhibition promises to be one of wide variety; and he goes on to remark that "the exhibition is intended as a means of bringing before the citizens in a practical and interesting fashion the latest and most scientific devices in connection with smokeless heating and lighting; and that the newest methods and contrivances for the complete combustion of fuel, as well as the most modern developments in heating, lighting, and ventilation by means of gas and electricity will be shown and explained." An extensive floor space is necessary for the thorough display of the exhibits; and the skating rink building in Victoria Road, which has an area of 30,000 square feet, will be utilized for the purpose. Floor spaces, varying in extent from 70 to 500 square feet, have been let to about 50 exhibitors from all parts of the country. The Gas and Electricity Departments of the Glasgow Corporation will provide interesting exhibits. Each department is fitting up a house, comprising dining-room, drawing-room, kitchen, bath-room, and laundry. The houses will each occupy an area of

MAIN



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THE NEW "PILGRIM" STEAMER.

A GAS-HEATED STEAM COOKER

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Previously Steam Cooking has only been adopted in large Institutions, now **WE** supply the Long-Felt **WANT** to the Household Kitchen.

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40 feet by 25 feet, and will be completely furnished. One will be heated and lighted by electricity and the other by gas. A number of smokeless fuels will be shown. There will be also a miscellaneous collection of gas-stoves, gas-fires, patent heaters, cookers, &c. Practical demonstrations of some of the appliances will be given daily. The Corporation will supply the gas or electric energy required by exhibitors for their stands free of charge. Among the firms to be represented at the exhibition are: John Wright and Eagle Range, Limited, the Richmond Gas-Stove Company, the Davis Gas-Stove Company, the Parkinson Stove Company, the Carron Company, Messrs. Fletcher, Russell, and Co., Wilsons & Mathiesons, Limited, R. & A. Main, George Bray and Co., Limited, James Milne and Son, Ewart and Son, and J. & W. B. Smith.

Regarding the gas transfer at Kirkcaldy, it is reported that last week Mr. Prosser, of Edinburgh, the Solicitor recently appointed by the Burgh in connection with the purchase of the gas undertaking, and Councillor J. Wright, the Convener of the Gas Committee, travelled to London, where they met Mr. Arthur Silverthorne, and afterwards conferred with representatives of the Gas Company with the purpose of discussing an amicable arrangement. As the Company had already intimated the nomination of their Arbitrator, they could not go further into the matter meantime. Arrangements are being forwarded for the arbitration. The Oversman has not yet been appointed; and if the parties cannot agree, the appointment will be made by the Court of Session. A special meeting of the Town Council was held on Tuesday of this week, when the deed of nomination of Mr. Silverthorne as Arbitrator for the Council in connection with the purchase of the gas undertaking was signed. Mr. Macindoe, the Town Clerk, reported that on July 25 he received from the Solicitors of the Gas Company a deed nominating Mr. Corbet Woodall as Arbitrator for the Company, and that the Act confirming the town's Provisional Order received the Royal Assent on July 26.

The result of the year's trading in the Gas Department of the Grange-mouth Town Council has been an increase to the net revenue account of £167, and an increase over the estimate of £194. The Gas Committee reported to the Town Council their satisfaction that the year's trading had more than covered the sinking fund payment of £800. As the price of coal had increased slightly since last year, and a further expenditure was to be met on the works, there might be a decreased profit this year, which meant that there would be no reduction in the price of gas. The report of the Committee was adopted.

The Cullen Gaslight Company have paid a dividend of 5 per cent. At the annual meeting of shareholders on Friday of last week, the Chairman reported that they had had a very satisfactory and prosperous year. The price of gas for lighting was reduced from 7s. 11d. to 7s. 6d. per 1000 cubic feet.

At the annual meeting of the Bo'ness Gas Company, Limited—ex-Provost Ballantine presiding—the Manager (Mr. J. Campbell) in his report stated that the make of gas for last year was almost 28 million cubic feet; being an increase of fully 1½ millions for the year. The new consumers numbered 118. The quantity of coal used was

103 tons less than before; and there were increased receipts from coke and tar. The usual dividend of 5 per cent. was declared.

Mr. W. Brown, who went from Lasswade to be Manager of the Cardenden Gas Company (a new undertaking), is finding business expanding in his hands. Intimation has been made that the Committee of Management of the special lighting district of Auchterduran have resolved to erect 152 street-lamps. The Committee have conferred with Mr. Brown as to the cost of erecting the lamps and supplying gas for the ensuing year, and have arranged that the Gas Company shall erect the lamp pillars and lanterns, with automatic lighting apparatus, for the sum of £4 4s. per lamp; the Committee to pay half of the wayleave charged by the Road Surveyor for the opening of the public roads. It has also been arranged that the Gas Company are to supply gas, mantles, and globes, and to do the cleaning of the lamps, their storage during the four summer months, and the lighting of them during the eight months of the year they are in use, for 32s. per lamp per annum—it being understood that the lamps are not to be lighted on nights when there is sufficient moonlight.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Aug. 6.

Notwithstanding the intervention of the holidays, and the fact that new orders direct from consumers have not been abundant, the demand has continued good throughout the week, and a further improvement in prices has to be recorded. At the close, the quotations are £11 17s. 6d. per ton f.o.b. Hull, £12 per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. In the forward position, makers still demand a premium on prompt values, but no further transactions have transpired.

Nitrate of Soda.

There is no new feature to comment upon in the market for this article, and spot prices remain unchanged at 9s. 3d. per cwt. for 95 per cent. quality and 9s. 6d. for 96 per cent. quality.

Tar Products.

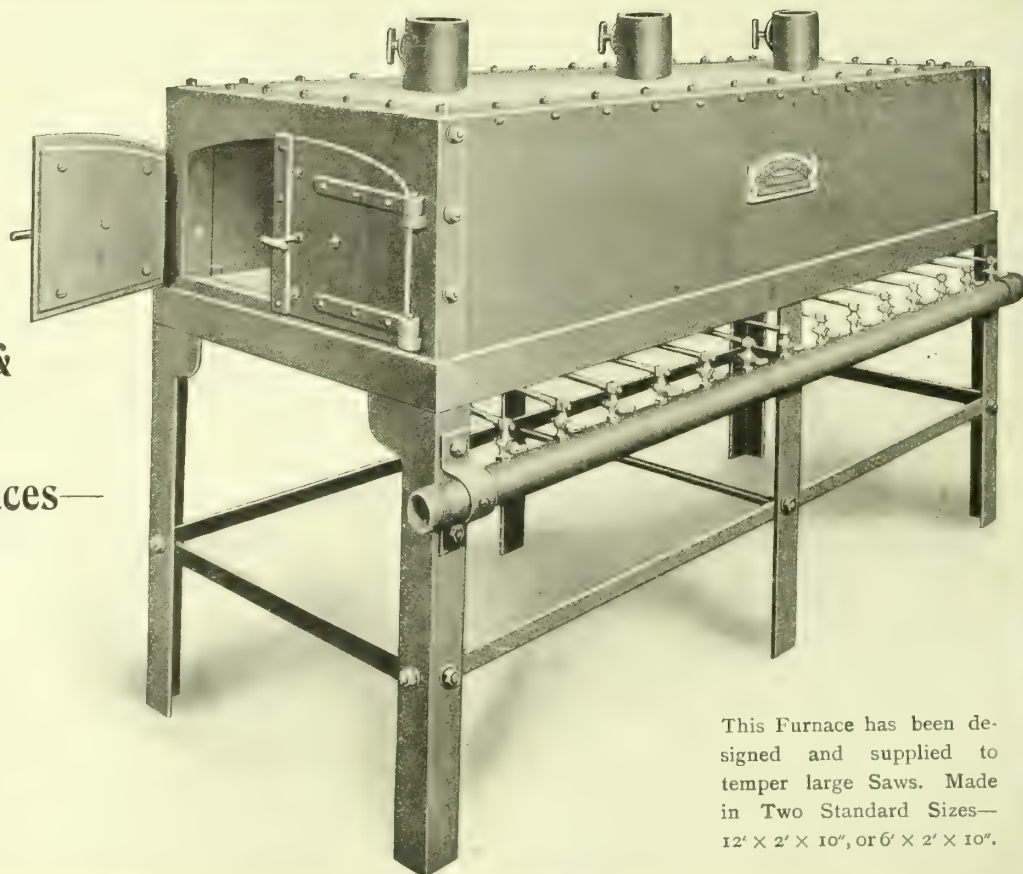
LONDON, Aug. 8.

Business in tar products has been quiet during the past week; and pitch remains in about the same position. Prompt orders are scarce; and for the forward position, buyers seem to be able to hold out in the hope of obtaining lower prices. Benzols are steady; and distillers report that they are receiving a fair number of inquiries. In solvent naphthas, the inquiry has been slightly better during the week, and little business has been done at fairly good prices for delivery to the end of the year. Crude carbolic acid is of very little interest.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d.,

**Specialists &
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ex works. Pitch, London, 33s. to 34s.; east coast, 32s. 6d. to 33s.; west coast, 31s. 6d. to 32s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, ¼ 10s. to ¼ 8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1¼d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has fallen very flat again; and although in the majority of cases makers are asking high prices, it is not possible to do business at their quotations. Actual Beckton to day is quoted at ¼ 11 12s. 6d., and outside London makes ¼ 11 7s. 6d. In Hull, ¼ 11 16s. 3d. to ¼ 11 17s. 6d. is quoted; in Liverpool, ¼ 11 16s. 3d. to ¼ 11 17s. 6d.; and in Leith, ¼ 12 to ¼ 12 2s. 6d. for prompt and ¼ 12 5s. for forward. In Middlesbrough, ¼ 11 17s. 6d. is the figure.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been rather more activity in the coal trade of the North, and the general demand appears to be stronger. In the steam coal trade, the output is well taken up, and prices are, on the whole, well maintained. Best Northumbrian steams are 10s. per ton f.o.b. For second-class steams, about 9s. is quoted; and for steam smalls, the price is from about 5s. 6d. to 6s. 6d. Exports appear to be a little heavier. In the gas coal trade, there is now a natural increase in the consumption. The shipments on the long contracts are growing more steadily; and the production is fairly full. For the usual classes of Durham gas coals, the prices vary from 9s. to 9s. 10½d. per ton f.o.b.; and for "Wear" specials, up to 10s. 6d. is the current quotation. In addition to a few sales for forward delivery, there are now contracts in the market for 130,000 tons of coals for the Naples Gas-Works, and of 17,000 tons for Padova; and the tenders for these two Italian contracts are expected to be soon decided upon. At the same time, there is a firmer tendency in the gas coal prices for forward delivery, which makes the settlement of contracts not so rapid, more especially when collieries have sold freely forward previously. In the coke trade, the demand is fair; but gas coke is now increasing in supply. Good gas coke is from 15s. 6d. to 15s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade remains unchanged; the demand being barely equal to the supply for shipment. The season is, in fact, slack. The prices now

quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 271,017 tons—an increase of 86,711 tons upon the previous week, and of 54,804 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,125,611 tons—an increase of 696,296 tons upon the corresponding period.

New Filter-Beds at Hereford.—At the meeting of the Hereford Town Council last Tuesday, it was decided to construct two extra sand filters adjoining the present filter-beds, which will treble the present filtering capacity, even when one of the beds is being cleaned.

North Sussex Gas and Water Company.—Readers of the "JOURNAL" are aware that a Receiver (Mr. A. W. Lunt) has been appointed of this Company. As he is at present engaged in carrying on the Ticehurst and District Water and Gas Company as Manager, a suggestion has been made that he should do the same in the case of the North Sussex Company, and endeavour to make it a success. Before anything can be done, the present Directors will be asked to resign; and Mr. M. J. Jarvis, the Solicitor of one of the shareholders, has invited the latter to attend a meeting, with the view of some concerted action being taken to recover some of the shareholders' money.

Stockport Gas Undertaking.—At the last monthly meeting of the Stockport Town Council, the Borough Treasurer's abstract of the various accounts of the Corporation for the year ended the 31st of March last was presented; and the Chairman of the Finance Committee (Alderman Henry Bell) offered a few observations upon it. Referring to the gas undertaking, he said it had again done well. The increase in the sale of gas was £542; but the sale of residual products was less by £1600. This, however, was more than counterbalanced by a saving of £2400 in coal. Out of the gas profits of £41,077, the usual depreciation had been allowed and interest paid; £3054 had been transferred to the reserve; and £18,000 had been granted in relief of the current year's rates.

York United Gas Company.—At the half-yearly general meeting of this Company last Wednesday, the Chairman (Mr. J. R. Hill) said the balance of profit for the six months ended the 30th of June was £8636, and they had received £381 interest on the reserve fund; making a total of £9017. The first charge on this sum was the interest on the debenture stock, amounting to £618; and there then remained a sum of £8399 to be dealt with. The Directors recommended that the usual maximum dividends at the rate of 4 per cent. per annum should be declared on the preference and ordinary stocks of the Company, which, after deduction of income-tax, would absorb £7910, and leave a surplus of £489 to be carried forward. The quantity of gas sold during the past half year showed an increase of upwards of 3¼ million cubic feet over that sold in the corresponding period of 1909. The Directors' report was adopted, and the dividends recommended were declared.

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New Joint-Stock Companies.—Combination Burners, Limited, has been registered with a capital of £2000, in 1750 preferred ordinary shares of £1 each and 5000 deferred ordinary shares of 1s. each, to carry on the business of gas, hydraulic, electric, motor, lighting, heating, ventilating, constructional, and general engineers, &c. The Lan Gas Coal Company, Limited, has been registered with a capital of £12,000, to carry on the business of colliery owners, coal owners, coal merchants, coke manufacturers, &c. Howellite Burners, Limited, is the title of a Company registered with a capital of £2000, in 10s. shares. The object is to carry on the business of manufacturers of, and dealers in, incandescent gas and other lights, fittings, and accessories, &c., and to adopt an agreement with H. Howell, of Balham, S.W.

Proposed Extensions at Salford Corporation Gas-Works.—At last Wednesday's meeting of the Salford Town Council, the report of a Special Sub-Committee of the Gas Committee, expressing the opinion that an extension of the gas-works is necessary, was approved. The question of applying for additional parliamentary powers for gas purposes was referred to the Gas Consultative Sub-Committee with power to add to their number; and the Chairman of the Gas Committee (Alderman Phillips), the Deputy-Chairman, and the Gas Engineer (Mr. W. W. Woodward) have been authorized to visit such cities and towns on the Continent as they may deem necessary for the purpose of inspecting new apparatus used in the manufacture of gas. It should be added that the report of the Special Committee sets out that an extension of the gas-works is imperative, and ought to be carried out at an early date.

Reduced Charges and Increased Consumption at Littleborough.—The accounts presented at the recent half-yearly meeting of the Littleborough Gas Company showed that the sales of gas for the six months ended the 30th of June produced £4419, compared with £4453 in the corresponding period of 1909. The decreased revenue was accounted for by the reduced price of 2d. per 1000 cubic feet, adopted last year. The quantity of gas sold in the six months was 31½ million cubic feet, which was an increase of 3½ per cent. on the consumption in the first half of 1909; and residual products realized £1349, compared with £1277. The profit on the revenue account amounted to £1560; and there was a disposable balance of £3019. The working results for the twelve months ended the 30th of June showed that 6243 tons of coal were carbonized, producing 68½ million cubic feet of gas, or an average of 11,015 cubic feet per ton. The Chairman (Mr. J. C. Hudson) expressed the satisfaction of the Directors in presenting again a report which marked distinct progress on previous records, and revealed a satisfactory increase in sales of gas for all purposes, which he said had assisted them in meeting decreased revenue due to reduced charges. A dividend at the rate of 10 per cent. per annum, less income-tax, was declared. The shareholders expressed their satisfaction that the financial position of the Company was so sound; and thanks were accorded to the Directors, the Manager and Secretary (Mr. S. E. Halliwell), and the staff.

Wandsworth and Putney Gas Company.—At the half-yearly meeting of this Company next week, the Directors will report a profit of £16,435 for the six months ended the 30th of June. The amount available for distribution is £23,225; and the Directors recommend dividends at the rates of £8 5s., £6 15s., and £5 15s. 6d. per cent. per annum on the several classes of stock—increases of 2s. 6d. and 1s. 9d. respectively as the result of the recent reduction in the price of gas. The make of gas in the half year was 583,063,000 cubic feet, of which 547,322,000 feet were sold, and 554,027,000 feet accounted for.

Malton Gas Company.—The amount available for distribution as the result of the working of the Malton Gas Company in the six months ended the 30th of June was £3246; and at the recent ordinary general meeting it was decided to pay a dividend of 6 per cent. for the half year, free of income-tax. After payment of this, there remained £1806 to be carried forward. The reserve fund was increased to £7100. In seconding a vote of thanks to the Chairman and Directors, Mr. Moorhouse spoke of the excellent management of the Company. He said the fact that with a revenue account of about £5000 for the half year the bad debts only amounted to 7s. 4d. spoke eloquently for the management and for the commercial honesty of the community.

Prospective Water-Rate for London.—Before the close of the year, London will in all probability be faced with yet another rate. At the last meeting of the Finance Committee of the Metropolitan Water Board, says the "City Press," the question of the immediate issue of a precept was discussed; and directly the holidays are over, the Committee will again have the question before them. There can be little doubt that the result will be the issue of a demand to the various rating authorities in London and the outer area served by the Water Board. The position of the Board is serious, so far as finance is concerned. The Charges Act has failed to provide a sufficient income, despite the huge demands of the Board in the central district of London. During the six-and-a-half years of the existence of the Board, the deficiency has reached £136,000. Probably the new rate will be fixed at ½d., unless the Board adopt the principle of levying an occasional rate.

Water Scheme for the Clown Rural District.—A Local Government Board inquiry was conducted at the Clown Co-operative Hall last Friday, by Mr. A. W. Brightmore, into an application by the Clown Rural District Council for power to borrow £5674, £12,494, £13,859, and £9473 for purposes of water supply for the parishes of Clown, Creswell, Barlborough, and Whitwell respectively, including the provision of reservoirs at Speetley Plantation, Barlborough, and Sparken Hill, Worksop, with capacities of 400,000 and 150,000 gallons respectively, and the execution of other works in the urban district of Worksop. There was a good deal of opposition to the scheme, which has been approved by Mr. Hodson, the Water Engineer to the Council. The cost of the joint works will be £25,500, and of the actual scheme £41,500. The annual cost will be £3472, which works out at 7½d. per 1000 gallons; and the water will be supplied at 10d. per 1000 gallons.

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Cambridge Corporation and the Water Company.

In the course of a highly satisfactory report presented by the Directors of the Cambridge Water Company at the recent half-yearly meeting, they recommended the payment of dividends for the six months ended the 30th of June at the rates of 10 and 7 per cent. per annum on the two classes of consolidated stock, less income-tax. Referring to the Bill promoted by the Company, they stated that it had been before Select Committees of the Houses of Lords and Commons. Before the House of Lords Committee, it was opposed by the Cambridgeshire County Council, the Cambridge Corporation, Trinity College, and others. But when it came before the Committee of the House of Commons, there remained only one opponent—viz., the Corporation of Cambridge, who desired to have inserted a clause providing that in the event of the Corporation introducing a Bill next session to purchase the Company's undertaking, and such Bill becoming law, the powers conferred upon the Company by their Act should not be deemed to increase the value of the undertaking. But the clause asked for was refused. With regard to the quality of the water, the Directors stated that they continued, through Professor Sims Woodhead, to keep a constant watch on its bacteriological quality, and through Mr. E. F. Smith on its chemical character. The Engineer and Manager (Mr. W. W. Gray) reported that during the past half year water had been laid on to 112 premises, the rental from which would be £161 per annum, and that the total number of premises now supplied was 18,675; also that the general condition of the Company's works was satisfactory. The dividends recommended were declared.

Co-Partnership at Grantham.—At the half-yearly meeting of the Grantham Gas Company, the Directors were able to present a very satisfactory statement, showing a balance of £3495 to the credit of the profit and loss account. Out of this sum, they recommended that £2000 should be applied in payment of the maximum dividend of 5 per cent. per annum on the consolidated stock, and that the balance of £1495 be carried forward. The result of the past year's working, they said, fully justified the course taken by them in reducing the price of gas last year. From the increased consumption, it was proved that this step had been duly appreciated by the consumers. The co-partnership scheme with the employees had been working smoothly and successfully, and was much in favour with the men, who earned £116 during the past year. In moving the adoption of the report, the Chairman (Mr. J. G. Thompson) said he thought they would agree that the accounts were thoroughly satisfactory. Referring to the co-partnership scheme, he pointed out that during last year the men earned 3½ per cent. on their wages. In the current half year, in consequence of the reduced price of gas, they would earn 5 per cent. If in future the Directors were able to still further lower the charge for gas, the men would proportionately benefit. The report was adopted.

APPLICATIONS FOR LETTERS PATENT.

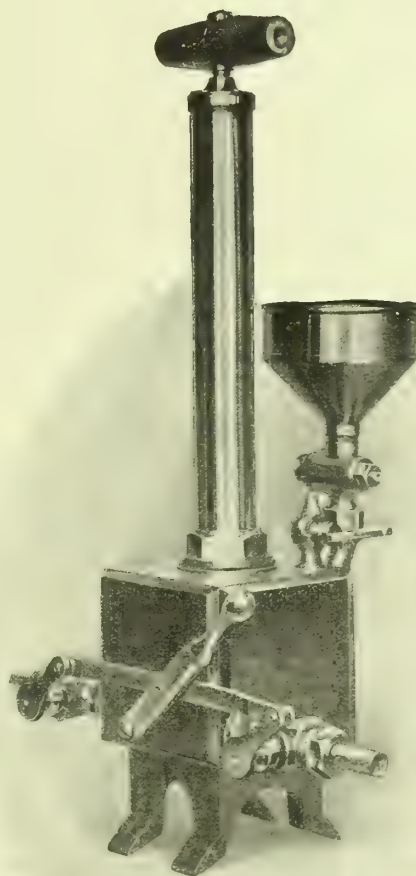
- 17,575.—CROSS, F. L., "Operating recording apparatus in gas distributing systems." July 25.
- 17,623.—BALDWIN, W. J., "Separating dust and other materials from gases." July 25.
- 17,667.—HARRIS, W. A., and JACKSON, J., "Gas-engine fault-detector." July 26.
- 17,712.—TRIMLETT, H. J., "Gas-pressure alarm apparatus." July 26.
- 17,728.—FREYTAG, E. E., and ALEXANDER, E. K., "Gas-turbines." July 26.
- 17,732.—JONES, A. O., "Improvements in coke." July 26.
- 17,760.—DOULTON, H. L., and MORRIS, C. E., "Pipe-joints." July 26.
- 17,766-7.—SOUTHEY, A. W., "Generation of gaseous fuel." July 26.
- 17,779-80.—WITHERS, J. S., "Gas-heaters." A communication from E. G. van Zandt. July 26.
- 17,781.—WITHERS, J. S., "Gas-burners." A communication from E. S. van Zandt. July 26.
- 17,807.—COTTERELL, E. H., "Two-cycle gas-motor." July 27.
- 17,881.—WITHERS, J. S., "Gas-burners for heating apparatus." A communication from E. G. van Zandt. July 27.
- 17,888.—ADAMSON, R. A., "Scraping and cleaning water-mains." July 27.
- 17,900.—MADELEY, J. W., "Automatic regulation of the flow of liquid through pipes." Partly communicated from E. P. Richards. July 27.
- 17,902.—BELSHAW, T. O., "Adjustable reflector for artificial light." July 27.
- 17,923.—LUCAS, H., and EGGINTON, W. H., "Acetylene generators." July 28.
- 17,931.—CROSSLEY, K. I., and WEBB, W. Le P., "Internal-combustion engines." July 28.
- 17,949.—BOLZ, C., "Distilling ovens with upright retorts." July 28.
- 17,985.—NICHOLSON, T., "Separators." July 28.
- 18,000.—WIRTZ, J., and HINNE, F., "Kindling and extinguishing street-lamps and the like." July 28.
- 18,016.—BERLIN ANHALTISCHE MASCHINENBAU-ACT.-GES. ABTEILUNG KÖLN-BAYENTHAL, "Gas-purifiers." July 28.
- 18,051.—WATSON, J., "Automatic meter and indicator." July 29.
- 18,057.—WILLIAMS, J., "Air-gas apparatus." July 29.
- 18,084.—BAGRACHOW, G., "Impregnating mantles." July 29.
- 18,130.—DOCKING, A., "Supplying a mixture of gas and air." July 30.
- 18,143.—WHITFIELD, C., "Gas-producers." July 30.
- 18,148.—BURSTALL, F. W., "Treating carbonaceous substances." July 30.
- 18,176.—WILTON, G., "Treatment of gas." July 30.
- 18,199.—CARR, H. O., and NAIRNE, U. O. S., "Testing the illuminating power of gas." July 30.
- 201.—EMANUEL, P. A., "Gas-making apparatus." July 30.
- 202.—FRIEDRICHS, L., "Safety device for gas-cocks." July 30.

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Brighton and Hove Gas Bill.—The East Sussex County Council have accepted without comment the report of their Brighton and Hove Gas Bill (1910) Committee, who stated that, as the result of their opposition, the County Council were successful in obtaining protection on the question of the control of the depth of pipes and on that of the reinstatement of the roads. The promoters also abandoned a clause which would have had the effect of enabling them to open up the main roads of the county for the purpose of laying pipes for procuring, conducting, or disposing of any oil or other materials used by them in, or resulting from, any manufacture of gas or residual products.

The Directors of the Derby Gaslight and Coke Company at their meeting last Wednesday declared an interim dividend at the rate of 5 per cent. per annum on the consolidated stock for the half year ending June 30.

At the quarterly meeting of the Forsbrook Parish Council, a letter was read from the Clerk to the Stoke County Borough Council saying that, in response to the Parish Council's request, the Gas Committee had recommended a reduction in the price of gas for the Blythe Bridge district, to 2s. 10d. per 1000 cubic feet, with a discount of 3d. for payment on demand. This was considered satisfactory.

The Lilleshall Company, Limited, of Oakengates, have recently received an order from the United Alkali Company, of Widnes, for a double-acting gas-engine, which will be direct-coupled to a compressor to compress the limekiln gases used in the chemical works. The compressor cylinder is connected to the two tandem gas-cylinders, and will be fitted with automatic frictionless valves. The output will be 1820 cubic feet of gas per minute, compressed to 40 lbs. per square inch.

The electric current suddenly failed last Friday evening at Bridlington, and the town was plunged into darkness. The shopkeepers who were dependent upon it had to resort to candles. On the Royal Prince's Parade, where 7000 people were assembled, the illuminations and lights went out in the middle of the performances. In the Floral Pavilion, the municipal orchestra were playing when the current failed; but they continued in the dark, to the great admiration of the crowd, and possibly to the avoidance of panic.

The Gas Committee of the Stockport Corporation have accepted a tender from Messrs. Gibbons Bros., Limited, of Dudley, for settings of inclined retorts for £7150.

The Southampton Borough Council have agreed to a proposal that, as electric mains are laid in roads, the public lamps shall be connected with them. The Mayor (Alderman C. J. Sharp) remarked that, as they owned the electricity undertaking, they should support it as much as they could; and he would like to see the whole town lighted by electricity. The Electrical Engineer had previously reported that in most cases the revenue obtained by the public lighting would cover the interest and sinking fund charges on the main.

At the Wrexham Gas-Works last Friday evening, prizes were distributed for the best kept garden plots. In handing over the prizes, Mr. J. Braithwaite, the Engineer and Manager of the Company, highly complimented the men on the successful crops resulting from the care and attention given to the plots. There were altogether six prizes—two were given by Mr. J. Oswald Bury, the Managing-Director, three by Mr. Braithwaite, and one by Mr. George Roberts, to whom a hearty vote of thanks was accorded at the termination of the proceedings.

In an attractive booklet bearing the title of "The Light Within," the Block Light Company, Limited, of Manchester, furnish particulars of a new American four-light inverted gas "arc" lamp which they are putting on the English market. It has been specially constructed for lighting large business establishments, factories, railway stations, and other places; and it is claimed that, with a consumption of 14 cubic feet of gas per hour, it will give a light equal to 600 candles. Other claims put forward by the makers of the lamp are its attractive appearance, simplicity of working, and facility of application.

The Dowson and Mason Gas Plant Company, Limited, has been formed to combine the business of the Dowson Economic Gas and Power Company, Limited, of London, with that of the Mason Gas Power Company, Limited, of Manchester. The Dowson plants will still be used for engine work, and the Mason furnaces and producers for furnace work. The works of the combined Company will be at Levenshulme, Manchester; and the London office will be continued at No. 39, Victoria Street, Westminster. Mr. Dowson will act as Engineer and Managing-Director of the combined business.

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Meetings.

BARNET GAS AND WATER COMPANY. Holborn Restaurant, Aug. 29, 12.30 o'clock.
BRIGHTON AND HOVE GAS COMPANY. London Offices, Aug. 25, Two o'clock.
ENFIELD GAS COMPANY. Offices, Aug. 30, 5.30 o'clock.
HORNSEY GAS COMPANY. London Office, Aug. 19, 3.30 o'clock.
NORTH MIDDLESEX GAS COMPANY. London Offices, Aug. 22, 2.30 o'clock.
RIDDINGS GAS COMPANY. London Offices, Aug. 29, 3.30 o'clock.

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Full Particulars may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Scaled Tenders, endorsed "Tender for Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 25th of August, 1910.

L. C. EVANS, Town Clerk.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 19th day of August, 1910, at Half-Past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th of June last; to declare Dividends; and to transact the Business of an Ordinary General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 5th to the 19th of August, 1910, both days inclusive. By order of the Board,

WILLIAM E. ROBERTS, Secretary.

Offices: 63, Chancery Lane, London, W.C., Aug. 2, 1910.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Monday, the 22nd day of August inst., at Half-past Two o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1910; to declare Dividends; and for other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 9th to the 22nd of August, both days inclusive.

ERNEST L. BURTON, Secretary.

Secretary's Office: 5, Great Winchester Street, Old Broad Street, London, E.C., Aug. 5, 1910.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Holborn Restaurant, 218, High Holborn, London, W.C., on Monday, the 29th day of August, 1910, at Half-Past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th of August, both inclusive.

By order of the Board, ERNEST W. DREW, Secretary.

Offices: 6 & 7, Queen Street, Cheapside, London, Aug. 5, 1910.

ENFIELD GAS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Sydney Road, Enfield, on Tuesday, the 30th day of August current, at Half-Past Five o'clock in the Afternoon precisely, to receive the report of the Directors and the accounts of the Company for the Half Year ended the 30th of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 17th to the 30th of August, both inclusive.

By order, CHAS. W. OFFORD, General Manager and Secretary.

Enfield, Aug. 4, 1910.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, Nos. 6 & 7, Queen Street, Cheapside, in the City of London, on Monday, the 29th day of August, 1910, at Half-Past Three o'clock in the Afternoon, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th inst., both inclusive.

By order of the Board, ERNEST W. DREW, Secretary.

Offices: 6 & 7, Queen Street, Cheapside, London, Aug. 5, 1910.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, the 26th of August, 1910, at Two o'clock p.m., precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1910; to declare Dividends; to elect Auditors; and for other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 13th to the 26th of August, both days inclusive.

ERNEST L. BURTON, Secretary.

5, Great Winchester Street, Old Broad Street, London, E.C., Aug. 4, 1910.

THE Proprietors of the Patents Nos.

7188, of 1901, for "IMPROVEMENTS IN, OR RELATING TO, ACETYLENE GAS-LAMPS OR GENERATORS;" 11,612, of 1902, for "ACETYLENE GAS-LAMPS FOR TABLE USE;" 23,629, of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" 10,185, of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No. 17,580,

of 1904, for "IMPROVED METHOD OF TREATING COAL FOR COKING PURPOSES," is desirous of entering into Arrangements by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, AND Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No. 19,799,

of 1907, for "IMPROVEMENTS RELATING TO GENERATORS FOR ACETYLENE GAS OR THE LIKE," is desirous of entering into Arrangements, by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, AND Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

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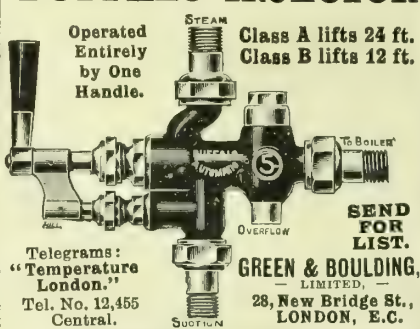
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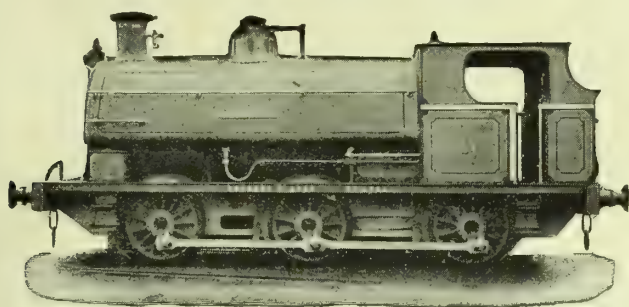
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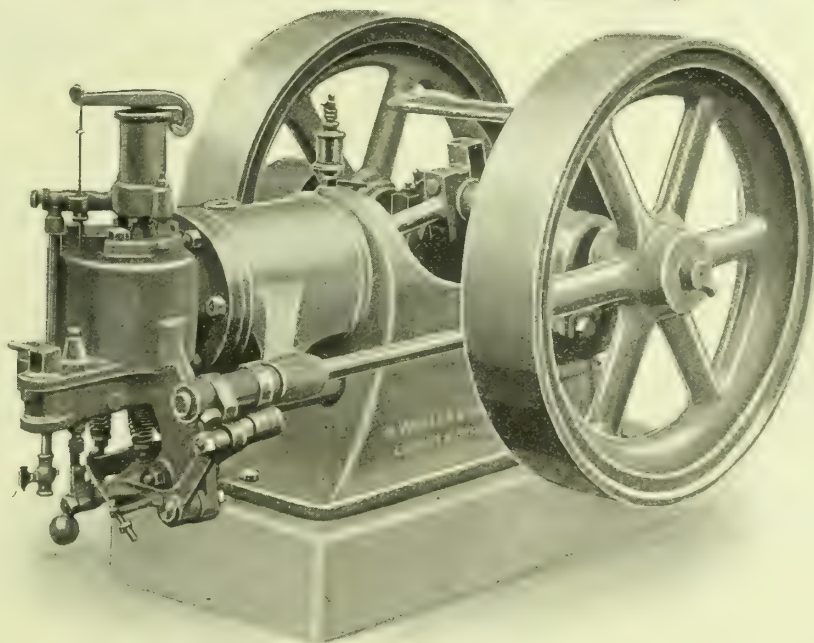
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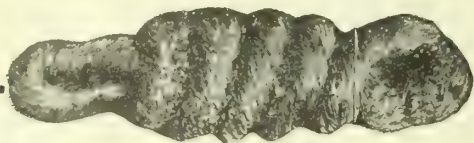
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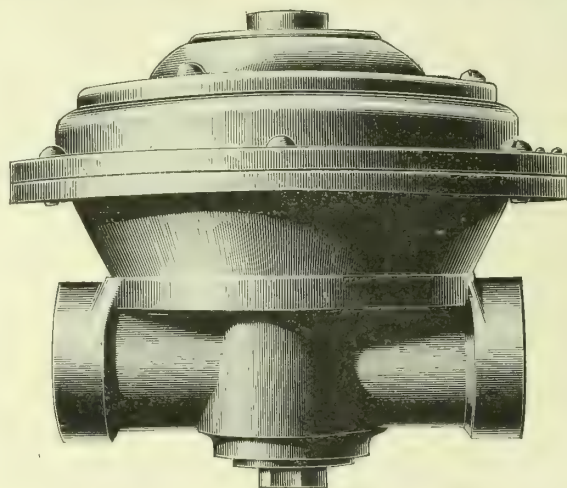
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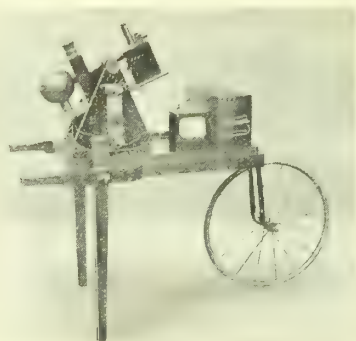
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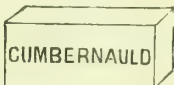
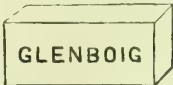
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Undertoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



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Offices: 48, West Regent St., Glasgow.

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of Honour.

Highest Award wherever exhibited.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03 ..	3.49 ..
Silica, combined	43.20 ..	49.77 ..
Alumina	36.55 ..	42.10 ..
Ferric oxide	1.80 ..	2.08 ..
Titanic oxide	1.30 ..	1.50 ..
Lime	trace ..	trace ..
Magnesia	trace ..	trace ..
Alkaline oxides	trace ..	trace ..
Sulphates as trioxides	0.92 ..	1.06 ..
Loss on Ignition	13.20 ..	— ..
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362 F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. — I am, yours faithfully,
JOHN T. NORMAN.

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ALL their **COKE**



in their own District

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By Adopting the **COALEXLD PROCESS.**

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For **FOUL GAS.**

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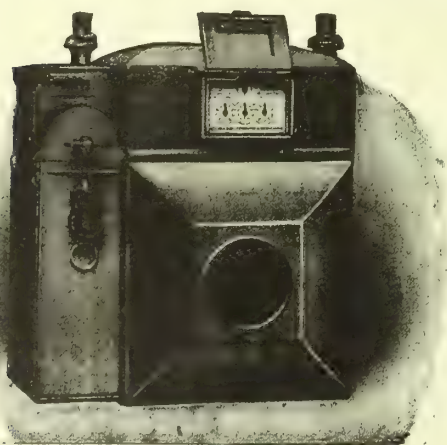
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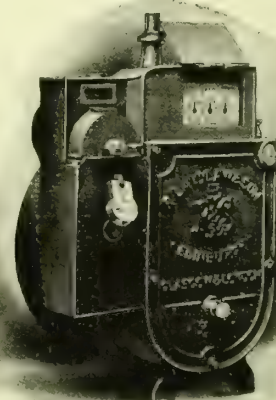


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Welsbach

LIGHT

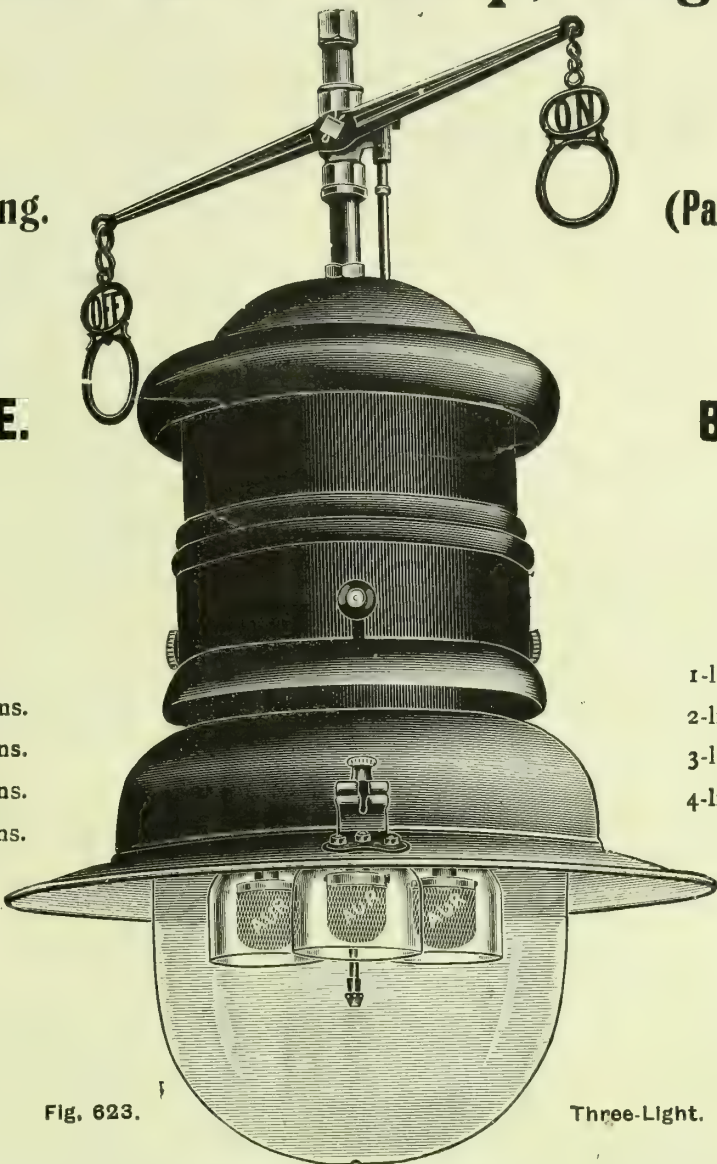
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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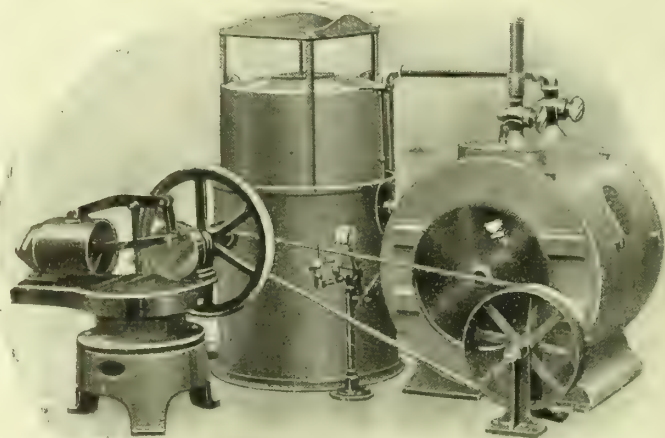
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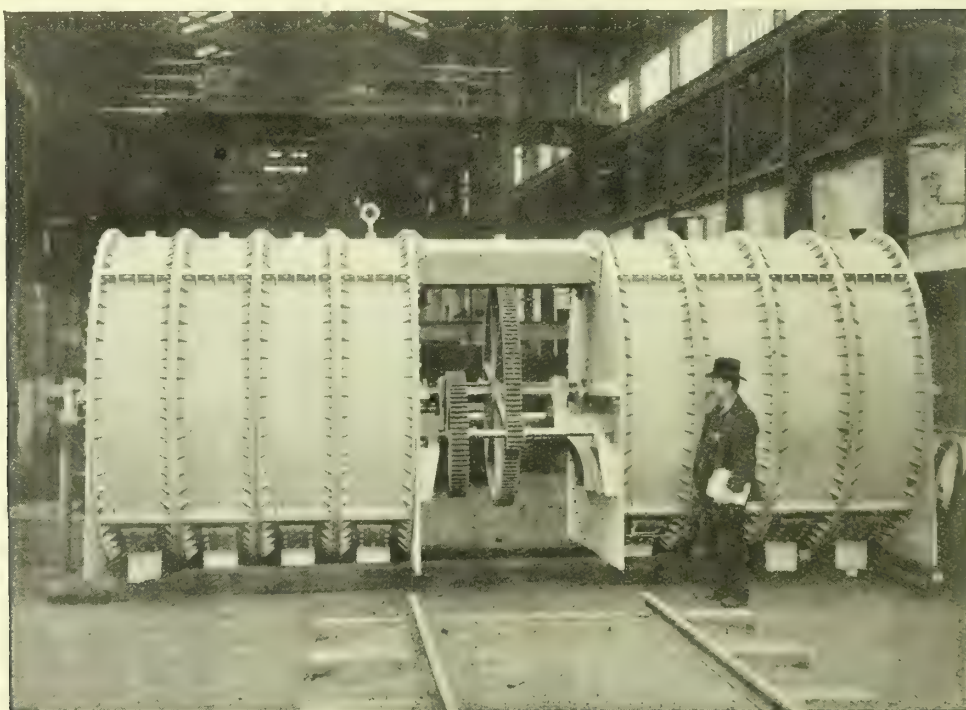
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OF FUEL
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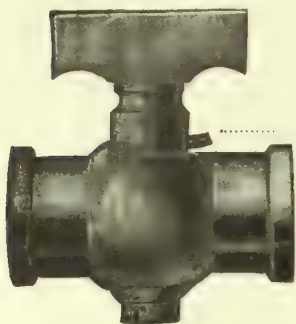


FIG. 1. The Old Style with the Old Trouble.
Note the Pin A.

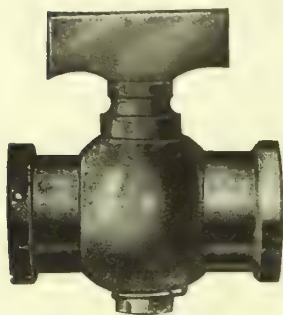


FIG. 2. Evered's Patent:
"Safety Stop." No Pin.
No trouble.

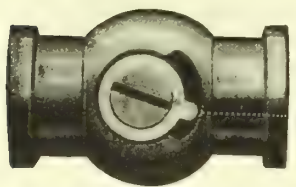


FIG. 3. Underside showing
"Safety Stop" in lieu of Pin.

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Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

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The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

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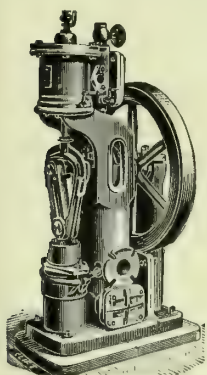


Fig. 705. "SINGLE RAM" STEAM-PUMP.

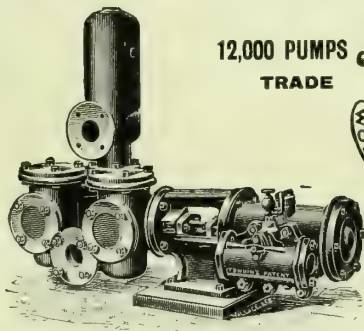


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

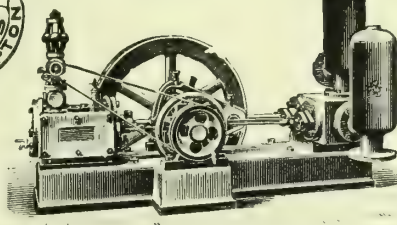


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

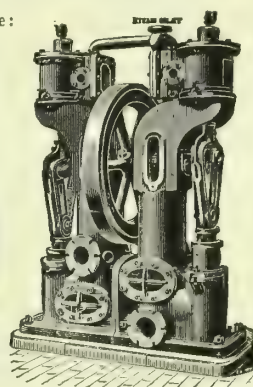


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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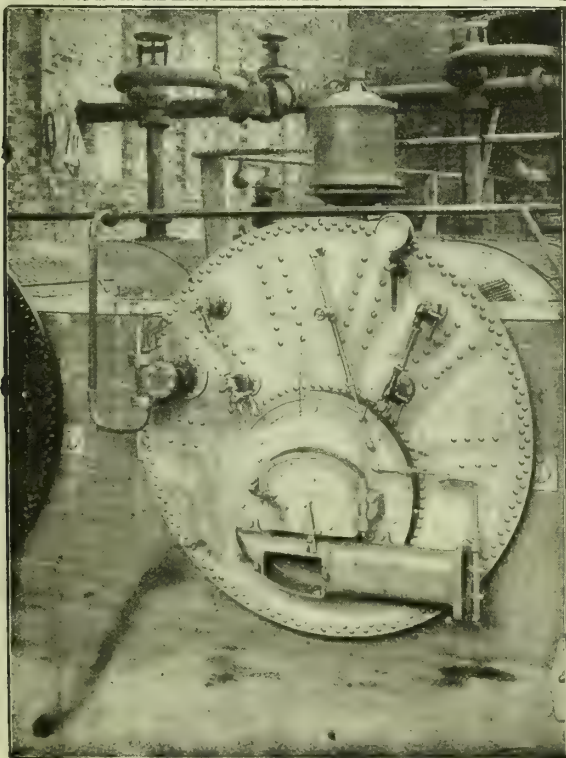
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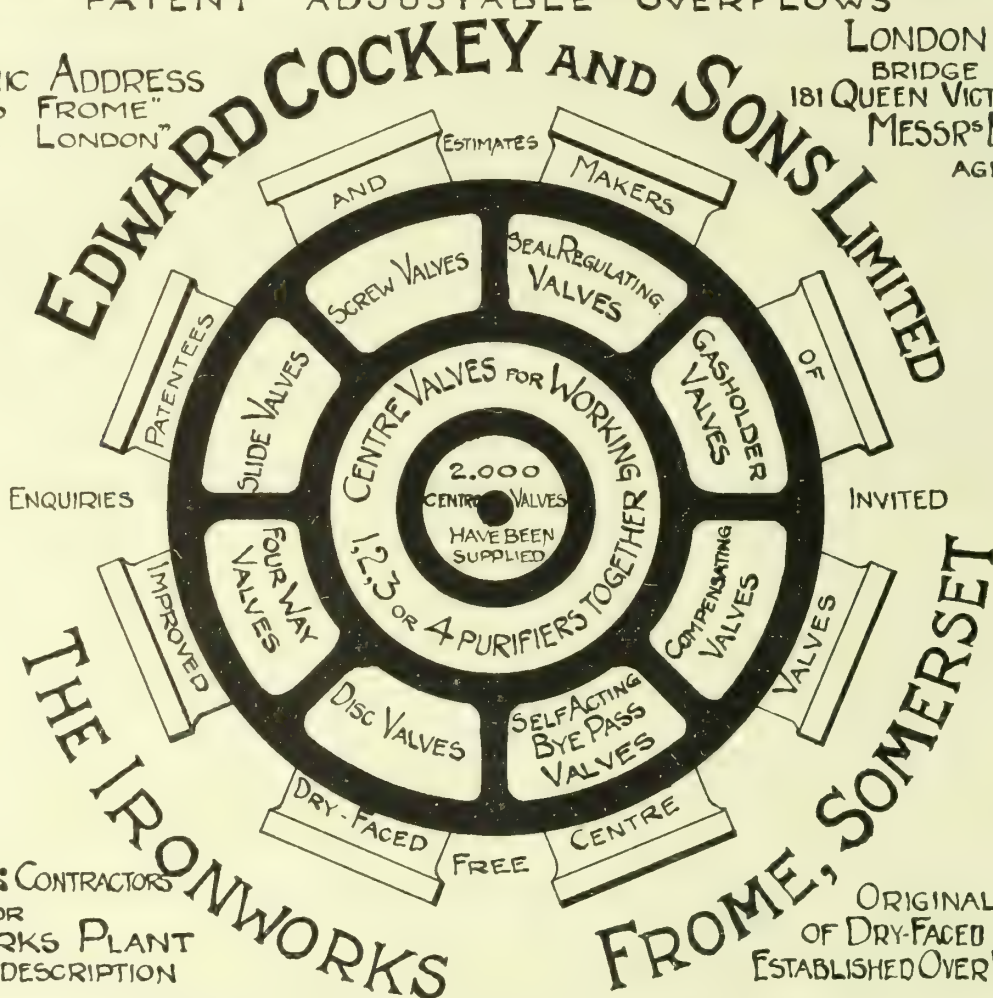
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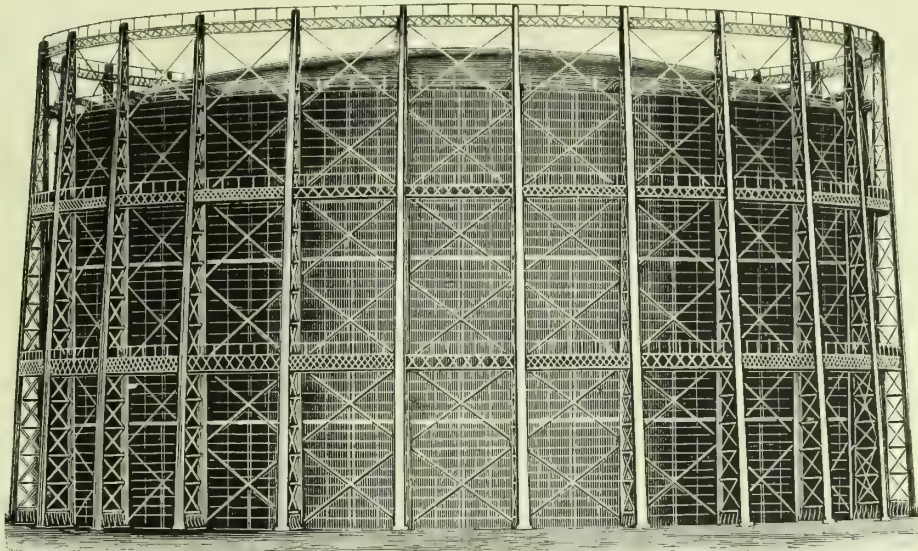
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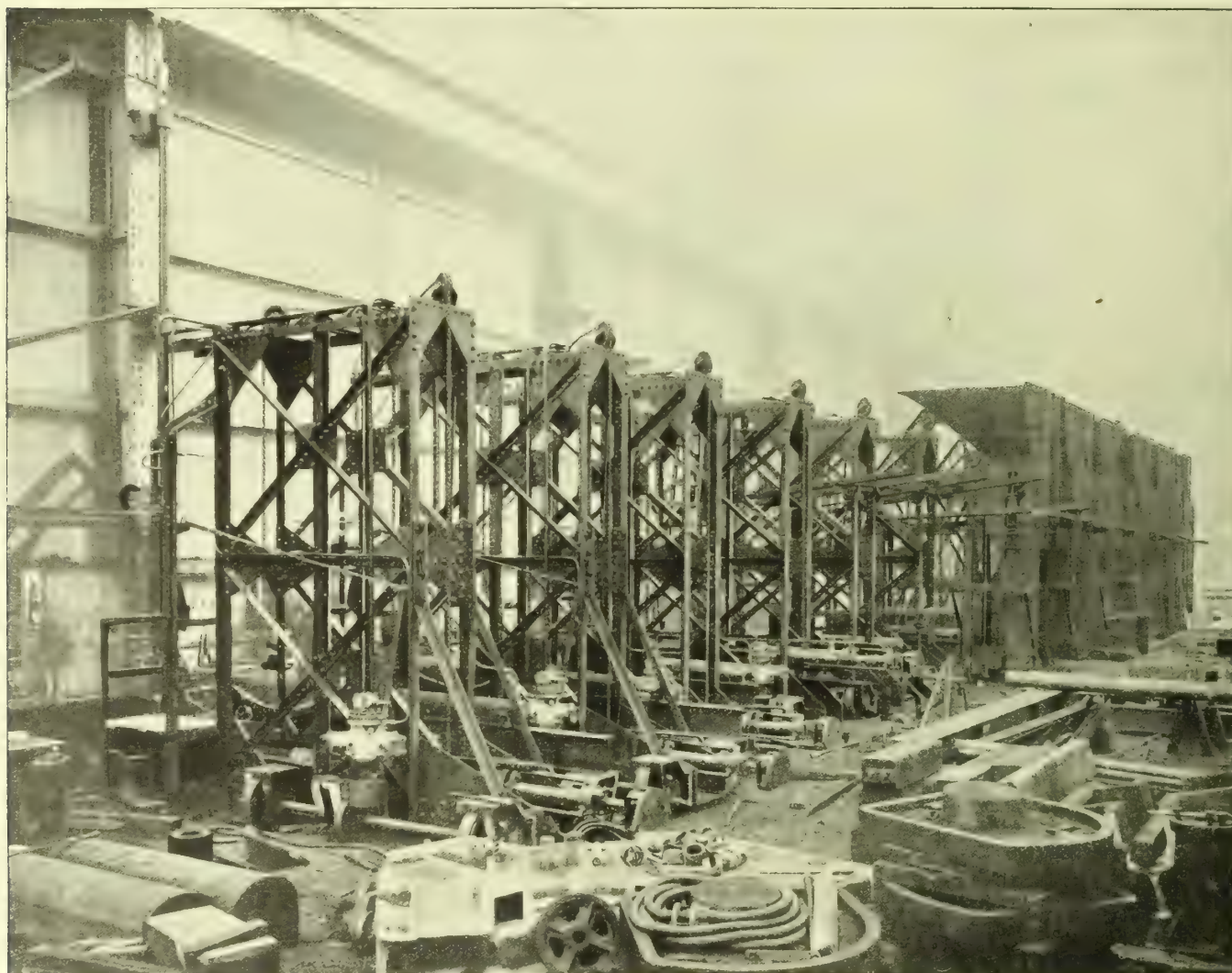


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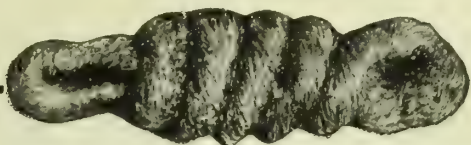


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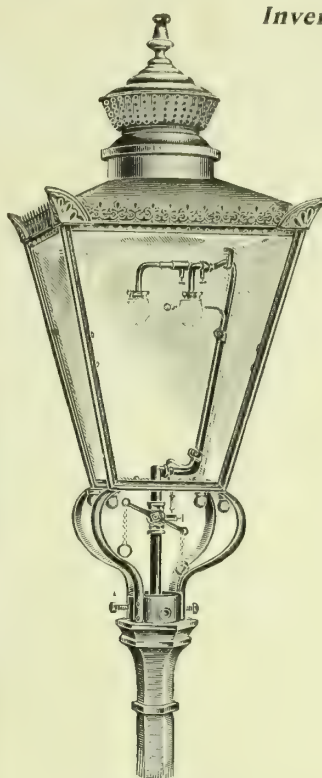
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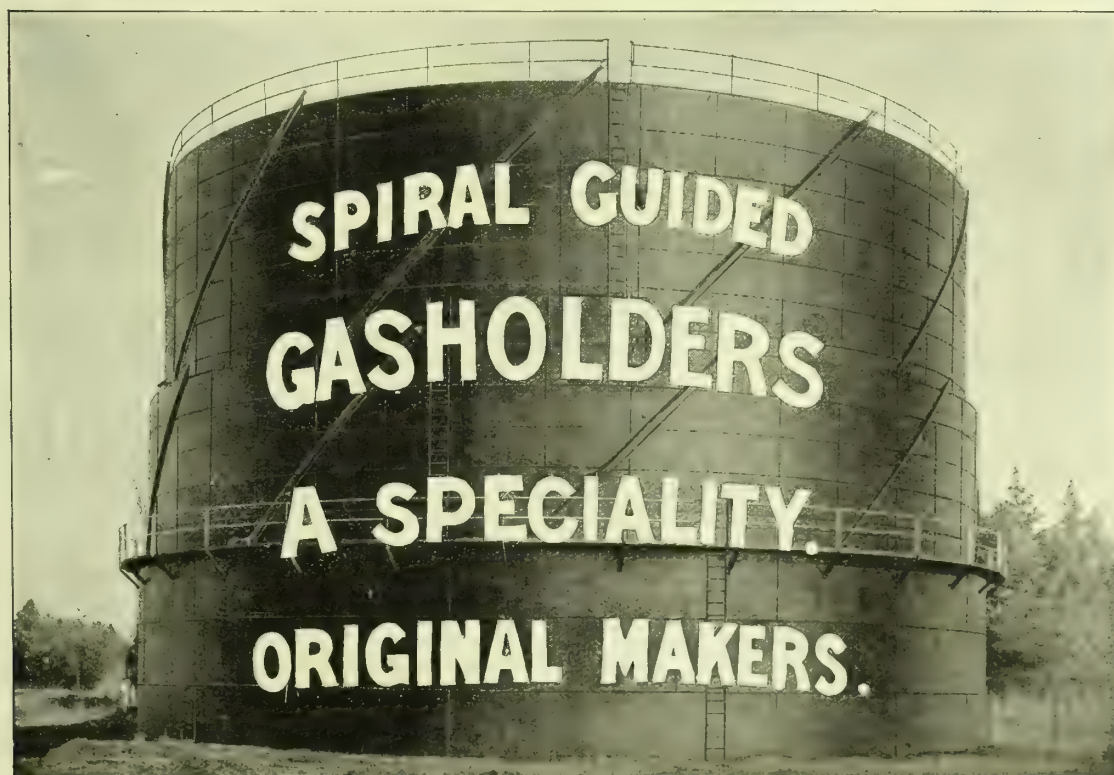
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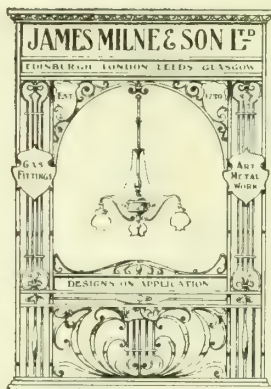
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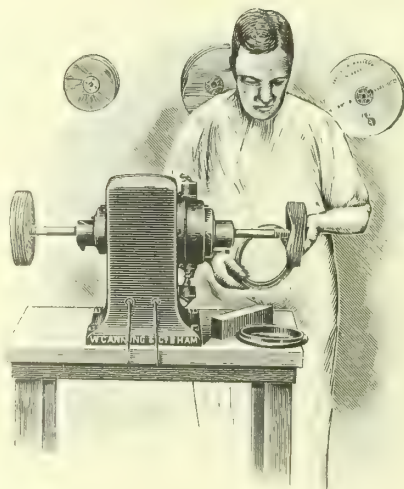
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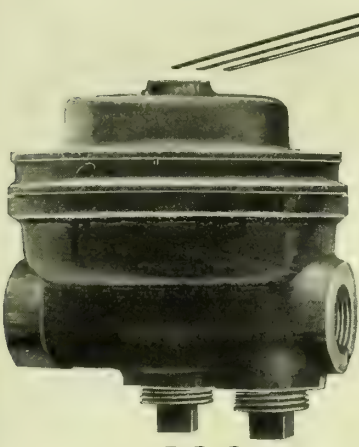
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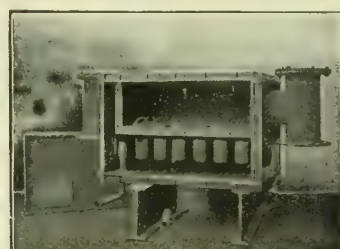
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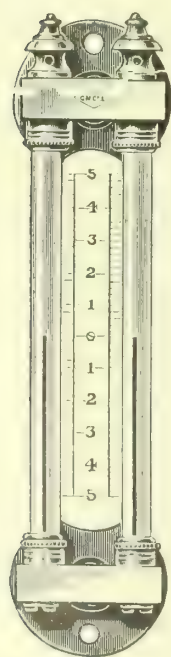
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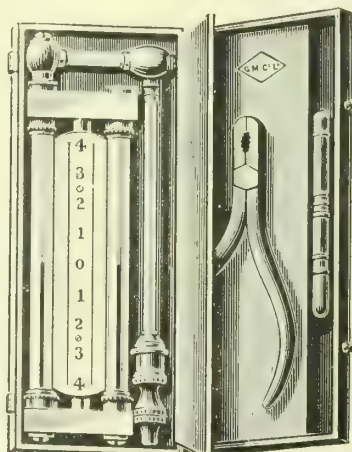
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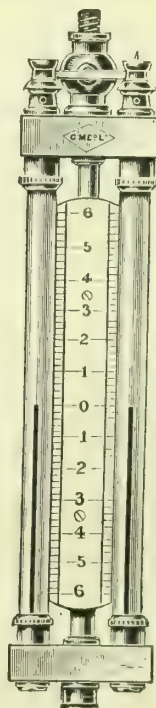


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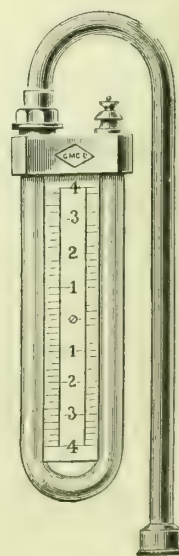
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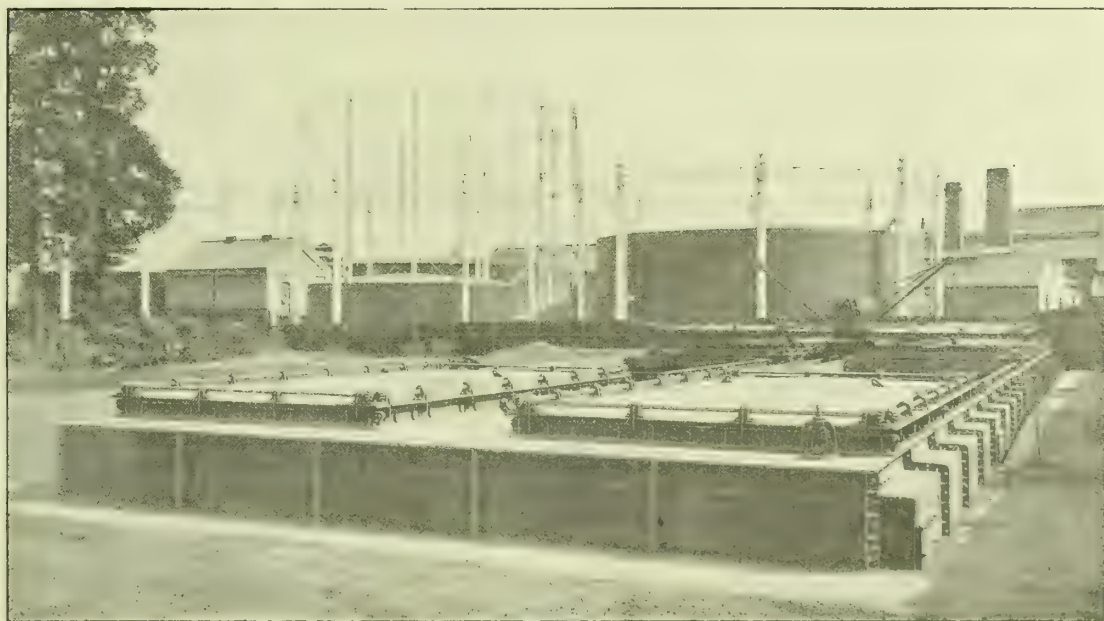
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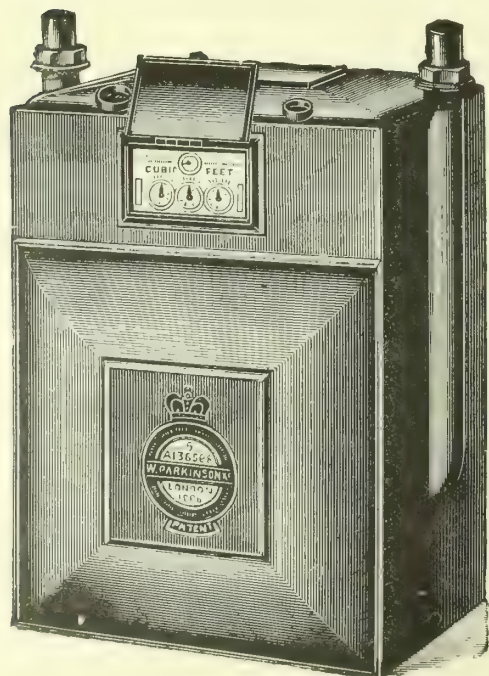
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VOL. CXI., No. 2466.—TUESDAY, AUGUST 16, 1910.

EDITORIAL NOTES—GAS, &c.

The Internal Factors in Prosperity.

THERE are few meetings of gas proprietors and directors that are the equal in their family-like character to those of the South Metropolitan Company. The cause is not easy of explanation; but a fact it is that there does not seem to be the distinction between the Board side of the table and the side on which the rank-and-file of the proprietary sits that is recognized in the case of some other companies. Perhaps it is due to the fostering through long years of that feeling from the master mind of him who preceded Mr. Charles Carpenter in the chair. If so, then the feeling has taken permanent root, and, like co-partnership, is now as strong, and has the same palpable influences, as in past days. Sir George Livesey never tired of insisting that the conditions of the gas industry had been framed by time in such manner that solidity in the future of gas companies would be largely dependent on a just recognition of the rights and the encouragement of the three contributory parties to success. The report and accounts placed before the meeting of the South Metropolitan proprietors on Wednesday by the Chairman, together with his speech, point to the prosecution of the old policy, both in letter and in spirit. The price of gas (2s. 2d.) is 1d. lower now than it was in the corresponding half of 1909; the proprietors and worker co-partners have shared with the gas consumers in the financial fruits of the Company's enhanced position; and yet more has been spent in maintaining and re-establishing portions of the property, and a larger sum has been carried to the undivided profits. Before, however, the Company can make a reduction of 1d. per 1000 cubic feet, the Directors have to see before them an economy of £52,000 a year. This is not a small sum; though we have known electrical competitors—it is one of their many mistakes—scoff at 1d. reductions per 1000 cubic feet of gas as being negligible quantities. The aggregate of a penny reduction can hardly be placed in that category; and reductions to this amount cannot be made unless there are gains in the purchase and sales of material, or unless economies within, or else business expansion, give the power. There is indeed something to be thankful for that we are living in an age when work within the gas industry is so fruitful of economy, and when we can feel that there is not absolute dependence upon outside markets and the benevolence of external factors for advance.

In his address, the Chairman showed this in several ways. Ten years ago, the Company were only selling 9300 cubic feet of gas per ton of coal; and now, 11,500 cubic feet. Carbonizing wages last half year showed a decline of £7000 from the amount in the corresponding period last year. But these things are not secured, where the conditions are unsuitable, without certain changes—in the case of the South Metropolitan Company, necessitating the scrapping of plant and the installation of new types. The most favourable time for scrapping plant of which we know, whether or not the plant is on its last legs, is when its supersession means profit; and a material profit has been found by the South Metropolitan Company. The advantage emanating from the heavier and longer duration charge in the matter of gas volume is also, in their experience, supplemented by the tar obtaining improved value through increased purity. However, indirectly, the Chairman cautioned those who interest themselves in investigating gas accounts in these days not to neglect, in considering any lower revenue from the sale of coke, to make allowance for the smaller quantity of coal carbonized, owing to the larger yields of gas. While on the subject of residuals, he dealt with the extended propaganda work of the Sulphate of Ammonia Committee—a matter to which consideration was directed in last week's issue; and he emphasized the objects of the Committee, and of the organizations abroad with which common action is being taken to disseminate knowledge for the purpose of creating

market expansion. The objects of the work are well defined, and to them, and to them only, is labour directed by the Committee. But there are a few who—some possibly intimately interested in doing so—have endeavoured to hamper the Committee's operations by using the word "Trust." A few terse sentences from the Chairman riddled the libel or the suggestion, as readers chose to term it.

Off main topics, there were several very interesting points. The Chairman mentioned that the Company are working now to a higher degree of gas purity than they have been doing hitherto. The reasons advanced for this held good in the past just as much as they do in the present; and the working to a higher standard now is, in effect, an admission of a little *ci-devant* shortcoming. It must not be overlooked, however, that the Company supply coal gas without any admixture with carburetted water gas. In the article on "The Quality of the London Gas" in the "JOURNAL" for July 19, we showed that there had been a remarkable diminution of sulphur in the Company's gas, and that the fall (which set in about a year ago) had been steady and continuous, until the coal gas contains now, on the average, no more sulphur than the mixed gas of the other two Metropolitan Companies—the maximum returns being also commendably low when compared with those of previous years. The adoption of the higher standard of purity caused an increased expenditure of £4041 last half year; and probably the heavier-charge working has rendered some assistance in attaining the higher standard that has been set up.

It will be seen that all the internal factors over which the Chairman and Directors, or the Chief Engineer (Mr. W. Doig Gibb) or the Station Engineers, staffs, and workers generally have control, are set in the direction for enhancing the prosperity of the concern; and there is still another factor, that is acknowledged as primarily responsible for the success of the undertaking. That is co-partnership. In this connection, there is new testimony. Until Mr. Gibb came to live in the undertaking, he did not realize what a power co-partnership is in causing such an army of workers as the Company possess to pull as one man to a single end. He has had a lesson from intimate contact that all former preaching and teaching had failed to impart; and to-day he acknowledges freely that it is not a sedent condition, but an active, potent actuality in the work and business of the Company from which the system sprung, and the beneficiaries of which are rejoicing this year in the good work having run a course of twenty-one years. To-day it is standing firmer than ever, seeing that the sceptics can no longer argue that the name, fame, and influence of the honoured founder of the system were the bonds to its security. As Mr. Carpenter truly says, it is the substructure on which the Company stands; and the Company itself will therefore have to fall before the principles of co-partnership can be removed from it.

We look on that picture, and then on the one representing the chief outside factor in current repressive influence upon prosperity. That is the Coal Mines (Eight Hours) Act, which has adversely affected the coal contracts—not only of this Company but of most others—for the present year. The Act is one of the progeny of Unionist restlessness. Never do we remember a piece of legislation in connection with which the opponents more correctly predicted the results than in this case; and its parliamentary sponsors would, we believe, be glad enough now if they could disown their part in its production. We well remember that Lord (then Mr.) Gladstone, during the discussion of the measure, admitted that, if there were likely to be any permanent material increase on coal as the result of the legislation, it would be a serious thing for industry. But he refused to heed the warnings of those better qualified than himself to form judgment, and went direct for imposing the "serious" thing upon industry. There is not the least hesitation now in saying that the Act has added to the conditions that combine to keep up the level of coal prices; and, as to the material character of the effect, there is illustration in the

South Metropolitan Company's report in the single sentence in which it says that "the proportion of the increase in 'cost' [apparently from no other cause than the disturbing effect of the Act] "which must come out of the pockets of "the Company's consumers is about £40,000 per annum." Another piece of legislation that will affect the London Gas Companies is the Port of London Bill, through the dues imposed on both their incoming and outgoing materials; and yet the spending of the revenue by the Port Authority will not contribute direct benefit to the Companies. The South Metropolitan and the Commercial Companies appear to have more ground for complaint under this head than the Gaslight and Coke Company, the Governor of which looks hopefully to the increased prosperity of London proceeding from the operations of the Port Authority for yielding some indirect return to the Company. "A bird in the hand, &c." It is a measurable sum that will have to be paid out to the Port Authority; the advantage to the Gas Companies is purely problematical. But, after all is said, it is one of the things that cannot be avoided. There may be ineffectual grumbling, and after—well, the situation has to be philosophically accepted, and the best made of it.

Rivalry in Technical and Commercial Results.

THE Directors, proprietors, and officials of the Commercial Gas Company were, at their meeting last Thursday, well pleased with the condition of their affairs; and congratulation flowed with, if anything, exceptional copiousness. The results of the past half-year's working are such that, with the propitious outlook, the Chairman and Directors at length feel themselves to be in a financial position to quit the 2s. 6d. ordinary price of gas, at which they have been doing business so long, and come down to 2s. 4d. per 1000 cubic feet. A twopenny reduction in price in these days is something to be proud of; the penny step having grown to be accepted almost universally as the normal rate of downward gradation. The Board, seeing the prospects are so fair, technically and commercially (with the exception of coal), have determined to divide among consumers, proprietors, and co-partners, the immediate advantage of working economies and improved financial results. It will mean, in all, a considerable sum for the Company; but there is no shadow of doubt as to ability to meet the whole of the obligations. It has been a good thing for the industrial East-end of London, with its large comparatively poor resident population, that the Gas Company supplying its needs have had their undertaking built up by such strict capital economists as three generations of Chief Engineers of the same patronymic; for it is to this largely that cheap gas has ruled so long in the East of London. And it is on the low capital expenditure (low bearing in mind that it was not many years since that the proprietors relinquished their right to new issues of capital at par) that wonderfully improved carbonizing results have come about which have enabled the Company to make a fresh move in reinforcing stability by trading at a lower ordinary price.

But we can see that the big marked advances of recent times in extra production per ton and reduced charges for carbonizing wages, are going to create a friendly rivalry between works and works in a single company, and between neighbouring companies. The production per ton of coal carbonized in the case of the Commercial Company last half year was 11,946 cubic feet. The Chairman (Mr. W. G. Bradshaw) pointed to the fact that this was the best make return of the three Metropolitan Gas Companies; and Mr. Stanley Jones declares that he and his colleagues, the station managers, are not by any means satisfied that they have reached the limits of the recoverable ground in this respect. It will be of interest to watch the carbonizing results of the three Metropolitan Companies in view of the challenge expressed by the modest claim to superiority, inasmuch as the conditions of the three Companies in regard to coal purchases and so forth have marked similarity. The claim will have a stimulating effect at Horseferry Road and Old Kent Road, though stimulation to well-doing is not required at either place. But it can be imagined there will be an official desire that the Commercial Company—whether or not the claim to superior carbonizing results was made in a spirit of boastfulness or of pride and thankfulness—shall not continue to hold the palm without an attempt to take it from them. But if the Commercial Company can boast of the highest yield of gas per ton in the Metropolitan area, they cannot claim the lead in the percentage of consumers with

stoves connected to their mains—their percentage being only 61, as compared with the South Metropolitan Company's 87. Between these figures, the Commercial Company have a good field for development. But the fact remains that their conditions do not bear so largely the residential character of the South Metropolitan Company's area, that gives superior opportunity for placing the cooking-stove. In the East-end of London, there has to be, for reasons not very far to seek, the exercise of greater discretion in locating stoves than is necessary in many places. Topographical and social circumstances must always in some measure establish and control differences, as between the business of area and area and of undertaking and undertaking.

The Lights of the City.

THERE are various points in the annual report of Mr. Frank Sumner, the City Engineer, on the lighting of the streets of the City of London (*ante*, p. 416) to which it may not be without advantage to direct attention. The City to-day, in the matter of its several forms of public lamps, is an object-lesson of the rapid progress that has been made in immediate past years in the development of both gas and electric lamps (the latest development being on the side of gas in the high-pressure inverted type of lamps), and in the advance of economical service to the public in relation to the efficient illumination of the streets. Just look at the old high-pressure lamps in Queen Victoria Street, of which we were not a great while since boasting as being the acme of perfection in gas lighting. That type of lamp has been left far behind in the race for supremacy by the application of the inverted system, and a form of construction of lamp that has worked marvels in the matter of flame temperature. These Queen Victoria Street pattern lamps consume 20 cubic feet of gas an hour, are of 600-candle power (with gas at 10 inches pressure), and cost £12 per annum; whereas the Fleet Street and New Bridge Street exponents of modern efficiency, only consume 5 cubic feet more gas per hour, give an illuminating power of 1500 candles (with gas at 54 inches pressure), and cost £15 2s. 6d. each, and we should not be surprised to hear of a further reduction not many months hence. The figures quoted are remarkable in the illustration afforded by their contrast. A gain of 900 candles by an additional consumption of 5 cubic feet is a single flight in progress that no one could have anticipated; and on the basis of £12 for 600-candle power lamps using the old Queen Victoria Street type of lamps, a 1500-candle power lamp should cost £30; instead of, as is the fact to-day, £15 2s. 6d. We have only to look with an unjaundiced eye on the illumination from one of the new high-pressure inverted lamps, and on the best the experimental flame arcs are doing in the City, to see that there is for the public much better value in these £15 2s. 6d. high-pressure gas-lamps than in the £17 10s. per annum flame arcs, at which price the Charing Cross Electric Supply Company stipulate they shall have at all events not less than 250 lamps connected to their cables, if eventually the Corporation should determine that their own Committee of Inquiry (who recommended high-pressure gas lighting for the main streets, and low-pressure inverteds for the side streets) were wrong in their conclusions. The difference between the £15 2s. 6d. and £17 10s. is £2 7s. 6d. per lamp; and this, multiplied by the number of lamps that will be in use in the main streets, means a considerable sum. In low-pressure lighting, experiment has also been made in the City with the Carpenter inverted burner "with satisfactory results;" and the results ought to be "satisfactory," seeing that, with a consumption of 4 cubic feet of gas per hour, the illuminating power is placed at 120 candles.

Among the things the City of London is proud of is its ancient history; but in that history there is one feature of antiquity of which citizens are not proud, and that is that the major number of electric arc lamps in use in the streets correctly come under the designation of "ancient lights," for which, in the main, the City of London Company have annually raked into their coffers, and continue so to do, £26 each per annum. That the Company have, "on their own initiative," as told by the "Electrician," converted a few of the ancient lamps to flame arcs—having had a bombshell cast into their midst by the high-pressure gas-lamps—seems to be regarded as an act of grace, inasmuch as the Corporation gain by the move an advantage of a decreased cost of £8 10s. per converted lamp. This gain, let us repeat, is from only a few of the lamps; the Company, "on their own initia-

"tive," still clinging to 366 of the old type, and incidentally to the £26 each per annum. There is another point bearing upon cost and service. There are in all 2720 gas-lamps (high and low pressure) in the City; and only 447 electric arc lamps of various kinds. The gas-lamps were lighted beyond the ordinary on 38 days of the year when there was fog or unusual darkness, while the electric lamps were only so lighted on 18 days. It would be interesting to know why there is this disparity in the days of unusual lighting—just as interesting, in fact, as it is to note (bearing in mind the great difference between the number of gas and electric lamps there are in use) that the extra gas lighting on the 38 days only cost £150 14s. 4d. more, while the extra electric lighting on only 18 days cost £198 os. 5d. more. The general behaviour of the gas-lamps was good, having regard to the number and their use on 365 days. The number of "feeble" lights reported—temporarily feeble, and easily rectified *in situ*—was only 1276, or an average per day of 3·5, with 2720 lamps in use. Surely the electricians cannot sincerely endeavour to make capital out of this. In the case of the 447 electric arcs, there were 52 defective lamps reported (spoken of also as failures), against 20 failures among the 2720 gas-lamps. This, the "Electrician"—by what manner of reasoning we cannot divine—thinks, shows the "electric lamps to considerable advantage." The matter may stand there, as everyone is entitled to his or her views, however unsubstantial their footings. However, we believe it will be conceded that there is more than ordinary interest to be extracted from the various points to which we have here drawn attention.

Technical Questions for Small Works' Managements.

THE members of the Irish Association were received last week in Belfast in manner becoming the trustees of the city gas undertaking. The gas authorities at Belfast have always held out the hand of good fellowship to professional organization connected with the gas industry. Long may the leading gas undertakings of Ireland give to the full the encouragement the professional Associations of the country need, and are thankful for! Technical business at the meeting will not largely appeal to the engineers and managers of gas undertakings of a size ranking above the greater number of the concerns of the Sister Isle; but an Association of the kind best serves the members by for the most part treating of subject, and in a form, pertinent to the needs of the majority. The President (Mr. R. Harrison, of Monaghan) viewed in his address a few of the subjects of the day from the standpoint of the engineer and manager of a works of small capacity. One recognizes to the full the responsibility that the manager of a small works must feel in making his selection of suitable plant when engaged on renewals, when it is remembered how seldom the limited sized plant is worked up to its full capacity, and the length of time the plant will probably have to continue in service. Expenditure has to be carefully studied. But the manager naturally wants the best that he can obtain, suitable to his requirement, for enabling him to give good results; and he does not want to be written down as old-fashioned before the plant is ready for renewal. Such a gas manager envies the colleague whose opportunities are more extensive, and who has the whole choice of gas plant spread before him from which he may select. Is it fancy, or are we right in tracing a little of that venial envy in Mr. Harrison's remarks, when he names the range of carbonizing plant that the engineer of the larger gas-works is able to choose from in renewing or extending his plant? We are not so sure, however, that the vertical retort system will not before long be placed before the manager of almost the smallest works in units, and equipped in form, that will answer his purposes. And why not? A large amount of mechanical auxiliaries would not be required for the small quantities of raw and spent materials that would have to be dealt with. A simple hoisting arrangement for the coal, and nothing more would really be required, unless the continuous system were adopted, and a moderate amount of power be then required for the operation of the coke-extractor. One reason the manager of the smaller works falls into the habit of looking at most new processes as being beyond his sphere, is that, for the most part, their development proceeds from the opposite end of the scale in gas-works' magnitude—going through their experimental, improvement, and probationary periods on such works; and therefore their design and all else are of character consistent with the conditions of those

works. Inventors and contractors, too, have a natural inclination first to the works from which they are likely to get the largest contracts. However, the President shows that, in his new bench of horizontals, he is perfectly up to date even to the tar-tower (but excepting a governor), though the extent of his operations would not justify mechanical means. Having in mind this completeness for a gas-works of such modest dimensions, we fail to see (though proof of superiority would be required) why a suitable vertical retort-setting should not be designed, though some engineers have placed a minimum capacity limit on works in which they consider that vertical retorts can be profitably adopted. It is, however, only surmise. It would, therefore, be a matter of considerable interest to have an attempt and trial in the direction indicated. It may be remembered that the Dronfield Gas-Works are having installed one bed of four 13-feet Dessau vertical retorts.

There was one point in Mr. Harrison's address that raises some regret. Certain evidence recently given in an arbitration case is regarded as reflecting generally upon the official gas managers of Ireland. We are disposed to think this is a great mistake. In Ireland, as in this country, there is gas management and gas management; and there is also a distinction to be drawn between the official manager and the administration he serves. Mr. Harrison knows, and we know, that many a gas manager's best intentions and efforts are completely annulled by an incompetent and discouraging Board or Committee. We feel sure that both the gentlemen against whom the charge is made of disparaging the work of the gas managers of Ireland, will disclaim any construction that is placed on remarks made by them, when under examination, that slights the work and endeavours of those officials who, in Ireland, anxiously and ardently pursue their labours under the adverse circumstances of their special environment.

It was a coincidence that Mr. C. Bryan Donkin should have read a paper on the subject of exhausters for small gas-works in the very city in which his father (of honoured memory) introduced in 1893, to the Gas Institute, the improvement, patented only the year before, that he effected in the Beale exhauster. Mr. Donkin last week fully made out his case as to the adoption of an exhauster being a profitable investment even for the smallest works. Passing from this to the second paper. Though several times of late there has been complaint that insufficient attention is being paid to the question of increasing pressures in the distribution system, it is a matter that is being brought forward with much more frequency now. The complaint was repeated by Mr. W. H. Roberts, of Newtownards, in the paper that he read at the meeting. He regrets that no one has yet made a pronouncement as to what, under present-day conditions, is an efficient pressure to maintain in the distribution plant. Circumstances alter cases; and circumstances are more diverse hour by hour, and day by day, and district against district, than they used to be. Mr. Roberts does not himself know what is the most efficient pressure to maintain; but he is going to ascertain—under his own conditions. He is supplying at 3 inches pressure now, and has made arrangements to supply at 4 inches, and even more—up to 10 or 12 inches, if necessary; and advance is proposed at the rate of an additional inch per annum, so long as he is satisfied that it will be useful to progress farther. Care will have to be taken. Ordinary incandescent burners can stand, properly adjusted, fairly high gas pressures; but the pressures they can advantageously endure so far as illuminating power goes, run up to a point at which it is necessary to individually govern gas-stoves. What is required is the maintenance, as near as practicable, of a pressure that is generally suitable for the varied purposes for which the gas is used. Mr. Roberts questions the necessity for the high pressure employed in Keith inverted gas-lamps. The high pressure is essential in order to drive the gas through the small perforations of the heated metal diaphragm which forms an important part of the lamp. It is known by those who have studied the construction of the lamps, that the mixture of gas and air is highly heated by passing over the surface of the metal diaphragm; and unless there is a high pressure at the back of this gas that is undergoing heating to drive it forward, there would be such expansion and back-pressure that the whole effect of the invention would be destroyed. However, the question of the supply of higher pressures is one of current interest and importance; and a larger statement of experiences would now not only be of interest but instructive.

Westminster's New Lighting.

Public interest has been aroused in the new public lighting by high and low pressure inverted gas-lamps which will soon be extensively seen in the City of Westminster. The daily papers were a few weeks ago taking considerable notice of it; but generally as the tools of disgusted and sore electricians, who sought to show the impossibility of the whole thing, and that the Gaslight and Coke Company were simply befooling the City Council, the public, and even themselves. But the Company listened to and read, with the utmost good nature, all that their traducers had to say, and spent the time in which they were not so occupied in perfecting their plans for carrying out their contract. The "Daily Telegraph" had last Saturday an article telling what the Company are doing, without reviling them for doing it. It is something to be thankful for that one prominent London newspaper can treat this question without electrically-generated bias running through what it has to say. The value of this Westminster contract, as we have before pointed out, lies in the fact that the largest power gas-lights will be found in certain of the most frequented West-end arteries, where traffic to and from places of entertainment, hotels, clubs, and restaurants, is great at the time of artificial lighting. Our morning contemporary names them—Regent Street, Piccadilly, St. James' Street, Pall Mall, Piccadilly Circus, Whitehall, Victoria Street, and Parliament Square, most of which are now lighted by electricity. The highest illuminating power lights will be in Piccadilly Circus; and the other places named will variously have lamps ranging from 1000 to 3000 candle power. The full contract obtained by the Company is to provide light from more than 2500 lamps; and the lowest of the units to be supplied will be equal to 90-candle power at low pressure. The Company are busy putting in Keith compressing plant at their Horseferry Road station, for the high-pressure gas, which will be conveyed by steel mains. All the work is well in hand, and should be completed before the period of long nights. Then the illumination photometers of our electrical friends will be taken from shelves and cupboards, dusted, and brought into play again; and our electrical contemporaries' pages will once more be adorned with wonderful curves, as well as proof that fines are piling up against the Gas Company. There will be a big exhibition of unholy joy. Then the excitement will all die down again, until the Gas Company secure their next big contract in open competition, and give electricity another blow. Then history will repeat itself.

Advanced Lectures in London on Gaseous Fuel.

In another column will be found the syllabus of a special course of advanced lectures on "Gaseous Fuel and Combustion" which will be delivered at the Royal College of Science, South Kensington, in the autumn of the present year and the early months of 1911, by Dr. W. A. Bone, F.R.S., Professor of Applied Chemistry in the University of Leeds, and the holder of the Livesey Chair in that institution. There will be two series, each consisting of about ten lectures; and they will be delivered on Fridays at three o'clock, and last for one hour. It will be seen that the syllabus covers the two subjects from the time of Sir Humphry Davy down to the manufacture and application of "blue" water gas; and it is unnecessary to lay stress upon the ability of the lecturer to deal adequately with them. The delivery of these lectures in London will afford students in the South an excellent opportunity of enlarging their knowledge; and it is to be hoped that a goodly number will make an effort to avail themselves of it. The fee for the course is fixed at £2.

The Cost of the Eight Hours Act,

The disturbing effect on the relations between employers and employed of the legislation for limiting the working hours of coalminers has been often enough before the public eye; and now proofs of the unwisdom in other respects of the passing of the Eight Hours Act are beginning to accumulate. Some few days ago, there appeared in the "Financial Times," from the pen of a Sheffield correspondent, a series of calculations showing the effect of the measure on the three classes primarily concerned—owners, consumers, and miners. To take the consumer first, it is shown that the prices of four typical classes of coal for the first half of this year exhibit an average increase of nearly 1s. 6d. per ton; and facts are adduced in opposition to any argument that these higher prices are due to greater demand, and not to heavier cost

of production. Granting, then, that the Act has added to the cost of production, the next thing to consider is how this increased cost is being met. Careful analysis, says the writer, reveals the fact that a small proportion of the extra cost is coming out of the miners, a considerable proportion out of the coalowners, a little out of foreign consumers of British coal, but by far the greatest part out of home consumers. This year's figures, it is pointed out, give an average increase of only 6d. per ton on exported coal, while the home consumer has had to pay from 1s. to 2s. per ton more than last year. But if the increase to the latter is put only at an average of 1s. per ton, and the foreign consumer is left out of the reckoning, it is found that the Act means an additional charge upon the British coal consumer of something like £10,000,000 a year. Even this enhanced price, it seems, is by no means sufficient to cover the whole of the increased cost of production, for the majority of the colliery companies do not now make anything near such substantial profits as was the case before the passing of the Act. That is to say, the accounts for last year, half of which, of course, was covered by the Eight Hours Act, show a big falling-off in profits; the aggregate decrease in the case of ten large companies being no less than 53 per cent. Thus, remarks the writer, it is abundantly evident that the universal assumption that the Act would mean a substantial tax on both the coal consumer and the coalowner has been justified. Lastly, there is the coalminer himself—that individual who was assumed to be so helpless and so unable to protect his own interests, as to be in need of this special legislation. Well, it appears that, though in some cases he has secured a reduction in his hours of labour, there are many drawbacks to set against this advantage—such as inconvenient shifts, and occasional loss of the Saturday holiday—and in some parts of the country the miners' earnings have been considerably reduced. In one of the Glamorgan County Courts, where many compensation cases are tried, the average wages of the batch of claimants this year, it is said, worked out at only 27s. per week, whereas last year, before the new Act, the average was 35s. Who, then, it may be asked, is the better for the passing of the measure which has caused these substantial losses?

And the Organization of the Miners.

Perhaps the most serious of all the results of the Eight Hours Act is the feeling of unrest that has existed, particularly in the South Wales coalfields, ever since it came into operation. Masters and men have been continually at loggerheads; and even now it is quite impossible to say how far the differences that have cropped up have really been settled, or how long a time may elapse ere fresh disagreements arise. For the moment, however, interest is centred on the restiveness shown by the South Wales miners under the policy of the Executive of their own Federation. This dissatisfaction found vent a few days ago in a manner to cause no little surprise, and may easily prove the fore-runner of big events. A number of men having been thrown out of employment in the Maesteg district—under what particular circumstances is a point of no importance here—the Federation Executive declined them financial assistance; and at a subsequent mass meeting of the men, a resolution was unanimously passed deciding to pay an allowance to the unemployed men out of the district funds, and not to pay any further contributions to the Central Federation Fund till a conference had been called to consider the policy and reform of the Federation. In the Merthyr district, also, there is considerable dissatisfaction with regard to the Executive Council; it being felt that the time has arrived when a complete change should be made in the Council. Many men there, it is said, believe that the Executive should be composed of men working in, or at, the collieries, as it is thought that the majority of the present leaders are completely out of touch with the workmen by reason of their not having worked about a colliery for many years. Here there would appear to be all the ingredients for the making of a very awkward situation. Any steps by their own members which resulted in serious weakening of the authority of the Federation would probably be fraught with far-reaching consequences—to employers, as well as to the men and their organization. An even more important question from the Labour Leaders' point of view—though one that does not perhaps so closely concern the masters—was also under consideration by the Miners' Federation of Great Britain, who last week held a conference to discuss the situation created with reference to the injunction granted against the levy of a shilling

a year for parliamentary representation. This, of course, was in connection with the famous Osborne case. Some of the delegates displayed keen anxiety to defy the law as laid down in this action; but calmer counsels prevailed, and a protest was entered "against the recent decisions of the Law Courts, to the effect that Trade Union funds cannot be used for political purposes, as being most unfair, undemocratic, and opposed to government by majorities." The view was expressed that a conference should be convened as soon as possible of all organizations concerned, so that the whole position may be considered with a view to such general action being taken as will result in an amendment of the law. That the leaders should desire to have the benefit of a compulsory levy to the parliamentary fund, is no more than natural; and they will get it if they can. In connection with labour organizations financial questions are usually all-important; and the Miners' Federations are evidently no exception to the rule.

Lighting the Exhibition Rooms of the United Gas Improvement Company, at Philadelphia.

The "Illuminating Engineer" (New York) for the current month says: The value of a complete exhibition room of lighting and other appliances placed in a prominent position in the business section of the city has been recognized to a large extent by the electrical interests—Philadelphia being no exception. That a similar display of gas appliances is equally valuable in attracting attention, and educating the public to their use, would seem to be a foregone conclusion. Probably the most conspicuous display rooms of this kind up to the present time are those recently opened in Philadelphia by the United Gas Improvement Company. These display rooms occupy the basement and first two floors of the building located at the corner of Eleventh and Market Streets; the upper floors being devoted to offices and other purposes of the Company. The building is naturally made an object lesson in modern gas illumination. A model gas-lighted living room and dining room are shown as special features. A modern gas kitchen, of course, is one of the chief attractions. The entire display has been admirably arranged, and is well worth a visit simply as an exhibition. That it is financially profitable is proved by the surprisingly large volume of business which is transacted daily in the various departments.

The Meeting of the British Association.

As customary, a forecast of the proceedings at the meeting of the British Association in Sheffield on the 31st inst. and following days has been given in "The Times." The next will be the eightieth meeting of the Association; and on only one previous occasion—in 1879—has the gathering taken place in the above-named town. The President this year is Canon T. G. Bonny, F.R.S., who will deliver his address in the Victoria Hall, where the evening discourses will take place. In regard to the work of the sections, at a joint meeting of those devoted to Engineering and Chemistry the report of the Committee on Gaseous Explosions, presented at last year's meeting, and given in the "JOURNAL" shortly afterwards, will be discussed; and a number of papers dealing with combustion will be presented for consideration. In the Chemistry Section, Professor H. E. Armstrong hopes to contribute a paper on "The Provident Use of Coal," in which he will raise the important question of using this mineral in such a way that the valuable constituents—gas, coke, volatile substances, and pitch—are, as far as possible, taken out of it. A report on "Combustion" will be presented by Professor Bone, F.R.S., who will describe and demonstrate a new method of heating by gaseous combustion, and its industrial application. The report and demonstration will be specially interesting in connection with the joint meeting of the Chemistry and Engineering Sections, the Presidents of which are Mr. J. E. Stead, F.R.S., and Professor W. E. Dalby, Dean of the City and Guilds of London Technical College. As usual, there will be visits to places of interest.

Errors of Labour Unions.—Writing on this subject in the current number of "Cassier's Magazine," Mr. H. F. J. Porter says: The industrial betterment theories of the Labour Unions are in the main praiseworthy, and the results which they have permanently attained are undoubtedly meritorious. What they have secured, however, is far less than they have demanded and could have attained with a moiety of the effort expended. Their aggressive methods are as objectionable as the tyrannical methods of some employers; and a working organization which is subjected to the disturbing influence of both is in a sad plight, and in no position to render efficient service. Fear is still the medium used by many to compel subservience, as it was in the dark ages; whereas in these enlightened days it is known that only by the absence of fear and its replacement by confidence, can satisfactory results be obtained. If Unions would adopt educational propaganda in order to induce employers to accept democratic ideas, instead of endeavouring to enforce their ideas by militant methods, they would accomplish their ends more rapidly and more effectively than they are now doing.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 482.)

THE Stock Exchange last week seemed every day to be getting quieter and quieter. And there was not much movement in prices, except when some speculative line gave a violent heave one way—soon to be supplemented by a lurch of equal force the other. It was account week, a matter not looked forward to with apprehension; but the next account will be a long nineteen-day one. On the opening day, things moved irregularly; but dulness was the prevailing characteristic, as realizing was not yet at an end. Government issues were flat; Consols falling $\frac{1}{4}$ and touching $80\frac{1}{8}$. Rails, too, were dispirited by much anxiety in regard to labour troubles. Sellers predominated in the Foreign Market; but Americans were fairly steady. Tuesday was even quieter, with little change in most departments. But Americans were sharply pushed up and down; the last impetus being upward. Consols were weak; but the quotation did not fall. Rails were shy, and Foreign ill at ease. On Wednesday, the settlement began, and was calmly confronted; the tone being favourable. Several markets were slightly firmer, and Americans improved considerably. Thursday was quite slack; but where there was any tide at all, it made for flowing. Gilt-edged were rather better; and some speculative lines were strong. On Friday, with the conclusion of the settlement, many members quitted, and the week seemed as good as over. But most lines were fairly firm. Saturday was very quiet, but still with a favourable tendency generally. Consols, however, touched $80\frac{1}{8}$, and fell $\frac{1}{4}$. In the Money Market, there was an abundant supply to meet all demands. Discount closed steady. Business in the Gas Market was on a fair scale, and showed plenty of strength. In Gaslight and Coke issues, the ordinary was firm at from $106\frac{1}{2}$ to $107\frac{1}{2}$ *cum div.*, and from $104\frac{1}{2}$ to 105 *ex div.* In the secured issues, the maximum changed hands at 89, the preference at $105\frac{1}{2}$ and $105\frac{3}{4}$, and the debenture at $80\frac{3}{4}$ free and $81\frac{1}{4}$. South Metropolitan was quiet at $122\frac{1}{2}$ and $123\frac{1}{2}$ *cum div.*, and 120 *ex div.* The debenture marked $80\frac{3}{4}$. Nothing was done in Commercials except one bargain in the debenture at 80. Among the Suburban and Provincial group, Bournemouth "B" marked $16\frac{5}{8}$, and Wands-worth 140. Alliance and Dublin was not dealt in; but the quotation, after being sharply lowered 6, was promptly reinstated with half-a-point to the good. These mysteries suggest investigation. In the Continental companies, Imperial was weaker, with transactions between $177\frac{1}{2}$ and $178\frac{1}{2}$ —a fall of 2. The debenture marked 95 *cum div.*, European fully-paid from $23\frac{1}{2}$ to 24, ditto part-paid $17\frac{1}{8}$, Union $90\frac{1}{4}$, and Malta $4\frac{3}{4}$. Among the undertakings of the remoter world, Bombay changed hands at $6\frac{3}{4}$, Cape Town debenture at 89 and $89\frac{1}{2}$, Monte Video at $12\frac{1}{8}$ and $12\frac{3}{4}$, Melbourne 5 per cent. at 101, Oriental at 140, Primitiva at from $7\frac{1}{4}$ to $7\frac{3}{4}$, ditto preference at from $5\frac{1}{8}$ to $5\frac{1}{4}$, ditto debenture at $98\frac{1}{4}$, and River Plate at $98\frac{3}{4}$.

PERSONAL.

Mr. ALEXANDER DONALD, who was for some years in the service of the Saltcoats Gas Company, having received his training under Mr. J. Napier Myers, the Company's Engineer and Manager, has been appointed Manager of the Millport Gas-Works.

The name of Alderman PHILLIPS, the Chairman of the Gas Committee of the Salford Corporation, is mentioned in connection with the mayoralty of the borough for the ensuing municipal year. The post carries with it a salary of £500. Mr. Phillips, who has rendered excellent service to the town during his long tenure of the chairmanship of the Gas Committee, was elected to the Council as long ago as 1885, and thirteen years later became an alderman.

In the "JOURNAL" for the 21st of June last, it was mentioned that the Leamington Corporation had decided to confer upon Alderman SIDNEY FLAVEL, J.P., the freedom of the borough, in recognition of his 35 years' connection with its public services, including the holding for six times of the office of Mayor. The ceremony was performed on Monday last week in the presence of a numerous and distinguished company. Alderman Flavel, as readers may remember, has been associated practically all his life with the business now carried on under the title of the Flavel Range and Gas-Stove Company, Limited.

Mr. W. Galbraith, the Gas Manager of the Ardrossan Corporation, being about to leave, the position became vacant, and applications for it were invited. There were 25 responses; and from this number three of the applicants were selected for interview. Last Tuesday, the Town Council unanimously selected Mr. JAMES D. KEILLOR, the Engineer and Manager of the Lochgelly Gas Company, Limited. Mr. Keillor, who is a son of Mr. George Keillor, formerly Manager of the Nairn Gas-Works, was educated in the Nairn Academy, and afterwards at the Heriot-Watt College, Edinburgh. He was for three years at the gas-fitting trade, and then spent four years at the Nairn Gas-Works. For one year subsequently he was Assistant-Manager of the Musselburgh Gas-Works, and then commenced a seven years' connection with Fife. Going to Kirkcaldy, he was for three years Assistant-Manager of the gas-works there, and for the past

four years has held his appointment at Lochgelly. During the time the gas-works have been under his care, they have been remodelled and enlarged, with very satisfactory results. The make of gas has been very considerably increased. It is interesting to note that Mr. Keillor was the first in Scotland to introduce high-pressure distribution—at Lochgelly, where the plant has been in daily use for the past two-and-a-half years. He described it in a paper he read before the North British Association in 1908. Mr. Keillor has two brothers engaged as gas engineers—one at Broughty Ferry, and the other at Hamilton (Ont.), Canada.

OBITUARY.

Much regret was expressed on the Newcastle Exchange last Thursday evening at the news of the death, at Ravensworth, Durham, of Mr. MARK ARCHER, the Managing-Director of the Holmside Collieries, which are well known as one of the principal sources of gas coal in the country. Although Mr. Archer had not been seen on the market for some years, his influence in the Durham coal trade was immense. He was a most conscientious man, and was regarded as one who filled his important position with the utmost integrity. He was highly respected by all who knew him.

We regret to record the death, on the 7th inst., at his residence at Swadlincote, after an illness extending over about eighteen months, of Mr. GEORGE BOLEYN SMEDLEY, formerly Manager of the Gas Department of the Swadlincote Urban District Council. Deceased was the son of the late Mr. Geo. Smedley, of Buxton, and was born at Sleaford, in the Grammar School of which town he received his education. He was articled to Messrs. Mabon and Co., ironfounders and gas engineers, of Manchester; and afterwards went to Buxton as assistant to his father during the time the new works were being erected. He next removed to Birstall (Yorks), to take the position of Manager and Chief Engineer—a post which he relinquished on securing a similar appointment at Gravesend, where he remained for nine years. After accepting an engagement for three years at Rosario, he suffered so severely from the climate that he had to return to England at the end of twelve months. After this he spent three years at Buxton, and left the town the second time to take the management of the gas-works at New Mills. When, some eight years ago, on the advice of the late Mr. Alfred Colson, the Urban District Council of Swadlincote advertised for a Manager, Mr. Smedley was the successful candidate. The works were at that time in anything but a satisfactory condition; one of the chief causes of trouble being the enormous leakage inevitable in a mining district. Mr. Smedley immediately turned his attention to this matter, and his efforts were attended by a fair measure of success. He also succeeded in a short time in increasing the make of gas per ton of coal carbonized. Despite the painful nature of his illness, he was able to supervise the works until within a short time of his death; and though the District Council last June decided to advertise for a Working Manager, they resolved to retain Mr. Smedley as Consulting Engineer. He was a Freemason, and one of the founders of the Northern Star Lodge; and had his health permitted, he would have been invested as S.W. last March. The funeral took place at Swadlincote on Thursday, when W. Bro. John Mackay, the W.M., and W. Bro. R. G. Shadbolt, the Secretary of the Lodge, were present. It was also attended by the local Freemasons, the Carnarvon Lodge, of which the deceased was a Deacon, many members of the Urban District Council, some of the leading inhabitants, and workmen from the gas-works. Mr. Smedley leaves a widow and family of eight children—four sons and four daughters—for whom much sympathy is felt by the large circle of friends he made during his residence in the district.

A Collapsible Mantle—The "Sirrah."

We have before us a sample of the new "Sirrah" mantle, which has commendable features, and which Messrs. J. W. May and Co., of No. 34, Cock Lane, E.C., are now offering, with good grounds for believing that it will secure an excellent amount of patronage, for vertical, inverted, and high-power gas-burners. It is not a patented mantle; but is prepared by, we are informed, a "secret process." It is shaped and collodionized; but, notwithstanding, it is so pliable that one can fold, twist, or drop it, and commit all manner of violence, without cracking or injuring it in the slightest degree. After maltreatment, it can be restored to its natural shape without showing any signs of the deformation to which it has been subjected. This is its great characteristic; and it is a valuable one. There is no chance of fracture, unless with deliberate intention, during transmit from maker to user, during carriage by maintenance men, or while in store; so that all danger of mantle waste is avoided prior to actual seating on burners, and engaged in useful work. We like the fine, close stitch of the knitted fabric, which, though the mantles are of normal size, gives a large surface for the incandescing flame to play upon—more so than an ordinary openwork mantle. There is advantage in constructing a mantle so as to give the gas-flame as much incandescing work to do as is practicable.

The late Mr. Benjamin Fowler, the Chairman of the Scarborough Gas Company, and a former Mayor of the borough, left estate valued at £13,622 gross, of which £11,094 is net personalty.

ELECTRICITY SUPPLY MEMORANDA.

Ignorance and Public Education—Street Lighting Units Cheaper to Generate than Private Lighting Units—Public Lighting Illustration—Gas Prices and Electrical Competition—Profit-Sharing by Officials—Fragility of Metallic Filaments—Electric Wires and Drapery Fires—Great Destruction at the Brussels Exhibition.

WE do not like doing it; but the temptation is strong, to get amusement at the expense of ignorance. The "Hastings Observer" sets out to instruct the people of that holiday resort, at this season of the year above all seasons, as to why the electricity used by the public lamps is less costly than any other electricity generated at the municipal central station; whereas—as we have before pointed out, but the "Observer" takes no heed—the public lamp consumption forms the peak of the lighting load, and that peak costs more to generate, but is charged for at a less rate, than the private lighting load. The old haze produced by the platitudes of electricians defending the position in the eyes of the non-technical public surrounds and runs through all the "Observer's" educational effort. According to this, the Hastings works as they stand "are capable of supplying many more consumers (we believe they can supply 100 per cent. more) without alteration or addition to the plant or works, and that therefore every additional unit sold is a profitable thing for the owners." The argument is that because the electricity station has spare plant, the only additional cost for electricity for public lighting would be for fuel, which, in the case of the public lamps (why "public lamps?"), does not amount to 3d. per unit. It is kind and considerate of the electricity plant to generate current for the public lamps at below the average cost of fuel. That there is this favourable discrimination, our Hastings contemporary asserts, is plain to anyone who has had practical experience of machinery. As a matter of fact, it is not plain.

Let us look into the matter. The average total working cost per unit at Hastings (excluding capital charges) is 2'7d.; and we should like our contemporary to tell us why the private lighting units should bear all, and the public lighting units none (save 3d. for fuel), of the costs comprised in this 2'7d. The amount includes 1'05d. for fuel; what is there special about a public lighting unit that it should pay less than the average for fuel? It is very condescending on the part of the public lighting unit to allow itself to be produced at a less fuel cost, instead of throwing its lot in with the others. Then, if we accept the authority of our Hastings contemporary, the public lighting unit claims nothing of the item of 0'09d. for oil, waste, water, and stores; and, of course, the public lighting unit would not think of robbing the other units of any part of the average of 0'3d. per unit for wages of workmen, and it would certainly disdain to add to it? Then, there is the item of repairs and maintenance of machinery 0'53d. Of course, the public lighting unit is quite different from all other units; and the extra work it puts upon the machinery does not, by some occult power, produce anything in the nature of wear and tear (to which electrical machinery is so susceptible in the case of the private lighting units), and so it asks for nothing for repairs and maintenance. It does the machinery good in fact to generate public lighting units. Then the public lighting unit should not undergo the indignity of sharing anything in the nature of rent, rates, and taxes; the private lighting unit can bear all the 0'13d. The same with management, salaries, office and insurance expenses, &c., 0'61d.; and likewise with all capital charges. If it is an excellent thing to sell electricity at the price at which that for public metallic filament lamps is being charged at Hastings—a figure not covering the average works' costs, and omitting altogether the capital charges—in order to give the spare machinery work, then Mr. Editor of the "Observer," it follows (to be logical) that it would be a good thing to get full employment for that machinery from private consumers at the time of lighting load at the same price per unit as for the public metallic filaments, seeing that practically the "only additional charge would be for fuel," which would "not amount to 3d. per unit." Then perhaps this same fount of electrical intelligence will tell us who is going to replace the portion of the machinery worn out in generating current for the public lamps. "That will be done by loan." Indeed! Then who is going to pay the capital charges on the replacement loan? And, Mr. Editor, which is responsible to the largest extent for the deficits on the electricity undertaking—the private lighting units or the units sold at a much cheaper rate? We suggested quite recently that the rôle of puppet to the electricity undertaking is not a dignified one, inasmuch as it leads to the authorship of such crass nonsense on this subject as we see constantly in the "Hastings Observer." We want to be fair with our *confrère*; but really there are electrical engineers (perhaps not in Hastings, but elsewhere) who would tell our journalistic friend that, when dealing with the questions of electricity supply and public lighting, he should keep in the foreground of his mind the words of Burns:

O wad some power the giftie gie us,
To see ourselfs as others see us!
It wad frae monie a blunder free us,
And foolish notion.

The same defender of the wholesale change of the public lamps of Hastings from gas to electricity, quotes certain other places where trials of metallic filament lamps are proceeding (and one

place where a complete change in the lamps of a borough is being effected), to show that Hastings is right in its own proceeding. The one place is Hampstead; and we have a suspicion that it is the borough referred to by the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) at the meeting the other day when he said: "I have to report, with regret, that the Corporation of one of the northern boroughs have decided, in the interest of their own Electrical Department, to substitute electricity for gas. The tender of this Company would have given to that borough an amount of light 70 per cent. in excess of the light it will enjoy, when the change is made, and at no more cost." Will the Editor of the "Observer" care to dispute the Governor of the Gaslight Company, who not only occupies the position named, but one of great eminence in the engineering and lighting world. Then, again, it is stated that at Woking (!) the Council have authorized extensions of the metallic filament street lighting. "Experiments," too, it is mentioned are being conducted at Stockport; and at Greystones (!) negotiations are at present in progress with the view to having the roads lighted by electricity. But above all, the full weight of a little experiment with Osram lamps at Glasgow is brought to bear by quoting a paragraph that appeared recently in our electrical contemporaries, the origin of which paragraph was undoubtedly the makers of the Osram lamp. Naturally the Glasgow Electrical Department must occasionally have a bone thrown to it by the Corporation to keep things quiet; seeing that, according to the latest returns, the gas undertaking had 28,716 public lamps connected to its mains, while the electricity undertaking had only 837 arc lamps connected to its cables, and then no incandescent electric lamps of any description. Now let the "Observer" show its desire to be impartial, and supply its readers with particulars of the Westminster, Finsbury, Bethnal Green, and Hackney gas contracts. The gas supply in all these places is in the hands of a Gas Company; variously the electricity supply is in the hands of companies and the local authorities. If the "Hastings Observer" has not the information at hand, Mr. C. E. Botley will be pleased to let him consult the files of the "JOURNAL;" and if the Editor is not acquainted with Mr. Botley's address (though he apparently is with the Electrical Engineer's), we shall be pleased to oblige him with it. For it is a pity that so much *ex parte* statement should appear in the columns of our local contemporary, through apparent ignorance of what is going on elsewhere than in the places quoted by it.

Last week reference was made to the degenerate finance of the Bristol electric undertaking. In a letter that has appeared in the "Bristol Times and Mirror," readers are bid to be of good cheer, for things are not altogether what they seem. Really big financial advantages have accrued to the citizens from the establishment of the electricity undertaking through the reductions made in the price of gas since the supply of electricity commenced in 1893! It is an old claim to place to the credit of an electricity undertaking when ratepayers are bemoaning the deficits that have to be lifted from their pockets. But the writer of the letter overlooks the conditions under which the Bristol Gas Company carry on their business. It is a maximum price Company. The maximum price allowed by Parliament is 4s. 6d.; and the maximum dividend permitted is 5 per cent. Now this wicked, grasping Gas Company who required the stimulus of an electric supply undertaking to compel it to reduce its price, was supplying general consumers at 1s. 8d. below its maximum price before the electricity undertaking started, and large consumers and the public lighting at 1s. 10d. below. The Company were paying their full statutory dividend. They could not pay more; and, with prosperity, they were obliged to reduce the price of gas, as they have been doing, step by step, till it ranks at 2s. and 1s. 6d., subject to certain conditions. The Company have served the city well. But though the Company have been so prosperous, the writer of the letter insinuates that electricity has had a good deal to do with the reduction of gas prices. He says he does not think that anyone would venture to say that the price would have gone down, in the fifteen years, to the extent it has done but for the existence of the electrical undertaking. How, under their conditions, would the Gas Company have disposed of their surplus profits if they had not reduced the price in these years of prosperity? And what would they have done with the additional profits that would have been received had there been no electricity undertaking to share the lighting and the industrial business with them? The citizens of Bristol may sigh in vain now for what might have been; but they ought to give the Gas Company credit for doing the best they can for them, while the municipal electricity undertaking is doing—what? But there the claim is a useful red-herring for the electrical people with undertakings showing debit balances after meeting financial responsibilities.

The activities of Mr. A. Hugh Seabrook, while at West Ham and since he has been at Marylebone, know no bounds. He came out as the author of the telephone system of charging for electricity—the originality consisting in the name only. Looking at his past work, it may with confidence be surmised that he is the originator of the scheme in connection with the Marylebone Electricity Department, whereby the officers are to share more liberally than they have hitherto done in the fruits of their work. Mr. Seabrook and his official associates are not minded that they shall be neglected or underpaid for what they do; and we fancy that somewhere on the walls of that enthusiastic gentleman's office is to be found posted just now, "The Labourer is Worthy of his Hire." It is a sort of profit-sharing scheme that has been framed, and has been successfully piloted through the Council.

Mr. Seabrook's salary on July 1 this year was £850, and it is to rise, by £50 per annum, to £1000—plus 2 per cent. on profits up to £10,000, and 3 per cent. on profits beyond. The other officers—the Secretary and Accountant, the Station Superintendent, the Mains Superintendent, and our old friend and admirer (Mr. Holmes), the Sales Manager—are to receive increases of salary up to £500, plus 1 per cent. on profits up to £10,000 and 1½ per cent. on profits beyond. Gas managers should note the scheme.

Confession by the "Electrical Review" assures us that though the many improvements in the manufacture of metal-filament lamps that have been brought about during the past two years have resulted in increased life and efficiency under normal conditions, the fragility of the filaments employed is still a very serious matter. Were it not for the fact that the lamps are unable to withstand rough usage, they would, says our contemporary, be adopted to a much greater extent in mills and factories than they are at present. In such situations not only are the lamps subject to excessive vibration, but as the ceiling from which they are suspended is usually a floor also, the moving or dropping of heavy weights causes jars or shocks that are destructive to the filaments in spite of the flexibility of the suspension. Various attempts have been made to overcome this drawback by a spring suspension of the filament; but success has not been very striking. But let us rejoice. The transmission of outside vibrations to the filament is prevented to a large extent, if not altogether, by a Continental method of manufacture. The foot of the lamp carries a rod arranged axially, which is surrounded concentrically by a cylindrical part, which forms the filament-holding device. The connection between this latter and the centre rod is formed by springs so arranged that "all vibration" along the rod is taken up before the filament supports are reached. There appears (it is said) to be some hesitation among British makers of metallic filament lamps as to introducing any anti-vibratory device into the construction of their lamps; but "there is little doubt that, if some satisfactory means of taking up vibration could be introduced, it would go far towards still further increasing the popularity of the metallic filament lamp."

Fire-engines were dashing hither and thither through the streets of South London on Thursday evening; and streams of people were flowing from all quarters towards the Brixton Road. On arriving there, one found a tremendous crowd of people gathered to watch the burning of the ground floor of the premises of Mr. Wallace Hughes, draper. The fire, inquiry subsequently showed, had started in one of the shop windows, which was not lighted by gas, in which matches were not used, and in which the young lady assistants were not in the habit of smoking cigarettes, and dropping the ends among the goods. The fire spread with remarkable vigour—the electric wires probably forming excellent transmitters of igniting flame; and so serious was the condition of things that the Fire Brigade authorities thought it wise to make a district call. The Brigade officials wanted no repetition of the Clapham and Accrington horrors; and they saw that everybody was out of the burning building. Though the fire, by the promptitude of the brigade, was confined to the bottom part of the premises, much loss has been occasioned by the destruction of the valuable stock, damage to premises, and interruption to business. But the cause? We had almost forgotten to mention that. It is known that a fire originated in a window where, as said, neither gas, matches, nor cigarettes were used; and those who have been looking into the matter can soar to nothing more original than that the fire was due to the fusing of an electric wire. Their foolishness will shock the occupants of certain editorial chairs, more especially the one who revels in writing about "holocausts" and other things that makes one's hair stand on end.

Yesterday morning, it was learned through the daily papers that irreparable havoc and destruction has been caused by fire at the Brussels Exhibition, through, it is believed, a short-circuit in the electric wiring of the exhibition. The messages agree in so attributing the origin, except that, in the earlier cables to one paper, a suggestion was made as to fireworks being the cause. But the fireworks were in the grounds, and not where the fire is said to have originated. However, we suppose this is about as near as we shall ever get to the truth as to the origin, though, seeing the immense financial loss involved, there ought to be an inquiry in regard to it. There is the deplorable loss, the ruin to the exhibition, and the sudden dashing to the ground of the hopes the citizens of Brussels had built up of considerable advantage to them from the exhibition. Happily, the loss of life first reported has not so far been confirmed. The British section and the Bruxelles-Kermesse have been destroyed; and the French and Italian sections are badly damaged. Those who took part in the visit of the Société Technique to Brussels, when they were so royally received by their Belgian gas colleagues, will remember well the portions of the exhibition now in ruins, inasmuch as it was in the restaurant in the Bruxelles-Kermesse that the visitors were entertained to luncheon. At that luncheon were the President of the Institution of Gas Engineers (Mr. Alex. Wilson), Mr. J. W. Helps, Mr. S. Y. Shoubridge, Mr. P. Holmes Hunt, and a representative of the "JOURNAL."

At the meeting of the Taunton Town Council last Tuesday, Mr. H. T. Coles, the Manager of the water-works, was unanimously granted the sum of £100, on the recommendation of the Water Committee, for extra services rendered in connection with the undertaking. The Committee reported in very appreciative terms on the way he had carried out very difficult work.

THE GLOVER-WEST VERTICAL RETORT SYSTEM.

THE specification has lately been published of a patent taken out for France by Messrs. Glover and West early in December last for their now well-known system of vertical retorts for the continuous carbonization of coal. As the specification of the English patent, which is dated Sept. 4, 1909, has not yet appeared, we give the following particulars from the French one.

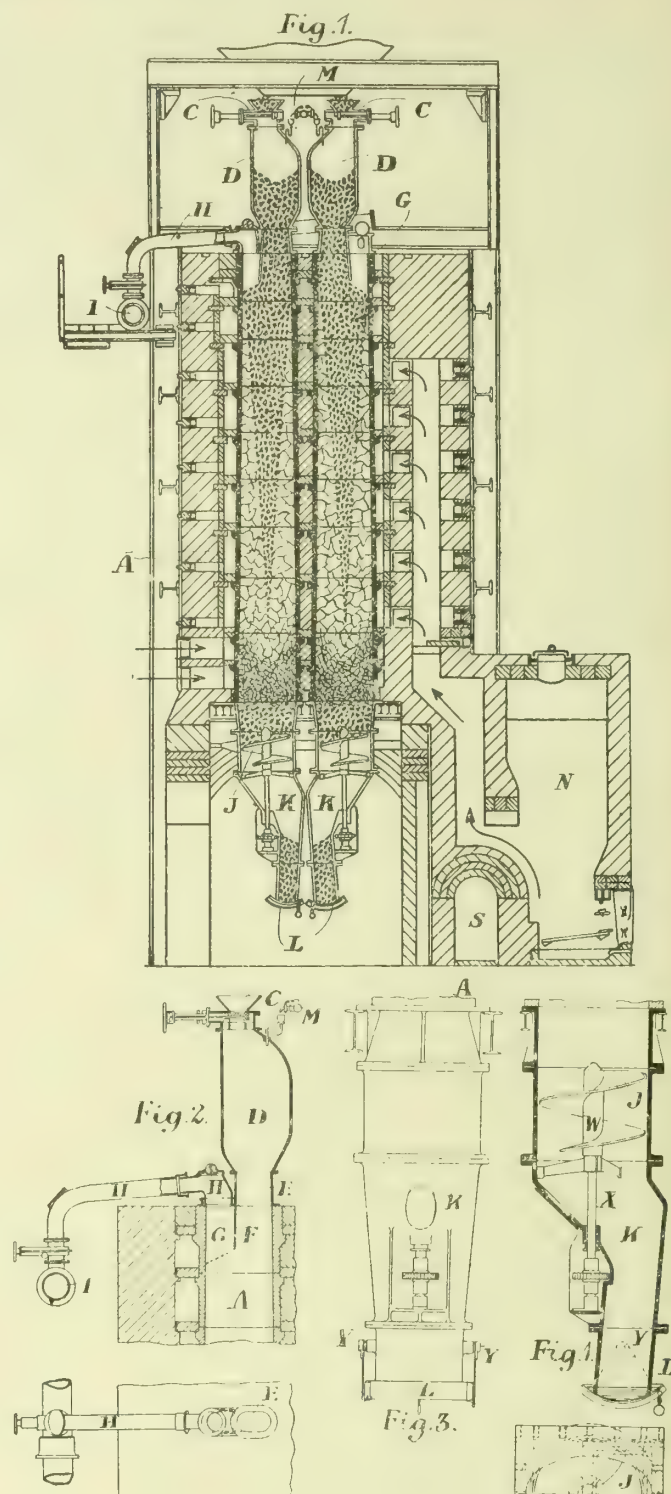
The object of the invention is stated to be the improvement of the appliances used in the continuous carbonization of coal in vertical retorts, with the view of rendering more regular the descent of the coal therein, and of better heating the column of coal during its progress downwards, so as to augment the volume of gas and ammonia produced, improve the quality of the coke, yield a more fluid tar, and avoid stoppages resulting from tar and other thick deposits. In order to obtain regular heating, the coal must be made to descend regularly; and it is necessary to provide means for the removal of the coke which will not deteriorate by the heat, facilitate the descent of the charge, and at the same time ensure that it shall be properly heated.

The illustrations show one method of carrying out the invention. Fig. 1 is a section of an installation of vertical retorts constructed as proposed; fig. 2 is a vertical section of the coal-hopper and of the outlet for the gas at the top of the retort, also a plan of the latter; and figs. 3 and 4 show, in elevation, section, and plan respectively, the coke-extractor and discharging-door, with hydraulic seal, beneath each retort.

As will be seen from the illustrations, the vertical retorts A, which are of appropriate profile and suitable conical shape, are narrow at the top and wide at the bottom. They are constructed of bricks arranged for supporting and heating them, in the manner described later. The receptacle for coal, fixed at the top of the installation, contains the quantity necessary for filling the retort. The gas-tight valves C, which are open to receive the coal, allow it to pass towards the hoppers D. The mouthpiece of the retort E has a division-plate or partition F, which penetrates into the retort, and is intended to make a free space G above the charges at the place where the gas issues from the retort. (See fig. 2.) The gas outlet-pipe H is connected to the principal collecting-pipe I. To the screw J, which is of special construction, a rotary movement is given, in order to extract the coke from the retort; it being collected in the chamber K and periodically discharged through the opening, which is closed by a door L, provided with a hydraulic joint. Water is furnished by the pipe M, for the purpose of conveying a small quantity into the coal-hopper, the admission-pipes at the upper part of which are so arranged that the saturation of the coal is greater at the centre than at the sides of the charge. The generator N has channels to convey the gas produced to the several combustion chambers, the number of which may be varied according to circumstances. These chambers are entirely separated from each other; but they are arranged in such a manner as to discharge the products of combustion into pipes by which they are conveyed to the circulation chambers at the upper ends of the retorts. The gaseous products, after having passed round the retorts, enter channels, which convey them to the chimney flues. The air necessary for combustion in the generator penetrates into the installation, circulates round the chambers, comes in contact with the sides of the retorts, and extracts the heat furnished to them at this point by the residual coke of the worked-off charge.

The heating of the retorts is effected by separate and distinct combustion chambers; the products being caused to circulate round those situated at the upper ends of the retorts. In this way, the greater part of the heat contained in the products is utilized before they enter the flue leading to the chimney. The secondary air necessary for the combustion of the generator gas in the chambers is heated by the heat communicated by the hot coke to the lower extremities of the retorts. This system of heating the secondary air by means of the heat of the coke allows of the discharge of the latter by the chamber K at such a temperature that very little water is required for quenching it. Moreover, considerable economy is thus realized in the consumption of fuel for heating the retorts. The additional heat is furnished to the secondary air by contact of this air with the partitions between the pipes shown and the channels for secondary air. By means of the system of separate combustion chambers, it is possible to heat more or less highly each section of the retort, according to the nature of the coal to be treated. After having passed round the retort, the secondary air enters the principal vertical channels, which are furnished with openings into the combustion chambers; these openings being adjacent to those in the pipes of the generator.

The lower extremity of the retort is provided with a mouth-piece of the same section as the retort itself, but widening to a circular section at the base, to correspond with the chamber of the coke-extractor, which is circular in the part containing the screw. This screw works in the circular part of the chamber K. To prevent coke going through the screw at the place where, in the ordinary way, the blades would have a greater inclination than the sides, the slope of the blade at the point W is not greater than the angle of repose of the coke. The screw is moved by the shaft X, which is provided with speed-regulating mechanism. The outlet-door L, which turns upon an axis Y, is constructed to contain water, which forms a hydraulic seal with the lower



edge of the outlet from the chamber K. It is necessary to renew the water after each opening and closing.

The action of the installation is as follows: To start the plant, the retorts are partially filled with coke; but this is necessary only when the installation is set to work for the first time. The coal is deposited in the upper receptacle by any suitable means of transport; and on opening the valves there is admitted into the hopper a certain quantity of coal, which is supported by the charge in the retort. Before passing into the retort, the coal is treated by water (the quantity varying with the condition of the coal) in such a way that the tarry mass in the core shall be more fluid, and consequently that the heat shall have a more rapid and effective action on the charge during its descent into the retort. The extracting mechanism having been set in motion, the contents of the retorts are gradually discharged into the chambers K, which are periodically filled by the opening of the doors L. The filling of the retorts is proportionate to the rapidity of discharge of the coke. Carbonization begins immediately after the coal enters the retort, and continues as the charge passes down by its own weight; it being completely carbonized at a point slightly above the level of the secondary air chambers.

All coaling records in the history of Hull have been broken during the past six months; more than 3,250,000 tons of coal having been sent to Hull for transshipment, chiefly to Russia, Germany, Holland, and Sweden. German gas companies, the coal inspector's report states, are buying British gas coal in enormous quantities.

OLDHAM GAS-WORKS EXTENSIONS.

Cutting the First Sod of a New Gasholder Tank at Hollinwood.

THE Oldham Gas Committee are carrying out, at their Hollinwood station, an important extension in the way of the erection of a four-lift spiral-guided gasholder, which, when completed, will be (as stated in our last issue) the largest of its type in use in this country. The cutting of the first sod for the tank was made the occasion of a pleasant ceremony, which took place on Monday of last week.

The members of the Gas Committee and a few friends met at the Gas Offices in Greaves Street about noon; and, by motor-car or waggonette, they went to Hollinwood. The party included the Mayor of Oldham (Alderman Schofield), Alderman Thompson, J.P., the Chairman of the Gas Committee; Mr. G. Hanson, J.P., the Vice-Chairman of the Gas Committee; Mr. J. H. Hallsworth, the Town Clerk; Mr. Arthur Andrew, General Manager of the Gas Department; Mr. T. Duxbury, the Gas Engineer; Mr. T. Kershaw, the Chief Draughtsman to the Department; Mr. N. G. Lemmon, the Manager at the Hollinwood gas station; and Mr. James W. Broadhead, of Messrs. Robert Dempster and Sons, of Elland, the Contractors for the new gasholder.

On arrival at the site of the new holder, which is within about 100 yards of the Hollinwood Gas-Works, Alderman Thompson, in response to an invitation from the Mayor, cut the first sod, and placing it on a barrow wheeled it outside the boundary line of the tank and holder; wooden posts (from which fluttered coloured flags) indicating the area to be taken up by the tank and holder. Then followed a little speech-making; the hope being expressed that the work would proceed without any unforeseen drawbacks, and that accidents of all kinds might be few, and no lives lost during the construction of the tank and holder. The silver trowel which the Contractors had presented to Alderman Thompson as a memento of the occasion had the following inscription upon it: "Presented to Alderman Thompson, J.P., the Chairman of the Oldham Corporation Gas-Works Committee, on the occasion of cutting the first sod of the 212 feet diameter gasholder tank at Hollinwood—Aug. 8, 1910."

At the conclusion of the ceremony, the party were entertained to lunch—Alderman THOMPSON presiding.

After the toast of "The King" had been honoured,

Alderman SCHOFIELD, the Mayor, proposed "The Gas-Works Committee." In the course of his remarks, he said he had always been struck with the way the Gas Committee conducted their business. The members carried out their work in a business-like fashion; and, judging by their decision of the previous week, were likely to become the most popular Committee of the Corporation. They had decided upon a reduction in the price of gas, which would be greatly appreciated by the ratepayers. It showed that the Gas Department was in a sound and healthy financial position. They had been brought together that day to take part in another important extension of the work of the Gas Department. The first step had been taken that day for the erection of a gasholder which, he believed, would be the largest of its kind in the world. This, in his opinion, was a splendid testimony to the energy of the Gas Committee, and evidence of their determination to keep their plant up to date. In conclusion, the Mayor referred to the great improvements which had been effected in recent years, not only in the manufacture of gas, but for its utilization as an illuminant; and expressed the opinion that much of this was due to the fact that electricity had become a keen competitor.

SIXTY YEARS' PROGRESS.

Alderman THOMPSON, in responding, first of all paid a compliment to Mr. Kershaw, the Chief Draughtsman, upon his excellent drawings, which were exhibited in the room in which they were assembled, adding that under their Engineer, Mr. Duxbury, and Mr. Kershaw and his staff, they had never had to call in outside aid in the conduct of their business. This he considered very creditable indeed. The Gas Committee had the greatest confidence in their officials. During the time he had been Chairman of the Gas Committee, they had from time to time carried out various improvements and extensions, all of which, he was proud to say, had been beneficial to the ratepayers and a wise addition to the works under the control of the Committee. That day they had put their hands to the spade and cut the first sod to what would become a very important extension to the Hollinwood Gas-Works. He pointed out that it was now over sixty years since gas-making commenced at Hollinwood under the old Gas Company, on a very small scale, on the site now occupied by the water-gas plant. Great improvements had since then been made in the manufacturing of gas and in the abstraction of residuals. The population of the district had also considerably increased, and a number of large mills had been erected in the locality. This brought about a demand for a greater amount of gas. The Corporation took over the Hollinwood works from the old Gas Company in 1853; and the following year the make of gas was 17,245,000 cubic feet. Last year, the gas made at this station was 621,907,000 cubic feet; and it was of interest to note that there was no part of the original works in existence now, with the exception of one or two small tanks which were now used for other purposes. The whole of the coal-gas plant was now situated on the western side of the canal and in the township of Failsworth—these works being first brought into use in the year 1873. Their area of supply remained practically the same; but it was very extensive—being some 16,000 acres. Although their area of supply had not increased, the mills and works within it had done so by leaps and bounds; thus making a constantly increased demand for more gas, except at short intervals of trade depression. Their supply area on this side of the borough joined that of Manchester at the boundary of

Failsworth and Newton Heath; but a part of Failsworth township, off the main road, was supplied through Manchester, by reason of its low elevation and to Oldham not having mains in the immediate district. He desired to assure the public that there could be no possible nuisance created by the erection of the new holder, and that the site acquired would not permit of any manufacturing plant being placed upon it. The nuisance which the Hollinwood people alleged arose from the putting down of the water-gas plant had been overcome. No unpleasant smells were now noticed, and no complaint had been made for a considerable time past. A point which was always of interest to consumers was the price of gas. When the Corporation acquired the works at Hollinwood, the price charged was 5s. 2d. per 1000 cubic feet, less a discount of 8d. per 1000 cubic feet. With the reduction made the previous Wednesday, the price to small consumers would be brought down to 2s. 6d. per 1000 cubic feet, less a discount of 6d. per 1000 cubic feet, or 2s. net. It was satisfactory to know that in the matter of price Oldham stood third on the list of corporations and gas companies in the country. In the case of Sheffield and Widnes, the charges were exceptionally low because they were exceptionally situated. At the time the Hollinwood works were constructed, the railway was not in existence, and the site was chosen owing to its proximity to the canal. Now, in consequence of being separated from the railway, the works were under a great disadvantage in their having to cart from the station a considerable quantity of the coal used. They were also handicapped in not being able to load coke on the rails as at the Higginsshaw works. This was a matter which would have to be dealt with—it was one of the first things the Gas Committee must do.

THE NEED FOR GREATER STORAGE CAPACITY.

With regard to the Contractors for the new work entered upon that day, he said this was the first opportunity which local contractors had had of constructing a gasholder tank of this character. The reason for requiring increased gasholder accommodation was because of the development of the area of gas supply from the Hollinwood station. In 1888, the total quantity of gas delivered from these works was 290 million cubic feet; in 1898, it was 399 millions; while in 1908 it had risen to 626 millions—an increase of 115 per cent. in twenty years. The maximum quantity of gas delivered in twenty-four hours from the Hollinwood works in 1888 was 1,942,000 cubic feet, as against 3,871,000 cubic feet in 1908—an increase of 100 per cent. This would have been much greater if the full pressure could have been maintained. At present they required at these works a storage capacity of anything between 4 million and 8 million cubic feet. The new holder would bring the working storage up to 7 millions; and an excess of storage there would always be useful for the Higginsshaw district. Hollinwood being 354 feet above sea level, and Higginsshaw 649 feet, the latter could not possibly assist Hollinwood. For many winters past, they had always had to reduce the pressure to the town if they had more than one day of fog. To avoid this, considerably more gasholder storage was necessary; and this was the work they had started upon that day. He hoped that in two years' time the new holder would be in readiness to receive gas. The site of the new holder was only 100 yards distant from the gas-works. The cost of the site was £1250; and the estimated cost of the holder, tank, mains, boundary wall, &c., was £45,000, or a reduction on the original estimate, which included a column-guided holder, of £11,000. The tank would be 212 feet diameter, and 41 feet deep when finished; while the walls would be 7 feet thick at the bottom, tapering to 2 ft. 9 in. at the top. The tank would contain 4½ million gallons, or 47½ million pounds, of water. The spiral-guided gasholder would be 210 feet in diameter by 160 feet high when fully inflated, and would have four lifts. The total storage capacity was 5,431,407 cubic feet. There were several holders in existence of larger capacity, but none on the spiral-guided system; the nearest in capacity being a 3½ million one at New-castle. The firm with whom the contract for the holder had been placed had carried out many large undertakings in various parts of the country, and had done no inconsiderable amount for the Oldham Corporation. The firm were engaged at present in the construction of a new spiral gasholder, with an additional lift, at the Higginsshaw Gas-Works; and the Committee had every confidence in their carrying out the new work entrusted to them in an entirely satisfactory manner.

COMPLIMENT TO THE ENGINEER.

The next toast was that of "The Engineer, Mr. T. Duxbury;" and it was submitted by

Mr. HANSON, who recalled the time when Mr. Duxbury was appointed as Engineer out of a very large number of applicants, and referred to the valuable services that gentleman had rendered to the department since then. The confidence reposed in him by the Gas Committee had been more than justified. They had only to look round at the works to see the state of efficiency to which they had been brought under Mr. Duxbury's supervision; and he was quite satisfied that the work started that day would be carried to a successful conclusion under their Engineer's care.

Mr. DUXBURY had a cordial reception on rising to respond. He assured the members of the Committee that nothing would be wanting on the part of himself and his staff in seeing that the extensions at Hollinwood were completed in a satisfactory manner; and he had not the slightest doubt as to the Contractors and their share of the work. He referred to the importance of securing a suitable site for such a tank and holder. They had every confidence in placing the contract for the tank in the hands of a local firm. He had known of Messrs. Partington for a good many years. The tank would be one of the largest in the country, although the gasholder in it might not be. Manchester, for instance, was at present erecting a holder which would have a capacity of 10 million cubic feet. But in that case, the diameter of the tank was only 240 feet, as against 212 feet at Hollinwood; and the depth 45 feet, compared with 41 feet. It would therefore be seen that there was not a great difference in the two tanks. The holder at Hollinwood would be a four-lift spiral-guided one, and would serve their purposes for a great many years to come. In the construction of the tank, 60,000 cart-loads of material would have to be excavated, and about 50,000 cart-loads removed to the tip. They would require 13,500 tons of concrete, 2000 tons of sand, 10,000 tons of brick-bat ballast, 1500 tons of Portland cement, and 5500 tons of clay puddle, 12 inches deep, round the tank. Passing

on to deal with the Contractors for the holder, he said Messrs. Robert Dempster and Sons, of Elland, had done a large amount of work for the Oldham Corporation Gas Department; and he had to congratulate the firm upon the excellent results of their work in the town. He added that this new gasholder ought to have been put down before now; but as it meant really dead capital, they had put it off from time to time. Now they could not delay any longer. In concluding, he paid a high tribute to Mr. Kershaw and his staff on the excellence of their drawings; they were as complete a set of drawing for a gasholder tank as he had ever seen.

Councillor H. WILDE, J.P., proposed "The Contractors."

Mr. J. W. BROADHEAD (Messrs. Robert Dempster and Sons), replying, said he was pleased his firm had secured the contract. It would mean that all their plant would be kept working during the winter. As a rule they had during the summer months to work practically night and day, and resort to short time in the winter. If corporations could

only look a little ahead, and place their orders well in advance, contractors would be able to keep their plant working all the year round, and corporations would get the benefit, because contractors could then afford to take less money for their work, as there would be no night shifts and less wages to pay. He complimented Mr. Duxbury and the drawing office staff on the plans for the new tank, saying he had never seen a better set.

The health of Mr. Arthur Andrew, the General Manager of the gas undertaking, was proposed by the CHAIRMAN, who said the Gas Committee highly appreciated the valuable services of that official, in whom they had the greatest confidence.

Mr. ANDREW, who was received with applause, in replying, pointed out that Oldham ranked as one of the lowest capitalized gas-works in the United Kingdom—a fact that was due to the care exercised in not spending money recklessly.

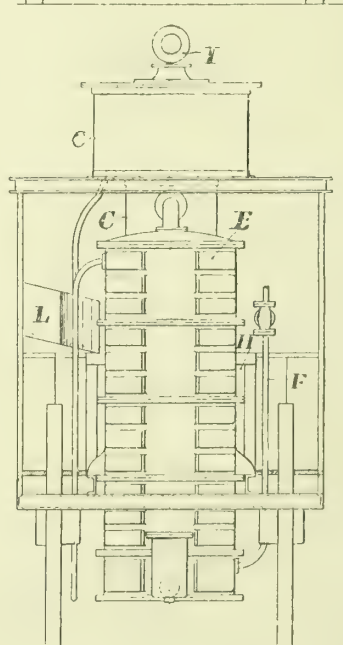
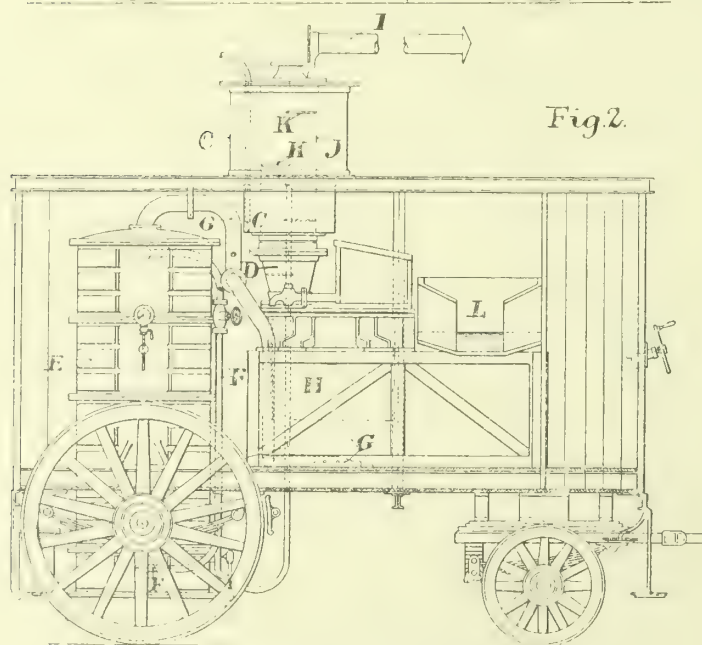
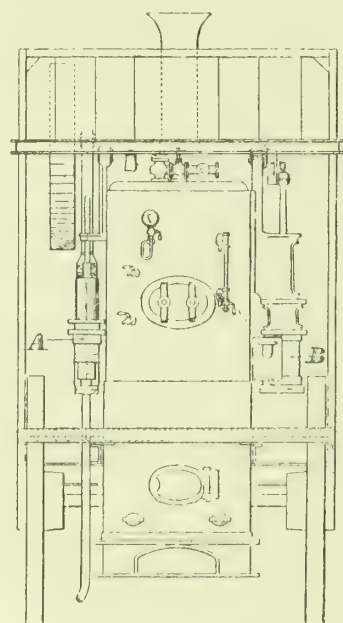
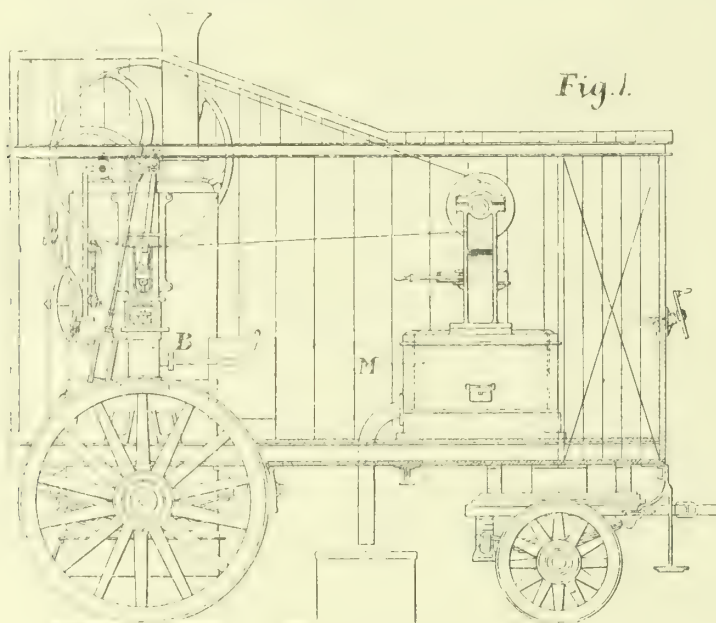
This concluded the proceedings.

ITINERANT SULPHATE OF AMMONIA PLANT.

THERE has lately been published the specification of a French patent taken out by M. Davranche for sulphate of ammonia plant which can be moved from place to place, so as to enable managers of small works to deal on the spot with their ammoniacal liquor, which at present is sometimes difficult to dispose of, and is consigned to the sewers, notwithstanding its great commercial value. In designing the plant, M. Davranche had in view the

requirements of works carbonizing only from 5 to 6 tons of coal per day, where it would be too costly to instal ordinary plant, and where the quantity of liquor produced would be scarcely sufficient to send away to be treated.

As will be seen from the accompanying illustrations, the plant consists of two carriages, occupying, when placed side by side, an area of about 170 square feet. On one carriage is placed the motive power, comprising a vertical boiler supporting a steam-engine which actuates a suction and delivery pump and a centrifugal turbine, shown in fig. 1; on the other, the distilling plant



consisting of a column with accessories, a saturator, a drainer, an acid tub, and a liquor reservoir, shown in fig. 2.

The action of the plant is as follows: The liquor is drawn from the tank on the works by the pump A, actuated by the shaft of the steam-engine B, and sent into the reservoir C on the second carriage (fig. 2). In this reservoir the liquor is heated by the inert gases contained in the cylindrical body D, before they pass out into the air. When raised to a certain temperature, the liquid enters the distilling column E. As it flows from the top downwards, it takes a circuitous course in the interior of the column, which enables it to remain as long as possible in contact with the steam entering by the tube F. The ammoniacal vapours pass by

the pipe G into the sulphuric acid bath in the saturator H, which is composed of three parts—a lead-lined box, a bell to aspirate the inert gases, and a condenser to separate them. These gases, which are drawn off by the chimney I, traverse a cylinder J fitted with lead baffle-plates K for the separation of the water resulting from the condensation of the vapours by the outside cooling caused by the admission of fresh liquor into the reservoir C. All the condensed liquor still containing ammonia in a free state drops back into the bath. The precipitated sulphate is fished out with a copper ladle and deposited on the drainer L, which allows the drippings to fall into the bath. The sulphate, when well drained, is put into the turbine M to be completely dried.

GAS OILS AND OIL GAS.

By Dr. H. HEMPEL, of Berlin.

(Concluded from p. 392.)

TESTS WITH THE WERNECKE APPARATUS.

After having established that the experimental results obtained with his apparatus were reproducible at any time, and corresponded with those obtained with working on the large scale, the author proceeded to make comparative tests with the Wernecke retort, which is largely used for oil-testing on the Continent. It is shown in section in fig. 3. The faults of the Wernecke apparatus are: That the temperature is not sufficiently constant, that the duration of the heating is inadequate, and that superheating occurs. The portion of the retort in which the temperature was approximately constant was only about $1\frac{1}{2}$ inches in length. The mean temperature in the lower part of the retort was determined for the comparative gas-making tests. It was found necessary to alter the apparatus by connecting the gas exit pipe to the retort gas-tight by a screw joint, as otherwise a great part of the oil distilled over unchanged until the joint got made-up through the separation of carbon. A sample of Messel gas-oil was then gasified in the Wernecke apparatus at about 840°C ., and fairly consistent results were obtained in consecutive tests. The difference between different tests of the same oil made as far as possible at the same temperature and in the same conditions were, however, greater than in the author's apparatus. The differences

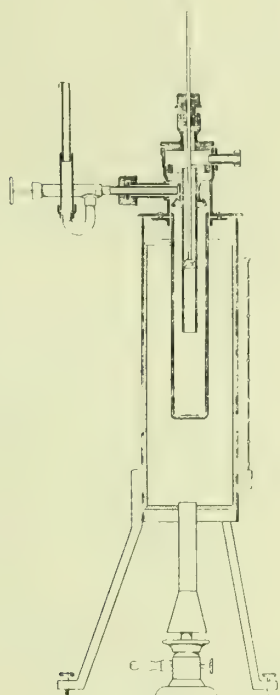


Fig. 3.

are explained by the difficulty of keeping the temperature the same except in the short stretch where it was maintained constant by reference to control observations. It was necessary that the mean temperature of the Wernecke retort should be kept higher, in order to secure as high a yield of gas as the author's new apparatus afforded. The calorific valuation number was, however, lower with the Wernecke apparatus, owing to the small length of retort heated to a constant temperature, and the consequent distillation of oil without gasification. The illuminating power and calorific value of the gas were somewhat lower than in the author's apparatus, owing to the local superheating producing more hydrogen and reducing the proportion of paraffins in the gas. The Wernecke apparatus, as modified by the author, can, in his opinion, however, become useful for showing approximate relative values of different gas-oils. For exact determinations of the calorific valuation number of oils it is unsuitable, as results obtained with it do not agree closely with technical results.

Various authorities on oils have held the view that they are so much the more valuable for gas-making according as the proportion of hydrogen in them is high—that is to say, the more nearly the nature of the component hydrocarbons corresponds to those of the paraffin series. The actual content of hydrogen in the oil does not, however, signify the chemical structure of the hydrocarbons. Investigations made a short time since by Ross and Leather [see "JOURNAL," Vol. LXXIX., p. 1561, and Vol. XCVIII., p. 368] have demonstrated this, and experiments by the author were confirmatory. The calorific valuation number obtained by the author varied considerably, while the proportion of hydrogen in the oils varied only from 11 to 13 per cent. The proportion of olefines, however, decreased as the proportion of hydrogen in the oil fell. The results of comparisons have led the author to the conclusion that there is no relation between the gasification value

of the oil as shown by the calorific valuation number and the proportion of hydrogen contained in the oil.

GASIFICATION OF OILS IN A CURRENT OF HYDROGEN.

The author next proceeded to study the gasification of oils in the presence of other gases—viz., hydrogen, carbonic oxide, and nitrogen. The oils used were five of those which had already been studied by him in his testing apparatus. The importance of ascertaining the behaviour of the oils when gasified in the presence of hydrogen and carbonic oxide, lay in the fact that these gases are the chief constituents of commercial water gas. The gases were, however, used separately in these investigations. The gases were taken from the usual steel cylinders in which they were stored at about 150 atmospheres pressure, and were passed through a washing apparatus and meter before being run into the gasification chamber. The gases applied were analyzed, and the hydrogen was found to be of 99.5 per cent. degree of purity, the remaining 0.5 per cent. consisting of nitrogen. The carbonic oxide was of 98.5 per cent. degree of purity, the remaining 1.5 per cent. being nitrogen. The oils were gasified in a current of hydrogen at a temperature of 785°C ., the proportion of hydrogen being from 1.1 to 1.3 litres per gramme of oil gasified. The results obtained have been tabulated alongside the figures which represent the composition of the gas, on the assumption that the hydrogen has acted merely as an indifferent diluent. The comparative figures show that the hydrogen had an extensive chemical influence on the course of decomposition of the oil. The yield of gas was lower than it would have been had the hydrogen behaved as an indifferent diluent, whereas the calorific power of the gas was greater in correspondence with a higher proportion of olefines and paraffins in the gas. The proportion of ethane in particular was increased. The results of gasifying a number of different oils in a current of hydrogen showed that the carburetting value in these conditions rose and fell with the rise and fall in the value of the oils for the making of simple oil gas. The greater production of hydrocarbons from the oils when they were gasified in the current of hydrogen gave, however, a higher calorific valuation number for them in these conditions than was obtained when they were gasified to simple oil gas. The chemical composition of the oil, however, had an appreciable effect on the relation between the calorific valuation numbers for carburetting and for simple oil-gas production. Thus, whereas Pechelbronner oil had nearly the same calorific valuation number as Messel oil in oil-gas production, in carburetting the calorific valuation number of the Pechelbronner oil was considerably higher. Also, the Borneo residue had a considerably higher carburetting power relatively to other gas-oils which are of higher value for simple oil-gas making. Broadly, however, it may be taken that oils which have a high value for simple oil-gas production are good carburetting oils. The effect of the addition of hydrogen during the decomposition of the oils by heat is to increase the proportion of hydrocarbons, by encouraging the formation of the lower members of the olefine series and of ethane.

The effect of the hydrogen on the production of tar was to reduce the amount of the latter by about 10 per cent., compared with the quantity made in simple oil-gas production. The amount of coke produced was also less. Another series of experiments was made with about twice the proportion of hydrogen used in the earlier series. The result of the higher partial pressure of hydrogen was a falling off in the production of ethane and in the gain in calorific power. A considerable part of the additional hydrogen was lost in the tar, the amount of which was increased. The figures indicate that the most favourable proportion of hydrogen to oil for carburetting purposes was about 18 cubic feet of hydrogen per pound of oil. The effect of temperature on the carburetting process was next studied, by the gasification of two oils in a current of hydrogen at 743°C and 785°C . It was found that the carburetting results were practically the same at the two temperatures. It, therefore, appeared that for carburetting the range of temperature was not so limited as for simple oil-gas production. Even at a carburetting temperature of 880°C ., the total effect as expressed by the heat units in the gas was only slightly reduced. Hydrogen was not produced from the oil even at the higher temperature; but the proportion of methane was considerably increased, and the proportions of olefines and ethane decreased. It follows from the results obtained by the author that the best carburetting effect, as ascertained by the calorific value of the gas, is attainable over a range of temperature of about 150°C .; whereas the permissible range of temperature for the best results in simple oil gas production is restricted to 80°C . With the varieties of oil examined, it appeared that the most favourable temperature for carburetting was about the same as the most favourable temperature for oil-gas production—viz., 745° to 785°C . The range of 150° was, however, only available if the carburetted gas was valued according to its calorific power. If the gas was valued according to its photometric duty—i.e., according to the proportion of the olefines produced—the most favourable temperature for oil-gas manufacture must be more strictly adhered to in carburetting also.

GASIFICATION IN A CURRENT OF CARBONIC OXIDE AND IN A CURRENT OF NITROGEN.

Similar investigations were made on Messel and Roumanian gas-oils, at a temperature of 785°C ., with a stream of carbonic oxide in place of the stream of hydrogen. The results indicated that the admixture of carbonic oxide had no influence at all on

the calorific effect of the gasification of the oil to simple oil gas. The presence of the indifferent gas protects the olefines from extensive decomposition, and the proportion of olefines was accordingly increased; but the proportion of methane was lower than in the simple oil gas. These differences, however, neutralized one another in regard to the total calorific effect. The photo-metric effect was, however, improved by the gasification of the oils in the stream of diluent gas in consequence of the increase in the proportion of olefines. In order to ascertain if the carbonic oxide behaved simply as an indifferent gas, a control gasification experiment was made on the Messel oil at the same temperature in a current of nitrogen in approximately the same proportion. The results agreed precisely with those obtained in the gasification of the oil in a current of carbonic oxide. Consequently, it may be assumed that carbonic oxide acted as an indifferent gas, and that the small changes in the composition of the gas were due simply to its action as a diluent in protecting the olefines from extensive secondary decomposition.

GASEOUS FUEL AND COMBUSTION.

Advanced Lectures in London by Professor Bone.

We have just received from the Assistant-Secretary of the Imperial College of Science and Technology, South Kensington (Mr. J. Chadwick Brooks), the syllabus of a special course of advanced lectures on "Gaseous Fuel and Combustion," to be given by Dr. W. A. Bone, F.R.S., Professor of Applied Chemistry in the University of Leeds, in the autumn of the present, and in the early months of next year. The entire course will be divided into two parts, each consisting of about ten lectures of one hour's duration; the first series beginning on Friday, Oct. 7, and the second on Friday, Jan. 13, 1911. The lectures will be delivered in the Chemistry Department of the Royal College of Science, at three o'clock each day; and the inclusive fee for the course will be £2. The following is the syllabus of the course.

PART I.—Review of the principal researches upon gaseous combustion from the time of Davy until 1880. Discovery of "detonation." Berthelot and Dixon on "rates of explosion." Theory of the "explosion wave." Photographic investigations of the initial stages of an explosion ("inflammation") as indicating the influence of reflected waves in determining "detonation." Discovery of "retonation." Pressure registered during gaseous explosions in closed vessels. Discussion of the nature and conditions of combustion in (a) ordinary aerated flames (e.g., the Bunsen burner), and (b) a gas-engine cylinder. Radiation from aerated flames. Ignition temperatures. The mechanism of combustion of cyanogen, hydrogen, carbon monoxide, and hydrocarbons. Influence of water vapour upon combustion. Relative rates of combustion of hydrogen, carbon monoxide, and methane at ordinary and at high pressures. Direct union of carbon and hydrogen and the thermal decomposition of hydrocarbons in flames. Luminosity of hydrocarbon flames. Influence of hot surfaces upon combustion. Surface combustion as a factor in furnace practice and construction of gas-fires and the like.

PART II.—Present state of our knowledge regarding (a) the combustion of carbon and carbon monoxide; (b) the action of air and steam upon incandescent carbon; (c) the influence of temperature upon the reversible changes $\text{CO} + \text{OH}_2 = \text{CO}_2 + \text{H}_2$ and $2\text{CO} = \text{C} + \text{CO}_2$; and (d) the action of carbon monoxide upon oxides of iron in the blast-furnace. The blast-furnace as a gas-producer, and utilization of blast-furnace gas for power purposes. Principles of "gas-producer" practice. Conditions requisite for (a) rapid and efficient gasification of the fuel; (b) high thermal efficiency; (c) ammonia recovery. Typical gas-producers, including "pressure" and "suction" producers for generating furnace and power gas. Ammonia-recovery systems. Gas firing of boilers and furnaces, and utilization of waste heat. The manufacture of "blue" water gas and its applications.

Further details may be obtained from the Secretary, Imperial College of Science and Technology, Exhibition Road, S.W.

HIGH PRESSURE IN A LOW PRESSURE SYSTEM OF GAS DISTRIBUTION.

A paper dealing with this subject was prepared for the last annual meeting of the Iowa District Gas Association by Mr. B. C. Adams, of Lincoln (Neb.). The following extracts are taken from the text of the paper in the "American Gaslight Journal."

The plant is located at the extreme western border of the city, and all the gas sent out passes through one main, feeding east. Branches are not taken off the main till a point 1600 feet distant from the plant is reached. The system is similar to the trunk and branches of a tree, with all branches interconnected. Out of 70 miles of main, more than half are 2 inches diameter.

In laying out the system, it was at one time thought that Lincoln would develop southward from the trunk feeder; and a feeder loop was laid near the south border. Lincoln has not only far exceeded the estimated growth in this southern section, but has enjoyed a remarkable growth in a north-east direction. Five years ago the feeder mains became too small to furnish from the

holder adequate pressure near the city limits, and a centrifugal fan blower was installed for the purpose of pumping gas over the peak-loads. By this means, we have gradually increased our plant pressure until last winter we reached as high as 17 inches of water. Our peak output was 100,000 cubic feet per hour for 15 minutes. The highest pressure at which a consumer received gas was probably about 14 inches; the lowest, 1½ inches. The complaints received under the above conditions of service came mostly from consumers getting gas at about 1½ inches pressure. Their complaint was that they could not get gas enough to cook with, and that their bills were higher than when they had sufficient gas. Those receiving what would be termed "high" pressure said that it was so great that the gas would blow out matches. When asked if the burner was adjusted to give proper flame-height or candle power, the answer was invariably "Yes." These people have ceased to complain; but the low-pressure people have not.

We have found that the greatest source of complaint has come from varying pressures. In order to eliminate this feature, we are installing pressure governors which automatically keep the maximum pressure at 3½ inches. It costs about 50¢ apiece to set these governors, in addition to their cost in the store.

I think our experience should be valuable, as we have demonstrated the fallacy of the old rule-of-thumb that we should not exceed 5 inches water pressure. Our gas "lost and unaccounted for" has not increased with the rise of pressure—indeed, it has decreased, as would be expected with an augmenting output. A consumer connected to our gas-mains wants all the gas necessary for the use he is making of it; and it is better to have more pressure than not enough. As indicated above, the consumer naturally adjusts his gas-valve to get the proper flame height or candle power. I could make exception in the case of industrial consumers, who should always get constant pressure, no matter what may be the limits of variation in the gas-main.

State and municipal governments have placed maximum and minimum limits on pressure at which gas can be distributed, and by so doing have caused consumers inconvenience and the gas companies needless expense. In fact, the maximum in Lincoln is 5 inches and the minimum 1½ inches; and if we had lived up to the maximum requirement, more than half of our consumers would have been without gas at times last winter. Our experience would teach that the minimum should be set higher; the maximum being left out altogether.

Had we increased our trunk feeder to a size which would have given ½-inch drop per mile of main, the net cost would have been, after giving credit for pipes taken up, \$24,000 (£5000) for 6400 feet of main; and this would have been only a start in order to meet the ordinance requirement. Our blower equipment cost about \$1000 (£208) and the cost of operation last year was a little more than \$300 (£62 10s.). We have no trouble whatever with our meters, and have taken 500 three-light meters which had been abandoned and put them back for use in the high-pressure district, where they are rendering excellent service.

A Gas-Driven Cargo Vessel.—There is at present being built by Messrs. J. T. Eltringham and Co., of South Shields, for the Holzappel Marine Gas-Power Syndicate, Limited, of London, a cargo vessel 120 feet long between the perpendiculars, 22 feet in beam, and 11 ft. 6 in. deep; and it will be fitted with a set of high-speed six-cylinder vertical gas-engines, made by Messrs. E. S. Hindley and Sons, of Bourton, Dorset. These engines, which will be placed aft, will have double ignition, and will give 180 B.H.P. at 450 revolutions per minute. The gas plant is in duplicate, and is being constructed by the Power-Gas Corporation, Limited, of Stockton-on-Tees.

Action of Hydrogen upon Carbon Monoxide.—This subject has lately been dealt with by M. Armand Gautier, in the "Compte Rendus" of the Paris Academy of Sciences. According to the author, the reduction of carbon monoxide by hydrogen begins at 400° C.—i.e., well below a red heat. Some water, carbon dioxide, and a little methane are formed. These reciprocal reactions are limited, and have their optimum at about 1000° C. The formation of methane increases with the relative proportion of hydrogen. When carbon monoxide and water vapour are passed through a tube heated to 1300° C., carbon dioxide is formed. These reactions would explain the occurrence of carbon monoxide, carbon dioxide, hydrogen, water, and methane in volcanic gases, if it were assumed that carbon monoxide and hydrogen or carbon dioxide and hydrogen were present in the depths of the earth.

Census of Production Statistics.—A Blue-Book recently issued contains summaries of the results of the returns received under the Census of Production Act, 1906. In the section relating to finished brass goods, the total of which is £5,460,000, gas-meters figure for £746,000, and lamps and metal fittings for lighting purposes for £1,130,000. Among galvanized sheets, hollow ware, &c., there is an item of £234,000 for lamps, &c., mainly of brass and copper. The output of wrought-iron and steel tubes and pipes and fittings is given as 289,000 tons, valued at £5,810,000; the value of cast-iron and steel tubes, &c., being put at £30,000. But, in addition, firms who made returns on schedules for other trades included in their output 19,000 tons of wrought-iron and steel tubes and fittings valued at £282,000; raising the total to 308,000 tons, valued at £6,092,000.

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Belfast.

The Annual Meeting of the Irish Association of Gas Managers was held in Belfast last Tuesday. The members, to the number of over seventy, assembled in the Banqueting Hall in the City Hall at half-past eleven.

A CIVIC WELCOME.

The LORD MAYOR (Mr. R. J. M'Mordie), who was accompanied by several aldermen and councillors of the city and the city officers in uniform, took the chair, and expressed the pleasure he had personally, and as representing the city, in receiving the Association. It represented all Ireland; and, with this provision, it was remarkable to find so large a meeting there. He trusted that the business would be gone through with the quickness and dispatch which were associated with men of training such as those he saw before him. If there was anything in which they might require assistance, he could guarantee, from experience, that they would receive it from Councillor Doran (the Chairman of the Gas Committee), who took a wonderful interest in the extension of gas consumption. There was nothing more associated with the development of large communities than the growth experienced in the manufacture of coal gas. In the earlier times, it was looked upon merely as a necessity for lighting purposes; but in these later days it had come to be associated with the supply of power for machinery and other purposes. The development which had taken place in this direction was perfectly extraordinary; and it seemed that there would be no limit to it in the future. The great point was to get gas good and cheap. In Ireland they were practically handicapped, because all their coal had to come from the other side of the Channel. They could not help this; but it greatly increased the expense to them. This difficulty had been more or less overcome. They recognized that, on account of the distance from which materials had to be brought, they could not supply gas in the localities so cheaply as they would wish. He presumed that, if the cost of coal were 25 per cent. higher to Irish gas managers, there must be 25 per cent. added to the cost of the gas. He did not know how this would be; but he knew that the Association was composed of very able gentlemen, who gave their whole time to the manufacture of gas. He was glad to see them there, and so was the whole community. He trusted that, in addition to doing the important work they had come to do, they would have time to see whatever sights there were to be seen.

The PRESIDENT (Mr. R. Harrison, of Monaghan) proposed that the best thanks of the Association be accorded to the Lord Mayor for his kindness in coming, no doubt at personal inconvenience to himself, to open their proceedings, and to assist in giving to the meeting the success the members all desired.

The proposal having been agreed to,

The LORD MAYOR returned thanks.

Councillor DORAN said there was one other item on the programme he would like to dispose of before they started their business. This was that they should be photographed, as they would like to have a *souvenir* of the visit.

A photograph was accordingly taken in the quadrangle of the building in which the meeting was being held.

OFFICIAL REPORTS.

On resuming, the chair was taken by Mr. HARRISON.

The HON. SECRETARY (Mr. George Airth, of Dundalk) read the report of the Committee. It set forth that the Dublin meeting of last year was well attended, and was a great success. The discussions raised on the papers written by Messrs. Enright and Saville showed that their efforts were appreciated; and the members who stayed to hear Mr. O'Connor's lecture on "The Inverted Incandescent Burner" were well rewarded by the information given. The Committee met in Dublin on the 16th of April, and, after arranging all the particulars for the present meeting, a long debate took place as to the way in which the bye-laws should be changed. As formulated by the Committee, these were now before the members; and the Committee asked for their serious consideration. Should they decide to accept them, the Committee urged upon the members the desirability of exercising the right to which the ballot entitled them; and they hoped every member would next year send in a ballot paper, whether or not he intended to be present at the meeting. Only 22 members had sent in ballot-papers this year. The Committee regretted having received the resignation of one extraordinary member.

Mr. T. FRIZELLE (Holywood) reported that, as representative of the Association upon the Council of the Institution of Gas Engineers, he had attended three meetings of the Council. The principal matter dealt with affecting the Association was the circular issued by the Board of Inland Revenue with regard to the allowance of income-tax in respect of depreciation of gas undertakings. After discussion, the Council referred the matter to the Parliamentary Committee, who, in considering it, were assisted by Mr. W. A. Schultz, F.C.A. Mr. Schultz reported that several gas companies had been allowed 3 per cent. after he had interviewed the surveyor or appeared before the district commissioners. It was most important that all gas companies desiring to claim depreciation should be careful to send in their claim in

the first instance, and insist in making their return in due form. Other matters dealt with by the Council included reports from the several Sub-Committees, &c.; but little of special interest to the Association was discussed.

The report of the Hon. Auditor (Mr. G. W. Norman, of Dublin) was then submitted. It showed that the year began with a balance of £67; that the income amounted to £38; and that at the close there was a balance in hand of £65.

On the motion of Mr. J. E. ENRIGHT, seconded by Mr. C. W. STOTT, these reports were adopted.

NEW MEMBERS.

The following were proposed for admission.

Ordinary Members.—Ellicott, P. B., of Warrenpoint; Hawkins, H., of Limerick; Millar, W., of Cookstown; Mearns, G. A., of Rathfriland; O'Grady, J., of Rathdowney; Pettigrew, W. M., of Portadown; Scott, R., of Castlebar; Stormonth, T., of Galway; Smith, J. D., Stears, S. M., Clelland, A. M'L., and Curry, G., of Belfast.

Extraordinary Members.—Adie, J. T., of London; Barrett, J. H., of Bangor; Bairsto, W. H., of Glasgow; Clark, G., of Chesterfield; Duxbury, T., of Darwen; Gray, T. B., of Belfast; West, F. J., of Manchester; Widdowson, E. L., of Halifax.

On the motion of Mr. J. PATERSON (Queenstown), seconded by Mr. FRIZELLE, the gentlemen proposed were admitted to the Association.

Mr. J. PATERSON (Queenstown) said that, arising out of the minutes, there was one important matter he would like to mention—that was, the fact that only 22 of their members exercised the franchise in voting for the election of office-bearers. He thought that all members—both those present and those not present—should be asked to return their ballot-papers. The system of voting by ballot was started by the Association in order to get the personal element introduced. Next year admission to membership of the Association would also be by ballot; so that he thought it doubly needful that every member should exercise the franchise by voting.

The PRESIDENT was pleased that Mr. Patterson had mentioned this matter. It was a good idea that every member of the Association should have his attention called to it.

The HON. SECRETARY intimated that last year notice of motion was given to the effect that "Every member whose name is deleted through arrears of subscription shall pay a fee of 10s. on his re-election."

ELECTION OF OFFICE BEARERS.

The PRESIDENT intimated that the following had, as the result of the ballot, been elected office-bearers of the Association for the year:—

President.—Mr. J. Patterson, of Queenstown.

Vice-President.—Mr. C. B. Outon, of Inchicore.

Members of Committee.—Mr. J. M'Grath, of Cork; Mr. W. Nesbit, of Ballymena; Mr. O. Fitzpatrick, of Maryborough.

Auditor.—Mr. G. W. Norman, of Dublin.

Hon. Secretary and Treasurer.—Mr. G. Airth, of Dundalk.

PLACE OF NEXT MEETING.

Mr. PATERSON thanked the members very heartily for having elected him President for the ensuing year. He felt deeply the honour they had paid him; and he assured them that his best services should be reserved for the Association. If it were agreeable to them, he would have great pleasure in inviting them to hold their meeting in Queenstown next year. It was not a very large town; but it was a pretty place. He could assure them that they would be made heartily welcome if they agreed to go there.

Mr. T. J. REID (Ballina) moved that Mr. Patterson's invitation be accepted.

Mr. T. FRIZELLE seconded; and the motion was agreed to.

REVISION OF BYE-LAWS.

The Committee submitted a set of bye-laws, which they suggested should be adopted in lieu of those at present in use. The Hon. Secretary read the proposed rules, which dealt with methods of voting, applications for admission to membership, and the election of office-bearers.

Mr. T. J. REID moved that the proposed bye-laws be adopted, subject to such alterations in wording as the Committee might think fit to make.

This was agreed to.

Mr. J. E. ENRIGHT (Tralee) gave notice of motion that the date of the annual meeting be considered by the Committee, and be submitted for decision at the next annual meeting. He thought that August was too late in the year. Subsequently, he called attention to the circumstance that they had not fixed the date of the annual meeting next year, although, by their rules, they were required to do so.

Mr. PATERSON moved that the meeting be held on the second Tuesday in August.

Mr. F. EUSTACE (Tullamore) seconded; and the motion was agreed to.

WELCOME TO MR. J. D. SMITH.

The PRESIDENT invited Mr. J. D. Smith, of Belfast, to take his seat on the platform. Mr. Smith, he explained, had been that day elected a member of the Association; and they were proud to see him in their midst.

Mr. SMITH thanked the President and the members very much for their kindness in electing him a member of the Association. He hoped that the friendships made that day would last for a long time to come. Whenever the Association chose to hold their meetings in Belfast, if he should be at the head of the undertaking, he had no hesitation in saying that they would always be well received.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

I feel it my first duty, on taking the chair to-day, to thank you most sincerely for the great honour you have conferred on me in electing me President of the Irish Association of Gas Managers. I can assure you that I appreciate the honour very highly, and can only express the hope that the Association has not suffered in any way during my term of office. I am deeply conscious of my inability to keep up the high standard attained by my predecessors, but have every confidence that the members, with their usual sympathy and co-operation, can be relied upon to see me through the duties of to-day.

I find myself in a very difficult position on this occasion, as I feel that, coming, as our meeting does, practically at the end of the season, most of the subjects the Chairman of a meeting such as this would likely speak about have already been exhausted.

THE LATE MR. SHARPE.

May I here refer to the loss which the gas industry in Ireland suffered through the death of Mr. R. Sharpe, the late Gas Engineer of this city. Though Mr. Sharpe was not a member of our Association, he was always ready and willing to give us all a hearty welcome to the Belfast Gas-Works. On many occasions I, with other members of our Association, have had the pleasure of visiting the works under his guidance, to our mutual pleasure and profit. I am sure that all here who were acquainted with Mr. Sharpe feel they have lost a valued friend.

HELPLESSNESS OF GAS ASSOCIATIONS.


As a rule, most of us have our attention more particularly directed each year to some portion of our plant which requires either extending or renewing. During the past winter, it has been my duty to make arrangements for the renewal of the retort-bench in the works under my charge; and I have had the pleasure of visiting various works with which members of our Association are connected, for the purpose of inspecting the systems of retort-settings in use, so that I could decide on what I considered most suitable, under the circumstances prevailing, for use at Monaghan. I consider that one of the principal objects of a society such as this has been attained when members are assured of a hearty welcome from their fellow-members at any time they pay a visit to the towns in which they reside. I can remember the time when things were very different indeed—when it was almost an impossibility to gain admittance to many works in this country. Happily this is a thing of the past, thanks, to a very great extent, to the feeling of good-fellowship engendered at our meetings.

CARBONIZING MATTERS.

I think there is no more fascinating study to the progressive gas manager than that of the different systems of retort setting and heating now in use for carbonizing purposes. We are all aware of the great advances made in the larger works from the old methods of carbonizing in horizontal retorts with direct fires. The managers of these works have now many new and up-to-date systems to choose from, including "slopers," verticals, and the different forms of machine charging of horizontal retorts. Some may say that these systems have no interest for the majority of us. But I am of opinion that it should be the aim and object of every gas manager, no matter how small may be the undertaking he is in charge of, to make himself thoroughly acquainted, so far as lies in his power, with all the modern improvements in connection with our great industry, so that when the advancement which most of us are looking forward to comes, we shall be in a position to make the best of our opportunities.

As I have already indicated, I have this summer rebuilt my retort-bench, including all ironwork and connections, complete. The old bench consisted of four beds of three retorts each, and one bed of four, set on the same principle as described by Mr. W. A. Reid, formerly of Longford, in a paper read at the 1899 meeting of this Association, held in Dublin.* There is no question that the results in yield of gas per ton of coal carbonized and per mouthpiece were exceedingly good. But the sales of coke were very poor indeed compared with those reported in other works—due, no doubt, in some measure, to the limited number of retorts in each setting, necessitating the keeping up of at least two furnaces, and sometimes of three, for only a short period in midwinter.

As I am of opinion that it is possible to run any works up to a make of 10 million cubic feet per annum with not more than one

oven in use at one time, I have arranged my new bench with this end in view. The bench consists of thirteen retorts in three ovens, containing six, four, and three retorts respectively, with regenerator furnace, and subway 4 feet under the level of the retort-house floor. The hydraulic main, which is 18 inches by 18 inches,  shape, is supported, as is now usual, on cross girders attached to the buckstays, and is divided into three sections. The gas is taken off from each section at the top plate of the main through a 6-inch valve, and passes into an 8-inch foul main, which runs round the retort-house. The tar is taken off at the bottom of the main, and passes into a tar-tower at one end of the bench, from which it is flushed periodically, and replaced by liquor or water, leaving the dip-pipes, which have their ends turned to a knife-edge, sealed in water only. I find the tar-tower a most useful addition to our plant, and believe a considerable saving will result from its use—the seal being adjustable. I have been running a bed of three retorts with 1-inch seal for more than two months, and there is scarcely a trace of any carbon upon the retorts as yet.

I am not in a position to give you the working results at present, but hope to be able to do so on a future occasion. However, I have no hesitation in recommending anyone who is going in for changes in his retort-house to put in a tar-tower. I had made arrangements to have a retort-house governor fitted also; but I am not yet thoroughly convinced that it would be any great benefit in works such as mine. Still, I am open to conviction, and would be quite ready to have one erected if persuaded that it would be a profitable speculation.

INCREASING OUTPUT AND PUBLIC LIGHTING.

No subject has greater interest for us just now than the question of upholding and increasing our output. The manager who has the interest of his employers at heart must be continually on the alert for ways and means of accomplishing this. The modern gas manager must, of necessity, be a competent engineer; but he should also be largely endowed with the commercial instinct. Like the commercial traveller, he should be always on the look out for new customers, and be ever making a study of the best means of attaining this end. This is the age of advertising, and we should not be behindhand in bringing our wares under the notice of the public. A weekly paragraph in the local papers; the maintenance of a good supply at a regular pressure; and, above all, strict, prompt, and, if possible, personal, attention to complaints, are all-important factors in this direction. A satisfied consumer is always better than one who has something to grumble about; and he may be the means of inducing others to introduce gas into their houses.

The public lamps supply another way of showing what we can do with regard to providing a cheap and brilliant light. Unfortunately, in many cases, the gas company simply supply the necessary gas; lighting, cleaning, and upkeep being in the hands of the urban council. A great many of these bodies are hard to persuade to make a change from the old flat-flame burner. With modern lanterns and incandescent burners, we are in a position to compete with any other method of lighting, both as regards price and illuminating effect. We should all feel pleased at the victory recently gained by gas over electricity in some of the principal streets in the City of London. It would be idle for me to enlarge on what can be done by pushing the use of engines, cookers, fires, &c., as this subject has been frequently dealt with by others more competent.

MANAGEMENT OF GAS-WORKS IN IRELAND.

I have no doubt most of you have read the account of the arbitration proceedings with respect to the purchase of the Lisburn Gas-Works by the Urban District Council. I feel it my duty, as President of the Irish Association, to make some slight reference to the remarks passed by Messrs. Stevenson and Hepworth on that occasion. Mr. Stevenson stated that most of the companies over here (in Ireland) are not well managed; and Mr. Hepworth agreed with him that gas management in Ireland is out of date. Now, to my mind, these gentlemen must either have spoken without due consideration, or their experience of Irish gas-works must be limited. Some time ago, there might have been grounds for this grievous indictment. But I can here assert, from personal knowledge, that vast improvements have been made within the past few years, and that most Irish gas managers, instead of being out of date or behind the times, are as fully alive to, and as keen to take advantage of, any useful improvements as either their English or Scottish brethren. The Irish gas manager, to be successful, must be, and generally is, a very self-reliant man. He is not situated as his brother across the Channel is. He is, as a general rule, far removed from foundries or engineering works, and, as a consequence, he has often to overcome difficulties and carry out repairs with materials that would astound many gas managers more happily situated in the larger towns. Our works being small, the manager cannot afford a foreman. Therefore, he must be always on the alert, and give every department his constant attention.

It is pleasing to find that most of our members can record a substantial increase in their sales of gas, notwithstanding the keen and very often underhand methods practised by our opponents in their struggle for supremacy, more especially in the lighting arena. At no time in the past has there been such intense competition as exists at present. But I feel that we are still in a position to hold our own, and that our industry is almost impregnable. Still, it behoves us to be always on the defence, and to

* See "JOURNAL," Vol. LXXIV., p. 427.

take advantage of every opportunity of maintaining the high standard we have attained for our products.

CONCLUDING REMARKS.

In conclusion, I would refer to the great difficulty experienced in getting papers for these meetings, and would appeal to the members to assist the Secretary in this direction, and, if possible, make our meetings still more successful. As we have two papers on most interesting subjects, I will not detain you any longer. Mr. Donkin's paper, on exhausters for small works, should prove a most useful contribution to our "Transactions;" and that by Mr. Roberts, on high-pressure gas, opens up a subject which is attracting great attention from engineers across the Channel.

Mr. J. PATTERSON proposed a hearty vote of thanks to the President for the very able address he had given them. It was not open to criticism; but he would just like to refer to one little matter to which the President had given prominence—that was, where he took exception to some remarks passed at proceedings in the transfer of the Lisburn Gas-Works. He considered it a serious indictment against the managers of Irish gas undertakings to say that they were generally very badly managed. He thought, on the other hand—and in this he quite agreed with the President—that the managers of gas-works in Ireland were as well able to hold their own as managers out of Ireland. They were often placed in circumstances which their brethren across the water had no idea of. It should be placed on record that this meeting protested in the strongest manner against the remarks.

Mr. F. EUSTACE seconded the proposal, which was agreed to.

THE PRESIDENT'S MEDAL.

Mr. EUSTACE said it devolved upon him to present to their worthy President—Mr. Harrison—the Presidential Medal. He was sure he was voicing all their sentiments when he wished the President many long years to be spared to wear it.

The PRESIDENT said he really felt it difficult to express how very deeply grateful he was to them for presenting him with the beautiful medal.

VOTE OF THANKS TO THE CORPORATION.

The PRESIDENT proposed a vote of thanks to the Lord Mayor and the Corporation of Belfast for their courtesy in placing so magnificent and spacious a building at their disposal. Citizens of Belfast had ever been famous for their desire to encourage advancement and progress, as was evinced by the hall in which they were met. The Association felt greatly honoured in being permitted to have the use of the hall. He therefore asked them to pass the vote of thanks with acclamation.

The vote was accorded with great cordiality.

THE READING OF PAPERS.

The papers were then read—one by Mr. C. Bryan Donkin, of Birmingham, on "Exhausters in Small Works;" and one by Mr. W. H. Roberts, of Newtownards, on "Distribution Pressures, Past, Present, and Future." These, with the discussions upon them, are given in another part of the "JOURNAL."

HONOUR TO MR. JAMES WHIMSTER.

The HON. SECRETARY intimated that the Committee, at a meeting in Dublin in April, passed a resolution to recommend that an illuminated address be presented to Mr. Whimster for his long and valuable services to the Association. He was sure that no words of his were needed to recommend this proposal to them. Mr. Whimster deserved it.

The PRESIDENT said he had great pleasure in proposing that the recommendation be adopted.

Mr. EUSTACE seconded.

Mr. PATTERSON supported the recommendation.

Mr. FRIZELLE also supported it. He had, he said, known Mr. Whimster for 32 years. Mr. Whimster was the founder of the North of Ireland Association of Gas Managers, which developed into the present Irish Association. He knew that he worked night and day to promote the interests of the Association, and of the members generally; and he thought it was as little as the Association could do to present him with an illuminated address.

The proposal was agreed to; and the meeting terminated at the early hour of half-past two in the afternoon.

VISITS TO WORKS.

Parties were made up, who proceeded to visit the works of Messrs. Harland and Wolff, Messrs. Stevensons and Turners' lead works (where the making of compo pipes was seen), and the Corporation gas-works. The last-named was the most popular of the three places visited. At the works, the visitors were received in the exhibition room by Councillor Doran, the Chairman of the Gas Committee, Mr. J. D. Smith, the Engineer and Manager, and others.

Councillor DORAN expressed regret that their time was so short that the Gas Committee could not show them round the city. They would go round the works as quickly as possible. To men who had spent all their days as managers of gas-works, there might not be much new to see. He understood that there was one of their number present who actually served his time within the gas-works at Belfast, and who was now a gas manager. He asked them to assemble at gasholder No. 6, where they would be

photographed, and afterwards they would return to the room for tea.

This arrangement was carried through.

The Dinner.

In the evening, the members and friends dined together in Ye Olde Castle Restaurant—Councillor RIDDLE in the chair.

The CHAIRMAN proposed "The Prosperity and Continuance of the Irish Association of Gas Managers." It was hardly possible, perhaps, that all of them should have the prosperity which had attended the Gas Department of the City of Belfast under municipal management. He was not very old; but he remembered well when the gas-works were purchased by the Corporation, in 1875. The first year the Manager delivered into the mains about 480 million cubic feet of gas; last year, it was 2236 millions.

The PRESIDENT (Mr. J. Patterson) acknowledged the toast, saying they were pleased to learn of the immense prosperity which the Corporation of Belfast had had with the gas undertaking. He assured the members of the Gas Committee that their wish was that the prosperity of the undertaking should continue, and be even still greater. They were satisfied that, under the able management of Mr. Smith, this would be realized.

Mr. G. HARRISON proposed "Kindred Associations," which was responded to by Mr. W. BLAIR, of Helensburgh. He expressed pleasure that a co-worker of his in Scotland had been appointed Gas Engineer and Manager in Belfast. From what they had seen that day, Mr. Smith had a great work before him; but they had no doubt he would prove worthy of the confidence that had been reposed in him.

Mr. G. AIRTH proposed "Prosperity to the City of Belfast."

Councillor HENRY JOHNSTON, in responding, said that the Corporation paid £386,550 for the gas undertaking, which was double its value. They had now very cheap gas; but he believed that it would be cheaper still, as they were looking forward to new works, in which the latest methods of working would be adopted. Perhaps everyone did not know that the Town Hall, in which the Association met in the forenoon, was built and paid for out of the profits on the gas undertaking.

Mr. J. BRODIE (Lisburn) proposed the health of Mr. Harrison, and Mr. FRIZELLE that of Mr. Airth, both of whom returned thanks.

A very happy day's proceedings came to a close shortly after ten o'clock.

On Wednesday, a party of about a hundred ladies and gentlemen went upon an excursion, in charming weather, to Glenariff, and the Antrim coast; going by Ballymena and Parkmore and returning to Belfast by way of Larne.

EXHAUSTERS IN SMALL GAS-WORKS.

By C. BRYAN DONKIN, of Birmingham.

[A Paper read before the Irish Association of Gas Managers, Aug. 9.]

My choice of a subject was influenced by the paper read by my father before the Incorporated Gas Institute, in the City of Belfast, in June, 1893. That paper dealt with the construction of rotary exhausters from the earliest times, with diagrams of the various types which had been tried. However, it is not my intention to-day to go into the history of the gas-exhauster, but rather to deal with it as applied to small works, of which there are many examples in this country. The use of exhausters in small gas-works has, during the last few years, increased very rapidly, as it has been found in practice that the exhauster will effect great economy in any works having an annual make of 2 million cubic feet or more; and several works making only a million cubic feet have adopted it with good results.

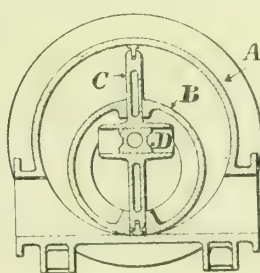


Fig. 1.

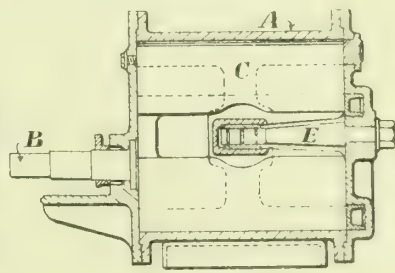


Fig. 2.

The exhauster itself is simply a pump, specially designed to draw the crude gas from the retorts so as to relieve them of pressure. The first exhausters were of the ordinary reciprocating pump type. These have now, however, been superseded by the rotary type, on account of their simplicity, absence of valves, piston rods, &c., and long-wearing qualities and reliability.

Fig. 1 is a section through a rotary exhauster specially suited for small works. The outer cylinder A is fitted with end-plates, having bearings in which the drum B revolves. Through this drum passes the slide C, which is supported by the block D,

mounted to revolve on the pin E; this pin being fixed to one of the end-plates, as shown in fig. 2. The whole weight of the slide being taken by the pin E at the centre of the exhauster, where the speed of the wearing surfaces is low, results in the machine being capable of running for long periods without appreciable wear. One end of the drum is formed into a shaft passing through the end-plate, and, on being revolved, carries round the slide—drawing gas in at one port and forcing it out the opposite side.

The exhauster is generally connected up just after the condensers. To get the best results, it must be arranged to keep a perfectly steady vacuum or pull on the retorts; this pull being set to suit the seal of the dip-pipes. There are two methods of keeping this pull constant—viz. (1) by varying the speed of the exhauster to suit the amount of gas coming from the retorts; (2), by bye-passing. The first method can only be used when the exhauster is driven by a steam-engine; and as the gas-engine is the most convenient power for small works, and its speed cannot be varied to any extent, the bye-passing method of governing is the one adopted.

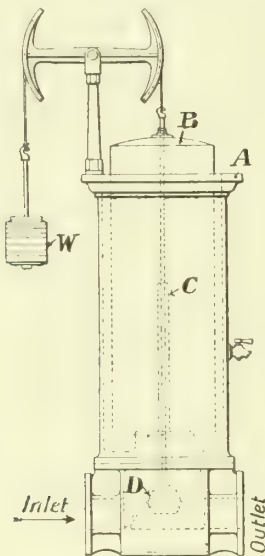


Fig. 3.

Fig. 3 is an illustration of a bye-pass governor which will automatically keep a constant pull on the retorts, irrespective of the amount of gas coming off. It consists of a tank A, partly filled with water, in which floats the bell B. Suspended from this bell, by means of a rod passing down the centre pipe C, is the valve D. The centre pipe also serves to connect the interior of the bell with the inlet of the governor. The bell is balanced by the weights W, which can be adjusted to give any required pull.

This governor is fixed in a pipe connecting the inlet and outlet of the exhauster, and the valve D, being partly open, allows some of the gas to bye-pass back from the outlet to the inlet. If the exhauster pulls too great a vacuum, the bell B will be drawn down, opening the valve D, and allowing more gas to bye-pass. If, however, the vacuum is not sufficient, the bell B will rise, closing the valve D, and thus allowing the exhauster to pass a larger quantity. This governor also acts as a safety governor; for should the engine stop, the pressure of gas coming from the retorts will force up the bell B, and the valve D, being a sliding fit in its seat, will be drawn through, leaving a clear way for the gas. This arrangement makes it eminently suited to small gas-works, as the plant can be left at work in perfect safety.

The advantages gained by the use of an exhauster are principally: (1) Increased make of gas per ton of coal carbonized; (2), greatly lengthened life of retorts. There are also minor advantages, such as more uniform quality of gas and the possibility of giving greater pressure to consumers.

(1) The increased make per ton, due principally to the absence of back-pressure in the retorts, varies in different works and with different coals; but an increase of 1000 to 1500 cubic feet per ton is usual. This increase can be taken advantage of by using a lower grade of coal or by carbonizing a smaller quantity.

(2) The life of retorts is greatly lengthened, because when an exhauster is used there is almost an entire absence of carbon deposit. Consequently, the retorts are not damaged by its removal; also they are not subjected to internal pressure. The gas is of a more uniform quality, as the pull on the retorts is always the same. More pressure can be given to consumers, by using heavier gasholders or by weighing light ones, as the back-pressure so caused is taken up by the exhauster, and does not affect the retorts.

The following results were obtained in a works making about 5 million cubic feet per annum; the same coal being used and the same candle power (18 candles) being maintained:—

	Without Exhauster.	With Exhauster.	Gain.
Average make per ton, cubic feet	8700	10,000	1300
Life of retorts, working days	600	1,300	700

Without an exhauster, 575 tons of coal were carbonized per annum; with an exhauster, 500 tons—annual saving, 75 tons.

In a works producing 2 million cubic feet per annum, the average make per ton without an exhauster was 8800 cubic feet; when the exhauster was used, the make rose to 10,000 cubic feet per ton. In the first case, 228 tons of coal were used; in the second, 200 tons—effecting a saving of 28 tons per annum. The cost of renewals for retorts was also reduced 50 per cent.

The largest item in the cost of running an exhausting plant is the gas consumed by the engine. Taking a 2-million feet works, the exhauster would probably be run only during the first part of the charge—say, an average of six hours a day during the year. A gas-engine suitable for a works this size consumes, according to actual meter readings, 18 cubic feet per hour, including the ignition burner. Putting the number of days a year at which the exhauster would be at work as 360, the annual gas consumption comes out at 38,880 cubic feet (say) 40,000 cubic feet per annum. The amount of oil used for lubricating the engine and exhauster is about 10 gallons per annum (a small amount of tar oil is also generally advisable for occasional use in the exhauster—say, 5 gallons per annum). Exhausters require very little in the way of repairs, and gas-engines only small parts occasionally, with, perhaps, a new piston and liner after a few years' use; the repair bill averaging only about £1 per annum.

The following examples will give a good idea of the saving effected by the use of exhausters in works making, respectively, 2 and 5 million cubic feet per annum:—

TWO-MILLION CUBIC FEET WORKS.					
Saving.			Running Costs.		
	£	s. d.		£	s. d.
28 tons of coal, at 16s.	22	8 0	40,000 cub. ft. gas, at 2s.	4	0 0
50 per cent. of retort re- newals	6	0 0	Oil	1	10 0
			Repairs	1	0 0
Total	£28	8 0	Total	£6	10 0
Total actual saving = £21 18s. per annum.					
FIVE-MILLION CUBIC FEET WORKS.					
Saving.			Running Costs.		
	£	s. d.		£	s. d.
75 tons of coal, at 16s.	60	0 0	120,000 cub. ft. gas, at 2s.	12	0 0
50 per cent. of retort re- newals	8	0 0	Oil	2	10 0
			Repairs	2	0 0
Total	£68	0 0	Total	£16	10 0
Total actual saving = £51 10s. per annum.					

Taking the 2-million cubic feet works, assuming the cost of the installation of an exhauster to be approximately £100, the return for the outlay is immediately apparent; and from the above figures it will be seen that the larger the works the greater will be the economy effected. Besides this, there are other advantages, among them the possibility of running pumps off the engine for tar and liquor.

As methods vary so much in different works, it is only possible to give a general idea of the results obtainable; but the author hopes these will prove of interest.

Discussion.

The PRESIDENT (Mr. R. Harrison, of Monaghan) said that to his knowledge exhausters had been introduced into many small gas-works in Ireland; and the meeting would now be glad to hear from any members who had introduced them recently as to the benefit they had derived from them.

Mr. J. PATTERSON (Queenstown) thought that no one would gainsay the remark that every gas-works with a make of over a million cubic feet per annum would be better to have an exhauster. Mr. Donkin said that an exhauster was simply a pump; and that the reciprocating type, as a matter of fact, had been entirely superseded by the rotary type. Though they were being superseded to a very large extent, there were a good many managers at the present day who had a decided leaning towards exhausters with reciprocating movement; and he himself confessed to having a considerable leaning towards them. The argument put before the members to prove the superiority of the rotary type was their simplicity, their absence of wearing parts, and their long reliability. A more regular vacuum was obtained with a rotary, as compared with a reciprocating, exhauster. They all knew that the reciprocating motion of a reciprocating exhauster caused a constant rising and falling of the gauge; whereas, with the rotary, they got a quite constant motion. He had used reciprocating exhausters himself; and he was still unconvinced that he would be wise in changing them. The wear and tear in reciprocating exhausters were far-and-away less than there would be in the rotary type. This had been his experience. He must take exception also to the statement in the paper about driving a reciprocating exhauster by a gas-engine. He had steam, which he kept as a stand-by; and it was really surprising to what an extent he could vary the speed of the engine by regulating the governor. The gas-engine was regulated to 250 revolutions per minute. When first installed, of course, he went by the makers' instructions, and set the engine to run at 250 revolutions per minute. He drove off the countershaft; and from the same countershaft he drove some pumps. It was found to be rather inconvenient to have the shaft running at such high speed for pumps; and so he set about trying to reduce the speed. He got it down to 140 revolutions per minute. It did just the same amount of work, and ran much more smoothly and steady, and with a saving of about 30 per cent. of the gas. This was his reason for taking exception to the statement that the speed

could only be varied when they had a steam-engine. He said the speed could be varied, to a certain extent, with a gas-engine as well as with a steam-engine. This, of course, was in favour of the gas-engine. He was a great believer in gas-engines; and the more they could find out about them, the better position they would be in to recommend them to their customers. Mr. Donkin spoke about the life of the retorts being greatly lengthened upon the adoption of an exhauster in small works. This was said to be because, when an exhauster was used, there was an almost entire absence of carbon deposit. He would not gainsay that the amount of carbon deposit was greatly reduced by the use of an exhauster, because the retorts were not subjected to internal pressure; but the passage he wished to refer to was that in which it was said that the gas was of more uniform quality. He had heard the very opposite stated on many different occasions—that, immediately an exhauster was introduced, down went the quality. And it stood to reason that, if they were going to keep a level gauge, or even a vacuum to exhaust the retort, there was bound to be a certain amount of depreciation of illuminating power. His experience was that immediately they introduced an exhauster, there was greater variation in the quality of the gas than before. Of course, this was greatly in the hands of the manager, in not unduly driving the exhauster, and pulling other stuff through as well as gas.

Mr. T. J. REID (Ballina) asked if the tests in a works of 5 million cubic feet were really carefully made, because the figures given were a little suspicious. The average make of gas per ton, without an exhauster, was 8700 cubic feet, and then, with an exhauster, it jumped to the nice round sum of 10,000 cubic feet. While this might happen, it was, to his mind, a coincidence. The life of the retorts, without an exhauster, was said to be 600 working days; and with an exhauster, 1300 working days. This was, of course, a marvellous jump; and he should like to know the works where retorts could be worked for 1300 days. Such a life would be very good even in large works, where every care could be taken of the retorts. Then, again, without an exhauster, 175 tons of coal were carbonized, and with an exhauster the quantity dropped to 75 tons—another suspicious round number. He was not saying that these results were not actually obtained; but they must all admit that the numbers were slightly suspicious. He joined issue with Mr. Patterson about the running of a gas-engine. Everyone who was acquainted with a gas-engine was aware that there was an economical number of revolutions in it—that was, there was a minimum number below which, if they went, they ran the engine at a disadvantage. He noticed that in the paper no credit was given—in the comparison between a one-million and a five-million works—for the amount of coke which would result in the one case and in the other. At 20s. per ton, the coke in the case of a yield of 10 cwt. per ton of coal, would be £14 in the one case, £27 in the other. He did not think anybody would contend that the introduction of an exhauster was undesirable. Twenty years ago it was argued that an exhauster was not justified in very small gas-works; but he thought that most people would now admit that an exhauster was desirable—certainly, in works above a million cubic feet.

Mr. W. MILLAR (Cookstown) found that an exhauster which he had, going at about 275 revolutions per minute, was far too fast. The greater part of the gas was being bye-passed. By means of a cord from the pump on to the governor of the gas-engine, he was able to lower the speed of the engine down to a third, and to do away with bye-passing altogether. He had done this for seven years; and he could endorse the statement about a gas-engine being a good thing for driving an exhauster. He had had ten years' experience of a steam-driven exhauster. He had to get in a man to clean the boiler; and that, with the inspection by the insurance company, cost about £2. He threw out the steam-engine, and put in a gas-engine, which ran for nine years, night and day; and in this time the repair bill amounted to only 14s. There was nothing in connection with the gas-engine which an ordinary stoker could not accomplish. With steam, the pressure in the boiler was liable to go down; and there was no satisfaction at all with the exhauster. With regard to the cost of running a gas-engine, in a works making two million cubic feet, he found that it could not only be done with 18 cubic feet, but that in the depth of winter it could be done with 15 cubic feet per hour, with three retorts in operation.

Mr. PATTERSON explained that the figures he had given with reference to the reduction in the consumption of gas in a gas-engine, consequent upon the reduction of the number of revolutions, were based upon actual facts. According to the makers, when driving an exhauster off a countershaft the consumption of gas was 8700 cubic feet per week—running 24 hours per day. It was in consequence of his finding that he was bye-passing an enormous quantity of gas that he started the experiment of reducing the speed of the exhauster. He could have done it quite easily by changing the pulleys on the countershaft; but he wanted, if possible, to avoid doing this. With this object in view, therefore, he started to experiment. He unshipped the governor of the gas-engine, and immediately got the speed down so far; and then, by means of a weight, he got it down to 140 revolutions. He found that he saved 3100 cubic feet of gas, which was fully 30 per cent. Like Mr. Millar he had had a good deal of experience in running an exhauster with steam power. There was a tendency to run with steam because they had a lot of surplus fuel which could be used in a steam-boiler. So long as he was about, there was nothing but breeze consumed under the boiler, except when clinking was going on, when 1 cwt. or over of coke was

employed. In this way, 21 cwt. of coke was used weekly, of the value of about 21s. When he introduced a gas-engine, the consumption of gas per week was 8700 cubic feet. He reckoned the price of gas into the holder at 1s. 6d. per 1000 cubic feet. Taking 8700 cubic feet gave a charge of 12s., as against 21s. when driving with coke alone. Now he was able to sell the breeze; and he got a considerable revenue out of it besides. So that driving by a gas-engine was much more economical than driving by steam alone, without taking into account that the wear and tear of gas-pipes was much less than that of steam-pipes.

Mr. DONKIN, in closing the discussion, said there were very few works now in which there were reciprocating exhausters; and where they had them, they were mostly being put out. By regulating a gas-engine, he meant "automatic" regulation, so that the exhauster itself would keep a constant pull, without any attention whatever. They could not do this with a gas-engine, except within certain limits. Mr. Millar said he had got very good results in this direction. He thought he was about the only man who had ever done so. As to the uneven quality of the gas, he had had to rely upon what he had been told by various gas managers upon this subject. He had got results from a number of works of two and five million cubic feet, and had averaged them up, so as to give a fair figure, because he did not want to single out works which were showing extra good results. He could give the names of works where were the retorts which he said had an extra long life; but he did not know that the managers would care that the names should be made public. He had overlooked the point about the coke. Of course, this would make a difference in the consumption of gas per engine. Mr. Millar got wonderful results—15 cubic feet, where the average, in a large number of works, was 18 cubic feet. This would certainly seem to be in favour of the exhauster.

Pressure Filters. placed direct on the mains, are in use by the Municipality of Krugersdorp, South Africa, who obtain their supply from a reservoir in which the water, during heavy rains, becomes highly discoloured. The filters are of the Candy type. Each is 7 feet in diameter, has a capacity of 6000 gallons per hour, and operates under a head of approximately 70 feet.

Gas Oil at Garston, Liverpool.—A tank to hold a million gallons, or 4000 tons by weight, of oil for gas making was erected recently at the works of the Liverpool Gas Company at Garston. We learn from the "Chemical Trade Journal" that the steamer *Caucasian* recently arrived with the first consignment of gas oil. The vessel delivered a full charge of 4000 tons of the oil, which was pumped through a pipe-line between the dock quay and the tank. The steamer was the first "tanker" to enter the new Stalbridge Dock; so that her coming with a supply of oil for the tank was regarded as a matter of importance to Garston. The tank in question has been erected by the Company to enable them to save the cost of railway carriage from a dock some 3½ miles W.N.W. of Garston.

Engineering and Machinery Exhibition at Olympia.—On Thursday, the 1st prox., the Marquis of Graham, C.V.O., will formally open the Naval, Mercantile Marine, and General Engineering and Machinery Exhibition at Olympia. The exhibitors include leading firms of manufacturers and engineers in London, Glasgow, Birmingham, Manchester, Leeds, Bradford, Huddersfield, Hull, Edinburgh, Sheffield, and other industrial centres. The exhibits comprise metallurgical processes and raw materials, castings, machine-tools, shop-tools and appliances, lifts, lifting-appliances, contractors' plant, tubes and fittings, transport plant, mechanical stokers and conveyors; warming, lighting, sanitary and ventilating apparatus; and gas, steam, and oil engines, &c. Special meetings of several engineering and scientific societies will be held during the period of the exhibition. The programme of events, as at present arranged, includes the following fixtures: Sept. 6, Junior Institution of Engineers; Sept. 15, Institute of Sanitary Engineers; Sept. 21, Society of Engineers; Sept. 24, Association of Engineers-in-Charge. The Organizing Secretary and Manager is Mr. F. W. Bridges, assisted by a strong Advisory Council. The exhibition will be open from Sept. 1 to 26, inclusive.

Automatic Public Electric Lighting in Germany.—The following is a translation of an extract from the "Berliner Morgenpost" of the 5th inst.: The first place in Germany to be provided with automatic electric public lighting is probably the village of Zarkau, near Glogau, in Silesia, where 12 minutes' lighting can be obtained for 10 pf. The road from the boundary of the town of Glogau to the commune of Zarkau, which is about 1 kilometre (0.62 mile) in length, is provided with nine electric incandescent lamps, which amply light this piece of road. The communal authorities pay for the lighting of these lamps until ten p.m. After this hour, however, anybody can place a 10 pf. piece in either of the two prepayment meters attached to the lamp-posts at each end of the road, when the light will be switched on for 12 minutes—a period sufficient to enable anybody to walk comfortably from one end of the road to the other. The current is switched on in the same way as with the automatic staircase lighting; the prepayment meter being contained in a small and unobtrusive iron box. A shield is attached explaining the object of the meter; and at ten p.m. it is lighted by a small lamp. The period during which the lamps remain alight is regulated by clockwork.

DISTRIBUTION PRESSURES, PAST, PRESENT, AND FUTURE.

By W. H. ROBERTS, of Newtownards.

[A Paper read before the Irish Association of Gas Managers, Aug. 9.]

In taking the above for my subject, I believe I am touching upon a matter which will be of great importance in regard to the future requirements of gas distribution. Gas engineers of the present day would, in my opinion, be well advised to look a bit ahead before making any great extensions in the distribution department. This paper, as is shown by the heading, is composed of three parts, the first of which deals with the pressures of the past. In using this phrase, I may say I am speaking of the time which is only of recent date, when we were supplying pressure suitable for flat-flame gas-lighting; burners of this type giving the greatest efficiency when the pressure at the burner did not exceed 5-10ths, and 10-10ths to 15-10ths pressure was quite a common thing in the distribution mains. With the advent of the incandescent burner, these conditions are completely changed.

Having made these remarks on the past, I think we may devote the rest of our time profitably to the present and the future. I will therefore take up the second part of my subject—viz., the pressure of the present. This at once raises the question, What are the pressures of the present? In nearly every town where progress has been made, it will be found the gas manager is piling on all the pressure his plant and circumstances will permit. But I am safe in saying that in the majority of cases the pressure is under 3 inches, and that very few, if any, can maintain an all-round pressure up to 5 inches. In the same towns will be seen private establishments finding it to their advantage to instal special plant for raising the pressure to 12 inches, and even up to 54 or 60 inches. You will also find them adopting what is termed the "Selas" system—i.e., adding 2 parts of air to 1 part of gas, and working at a pressure of 10 inches. As there is something to say in favour of each, and a good deal to say against them all, the question is, What should be the pressures to meet present-day requirements?

I do not hesitate to say that the gas profession has not given this matter, which is of great importance, the attention one would have expected. Up to the present, I have not heard of anyone, either in or out of the profession, who has attempted to state what is the proper and most efficient pressure to maintain on distribution plant. All that I would myself care to say at present is that it should be a great deal more than we are now giving. In Newtownards, the greatest maintainable pressure that I have been able to give in the past has been 30-10ths. But we have now made arrangements whereby the pressure this year will be maintained at 4 inches, or even more, and can be increased to 10 or 12 inches. This we shall probably do at the rate of 1 inch a year, so long as we are satisfied it is advantageous to do so.

I believe this is one of the first steps in departing from the practice of the past to that of the future. I feel quite safe in saying that the pressures at present supplied are more a matter of force of circumstances and past conditions than that the gas profession believe or desire these to be the pressures suitable for incandescent lighting. Manufacturers of incandescent burners are no better off. For instance, had they been required to supply burners to work at a pressure of 12 to 14 inches, instead of under present conditions, would they have been supplying the present type of burners? In all probability, they would not. Take, for instance, the Keith burner, working at 60 inches pressure. The efficiency and brilliancy of this burner is unquestionable. If our general supply could be done with safety at this high pressure, electricity and all other systems of lighting would be put further in the shade than ever. Since lighting our new technical school and one or two private establishments direct from our high-pressure system in Newtownards, I have had ample proof that there is much to be desired in regard to our present means of distribution. I am having requests continually for the same results in private dwellings; but, as you know, I could not take the risk of putting this high-pressure on under present conditions. The Selas system I do not think lends itself to present-day distribution. I will, therefore, deal with it under the heading of pressures of the future.

As to pressures of the future, I do not think it needs any one to be a prophet to state that present-day conditions will in the very near future be placed with those of the past. But what will take their place? Those who are acquainted with the Keith and Selas systems will not hesitate to say that if the danger of the one cannot be overcome, the other (the Selas) has not this defect; and, as far as the consumer is concerned, it is nearly, if not quite, as efficient as the Keith system. To get away from the past and present, let us consider our position if any of us were asked to erect a new gas-works in a town where gas has never been supplied. Among other things, we would have to decide upon the distribution system. We have, at once, the present-day system of distribution adopted by gas undertakings—the Keith system and the Selas system. Present-day distribution is, in my opinion, only worthy of a passing glance, and then to be cast aside as a system of the past. The second—the Keith high pressure—is an ideal system in every respect but one—viz., the high-pressure it is necessary to supply at makes it, as far as one can form an opinion at present, unsafe for general use, though with common use and experience this may be found not to be the case. The

brilliancy and efficiency of the light obtained from this system is well known to you all, and needs no comment from me.

But before passing from this, might I ask, Is it necessary to have such a high pressure in order to obtain the well-known efficiency under this system? The reason I put this question is that in testing the Keith burner as an air-injector against a pressure, I found it capable of only injecting a very small portion of air against a pressure of $\frac{1}{2}$ inch. By using another form of injector, I was able to inject an equal quantity of air, with the same volume of gas, against a pressure of 2 inches. Based on the same ratio, might we not expect that with an improved burner the same results could be obtained with 12 to 15 inches pressure? If this were found the case, I would not hesitate to adopt this system in preference to our present practice. Failing this, our attention might be profitably turned to the Selas system.

By this system, the efficiency of the burner is almost, if not quite, as efficient as the Keith system; and as the pressure is only 10 inches, it would be within quite reasonable limits for any town. The main difficulty to be faced would be the provision of the extra carrying capacity of the distribution plant, owing to two volumes of air being required to be passed along with the gas. Having regard to the modern improvements in distribution of compressed gas, either in boosting mains or on the distribution mains, it is surprising to find that in small undertakings such as we have to deal with in Ireland, the costs under the different systems are such that it will be only a matter for the gas engineer to decide in each individual case, according to the local circumstances. For instance, putting high pressure on the mains means a considerable outlay for governors on consumers' meters. On the other hand, boosting would only require one or two district governors; and the saving in cost of consumers' governors would go a long way in laying a boosting main. Thus, in the towns we have to deal with in Ireland, the branch mains being of such small diameter, it would be surprising to find, in working out an individual case under either system, the small difference in cost. I admit that these conditions would differ greatly in the Belfast or other large undertakings.

I have just one other point to take up, and, though last, it is not least, and should be interesting from a consumer's point of view—viz., the saving such a scheme as I suggest, if adopted, would be to the consumer. The following statements are based on what I believe to be obtainable, even with our present knowledge, and what is being obtained in small units all over the kingdom. I will take Belfast for example. Last year, 2,139,900,000 cubic feet of gas were consumed. In all probability, 1,100,000,000 cubic feet of this were used for lighting. This would represent somewhere about £96,250 for the total gas lighting required in the city. Now, to give the same lighting value under one or other of the schemes suggested, or, better still, one of the same lighting value and more efficient as regards supply and distribution, would, for the same area, reduce the cost of lighting to £43,346. It has been suggested to me to show a comparison with electricity at Belfast prices. As I am not extra well acquainted with electrical valuations, I got this done by a party who was specially up in these figures; and the figures he has furnished me with show that it would cost £56,000 more to obtain the same light from electricity at the present price of current in Belfast. Also, assuming that one mantle is required for every 3000 cubic feet of gas consumed, the greater life of the high-pressure mantles and less cost of attendance would represent, I am safe in saying, another £9000 saving to the gas consumers. Added to this is the most important item of all—viz., the very little attention required to keep the burner adjusted and in good working order; thus doing away with the constant annoyance and inconvenience at present experienced by the public in using ordinary incandescent burners.

Another important point to be considered is the time at which a gas undertaking should put into effect this stage of transition, so as to choose the time which would be most advantageous to all concerned. I may again take Belfast as an instance. Assuming that at the conclusion of this discussion to-day we have arrived at what may be considered the fit and proper scheme to be adopted for the future, Belfast could, by adopting such a scheme, probably put off indefinitely the enormous expenditure at present contemplated, as the actual requirements for gas would be reduced about 25 per cent. on present consumption; the major portion of this reduction taking place at a time when everything is taxed to its maximum, and, consequently, when relief would be of the greatest importance. But, on the other hand, owing to the value of the light obtained being more than doubled for the same cost, there is every risk of the increased demand being so great as to make it impossible to have the contemplated extensions carried out in time.

Discussion.

The PRESIDENT (Mr. R. Harrison, of Monaghan) said that the subject of Mr. Roberts's paper was one which was attracting a good deal of attention from their brethren on the other side of the Channel. He noticed that Mr. Waddell, of Dunfermline, and Mr. Keillor, of Lochgelly, had been carrying out a good deal of experimenting in this matter; and they seemed to have made it a success. He did not know that it would be such a success in small works in Ireland. Sometimes he found that 3 or 4 inches of pressure was far enough for them to go. Often their distribution plant was not in such good order as would stand a pressure like 54 inches. He hoped, however, the paper would create a good and interesting discussion.

Mr. W. MILLAR (Cookstown) instanced the case of the owner of two factories, who was about as keen a business man as was to be met with in the North of Ireland, and who had had one of his mills lighted by paraffin oil for about twenty years. In his other mill, he burned coal gas in one part, and used electric light in the other. The gas he put in was an 8-inch Keith installation. He was so well pleased with it that he put in a 54-inch installation in the other mill. It was found to give 50 candles per cubic foot of gas used, without any globes. It had been a very great success. In another mill, the pressure went down to 1-inch, which he need not tell the meeting was of no use. He got them to put in a high-pressure system, with good results. The consumption of gas had gone down over 50 per cent.; and the light was increased over 200 per cent.

Mr. J. BRODIE (Lisburn) said the paper was one which brought them very closely into touch with present-day work across the water—at least in a good many instances, such as had been mentioned by the President. He could verify the statements made by Mr. Millar as to the mill he referred to. In a case which he had, the question of lighting was gone into very closely. Some time after an electrical system was put in, they tried an 8-inch Keith plant; and it was so satisfactory that they put in a 54-inch system. The manager of the mill had told him that it paid them to take gas from them at 3s. 4d. per 1000 cubic feet, less discount, rather than light the mill themselves. Mr. Roberts had mentioned that the Selas system of lighting, which had been known in Ireland for a long time, had been very satisfactory; and he was sure that any of them who contemplated going in for a high-pressure system of lighting would take it into consideration.

Mr. J. PATTERSON (Queenstown) said there was no doubt that the pressures of the past were gone and buried; but it was a strange thing to find, in towns of large dimensions, pressures of from 23-10ths to 24-10ths at night, and day pressures of 15-10ths. How people could get satisfaction under these circumstances was beyond comprehension. Still they would not increase the pressure. The idea seemed to be that to increase the pressure would be to increase the leakage. He did not at all agree with any such contention. As a matter of fact, he did not believe that the leakage which was represented as taking place in an undertaking, actually took place to any considerable extent in the mains. In his opinion, the greater part of it took place in the service pipes, and was largely accounted for by defective meters. In one works he was in, the leakage was abnormal; and he went to a great deal of trouble in testing all the mains and services. They were very much surprised at the result. They then went in for testing the meters, and were amazed at finding the number of them which were wrongly registering. On the other hand, he believed that if they increased the pressure, small leaks which were at present undetectable would be detected, and they would be able to make good the defects. So that he really thought that the leakage would be less under high-pressure conditions than at the present day. There was no doubt that, to get satisfactory lighting with incandescent burners, anything under 3-inch to 4½-inch pressures were practically useless. In his own district, he maintained a minimum of 40-10ths pressure; and in some districts even up to 60-10ths. Where they had 60-10ths, the lighting was far better than in districts where they had only 40-10ths. So the tendency was to increase the pressure; and he believed, with Mr. Roberts, that the time was not far distant when pressures far beyond those in use at present would be found the best.

Mr. T. FRIZELLE (Holywood) wished for a word on the other side. He considered they could have too much pressure. He held that, in an ordinary country town, from 3 inches to 4 inches of pressure was ample for ordinary purposes—cookers, incandescent burners, and street lighting. If they could get 50 to 60 candle power per cubic foot in the street-lamps with from 3 inches to 4 inches of pressure, why should they instal a Keith system, or any other high-pressure system, when they got what they wanted with the ordinary pressure from the gas-works? This was the case in the majority of residential districts. He spoke from experience in a residential district, where they had no factories, or public shops or warehouses, of any description, but only ordinary private consumption; and he held that where the mains were ample, a pressure of 3 inches to 4 inches was sufficient for ordinary work. If one lived in a growing district, the mains would, in all probability, be rather small. They could either put in a larger main or they could boost the existing one. But if the mains were large enough, the ordinary pressure of 3 inches to 4 inches, which most of them could get from their holders, was sufficient.

Mr. T. J. REID (Ballina) congratulated Mr. Roberts on being the first gas manager in Ireland, as he understood, who had put in a system of high-pressure distribution from the gas-works. The subject of his paper was one which should be carefully considered, because systems which might do in larger places might not be suitable in small works. In gas distribution, it was necessary that, whatever pressures might be decided upon, they should be uniform. This pressure he would put, for domestic purposes at (say) 4 inches; or, if a burner could be produced which would give better results without creating objectionable fumes, he would even increase the pressure. It was impossible to say what the pressure would be in the result. It would altogether depend on the burner. For outside lighting, he would put the limit at what the mantle would stand—which, he believed, would be up to about 60 inches. It would be necessary with such a pressure to have an extra pressure on the mains. But they all knew that their mains had been laid in such a bad way that to attempt high

pressures with them would not always be advisable. He believed that there was a works in England where they had high-pressure lighting by gas; and he had looked forward with some interest to learning how the works had turned out. But up to the present, he had not had any reliable information on the subject. In comparing lighting by high-pressure gas and by electricity, did Mr. Roberts pay attention to the actual outlay involved in the high-pressure distribution of gas, or had he merely taken the present cost of gas? He (Mr. Reid) would like to know if high-pressure lighting required the attendance spoken of in the paper.

Mr. ROBERTS thanked the members for the friendly discussion which had taken place upon his paper. Mr. Frizelle felt satisfied with a pressure of from 3 inches to 4 inches. He would not care to put more than this on his present day supply; but let them assume that a town was putting out two-thirds of its supply by boosting mains—say, a town selling 20 million cubic feet. Such a town might increase up to 200 million cubic feet by boosting. This meant that, getting 50 to 60 candles per cubic foot from low-pressure mains, they were going to bring this down to only 20 candles; so that they would be bringing down the value of their commodity. This was a thing they would hardly care to practise. In their Technical School they had over sixty high-pressure gas-burners which had been in use since January; and up to the present time (unless on one or two occasions when a workman broke a mantle), not a mantle had given way. He knew that a considerable number of low-pressure mantles had had to be replaced in that time.

REINFORCED CONCRETE WATER-PIPES.

About three years ago, the Board of Water Supply of the City of New York built at Hunter's Brook, near Peekskill (N.Y.), experimental sections of reinforced concrete pipe, and tested them under various heads (up to a maximum of 125 feet), to determine the practicability of this type of structure for certain portions of the Catskill aqueduct which will supply the city with at least 500 million gallons of water daily from the Catskill Mountain watersheds, some 100 miles north of New York. The records of these tests are contained in the last annual report of the Board; and the following notes are taken from "Engineering Record."

The test section of pipe was circular, 11 feet inside diameter, 8 inches thick, and 210 feet long, made up of seven 30-foot lengths. It was reinforced with welded rings of twisted square steel bars, about 1 square inch of cross section for every 2½ inches of pipe length. The concrete was quite wet, machine-mixed in the proportions of 1 part portland cement, 2 parts sand or stone screenings, and 3½ parts gravel or broken stone. Transverse tests made on samples of the material at seven months (the average age of the pipe when tested) indicated an average tensile strength of not less than 330 lbs. per square inch; the so-called transverse strength being 400 lbs.

When first tested under a head of 28 feet, the leakage from the pipe was at the rate of 560,000 gallons per mile per day, most of which was due to porous spots in the sides of the pipe, especially where stone screenings, instead of natural sand, had been used in the concrete. After grouting and pointing the defective portions with cement mortar, the leakage was as follows.

Head, in Feet.		Gallons per Mile per Day.
30.	Leakage	55,000
62	Initial leakage	119,000
	Decreasing after six hours to	78,000
93	Initial leakage	215,000
	Decreasing after two days to	110,000
125	Initial leakage	465,000
	Increasing after five repetitions in six days to	816,000

After again pointing and painting the interior surface with grout, the leakage was as given below.

Head, in Feet.		Gallons per Mile per Day.
34	Leakage	28,000
62	"	36,000
92	"	114,000
125	Initial leakage	240,000
	Increasing after six repetitions within six days to	497,000

The magnitude of the leakage in the first test, according to the report, was due mainly to imperfections in the concrete. Under a moderate head—less than 100 feet—the leakage decreased while the head remained constant; but when the head was increased, the leakage increased at a somewhat higher ratio. On reaching a certain "critical head"—in this case about 100 feet—the permeability of the pipe was radically changed; the leakage not only increasing at a much higher ratio than the head, but with each new application of pressure, indicating that the concrete begins to crack when the "critical head" is exceeded. A large number of longitudinal cracks were actually observed. Most of them, however, were so fine as to be perceptible only by colour differences, while the concrete was still damp after the pipe was emptied. When the first cracks appeared, the tensile stress in the concrete was estimated at 270 lbs. per square inch, or 82 per cent. of that derived from the beam tests. The results recorded in the report states, are for the pipe as a whole, though considerable portions of the pipe remained dust-dry under the maximum head of 125 feet.

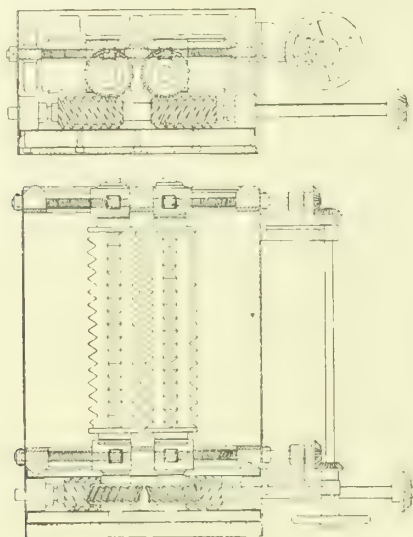
REGISTER OF PATENTS.

Breaking Coke and Other Materials.

INGHAM, O. H., of South Shields.

No. 12,087; May 22, 1909.

This breaker is of the class in which rollers with teeth, grooves, or other projections or indentations, revolve and crush the coke to the required size; the object aimed at being to provide a means by which the distance between the rollers may be adjusted to suit the various requirements and separated to such an extent that the coke can be passed right between the rollers and through the machine without being broken at all.



Ingham's Adjustable Coke-Breaker.

For this purpose, the rollers are fitted (as shown) with a shaft running through their centre and made to revolve in bearings carried in, and forming part of, a rectangular block, which is free to slide between guides formed in the side plates of the machine, and move in a line at right angles to the centre line of the rollers. These rectangular blocks are also large enough to allow of a shaft or spindle passing through them at right angles to the centre line of the rollers. The shafts or spindles have a square thread on the part which passes through the rectangular blocks, which are also threaded in a similar manner. The rectangular block on one roller has a right-hand thread; while the one on the opposite roller has a left-hand thread.

A cross shaft with bevel gear and a hand wheel connect these two shafts or spindles together at one end, and not only provides a means for operating the screwed shafts or spindles, but also ensures a simultaneous movement to both shafts or spindles, when the hand wheel is revolved, causing the rollers to be moved nearer together or further apart according to the direction in which the wheel is turned.

Parallel to the threaded shafts or spindles, but on one side of the machine only, a driving shaft is placed, on which right and left hand worms are fixed in a position suitable for driving the toothed worm wheels on the roller shafts, which revolve in opposite directions.

The worms are made sufficiently long to keep in gear with the toothed worm wheels during the operation of moving the rollers nearer together or further apart as the case may be.

Automatically Operating Valves for Gas-Lamps.

CONTI, A., and GALLI, A., of Milan.

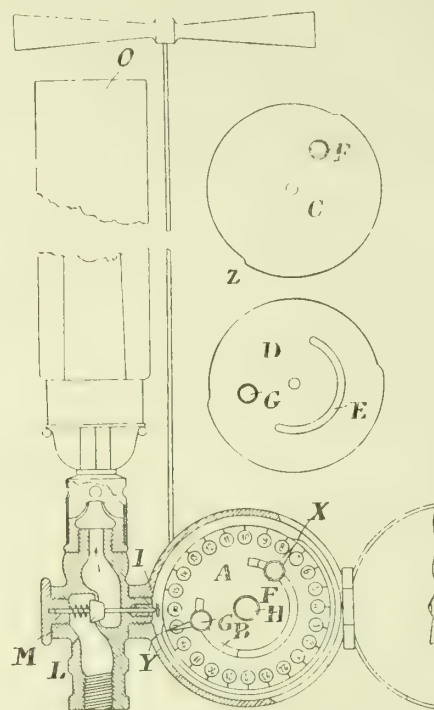
No. 12,991; June 2, 1909.

This apparatus, for automatically kindling and extinguishing public gas-lamps, is of the kind in which clock-work mechanism is employed that is connected with the gas supply valve or cock with which it is connected through the medium of a pair of relatively adjustable semi-circular cam discs of different diameters, and in which a pilot flame is also provided, arranged in proximity to the gas-burner, to light the lamp when the gas-cock is opened. The object of the invention is to provide an improved valve construction, which can also be combined with means for automatically winding the clockwork mechanism.

The illustration shows one form of the apparatus in which the clockwork is provided with fan winding mechanism of known form. The dial A is provided with a segmental recess B; and beneath the dial there are two circular discs C and D (shown separate) mounted upon the same pivot and concentrically with the dial, together with which they are rotated by the clockwork. The upper of the two discs is provided with a semi-circular recess E, the radius and width of which corresponds with those of the recess in the dial. A pin is fixed to each of these discs. The two pins F and G extend outside the recess B provided in the dial; and each of them carries a guide-piece provided with an index. Y is the stud G belonging to the upper disc C; the other is marked X. One of them corresponds to the kindling of the lamp and the other to its extinction. The two discs are of equal size; but neither is perfectly circular. The circumference of each disc has two different diameters, so that each disc is composed of two halves of different radius, the points of transition of which correspond in the known manner to the period of lighting and extinction respectively.

The operation of the apparatus is as follows: Assuming the lamp in question is to be lighted at 5 p.m. and extinguished at 7.30 a.m. By turning the knobs G and F, the lighting index Y is set at 5 o'clock and the extinguishing knob at 7.30. In order to do this, it is merely neces-

sary to slacken the screw of the pivot H, which assembles the two discs with the dial, so that the two indices are brought by hand into the desired positions; whereupon the discs are again fixed to the dial by the same screw, so that they are rotated by the clockwork simultaneously with the dial.



Conti's Automatic Gas Lamp Lighter and Extinguisher.

As the studs and the indices rigidly connected with them are arranged left and right of the centre of rotation of the corresponding disc, and both of them are located on the diameter which corresponds with the line of division of the two semi-circles, the lamp will be kindled when the dial, together with the index Y, brings the position 17 (5 o'clock) opposite the end I of the gas-admission valve L provided with a guide-valve or stem, because this position corresponds to the point of transition Z of the projection of the disc C; and the half-discs of larger diameter, in pressing the conical gas-valve L towards the left-hand, enables the gas to flow into the lamp. The lamp is now lighted by the pilot-flame, and remains alight for the desired period—in the present case, until the dial, the discs, and the index X have reached the position 7.30 in front of the end of the gas-valve; so that, in passing from the larger to the smaller disc diameter, even under the counter-effect of the spring M (which is preferably provided behind it), the valve resumes its closed position, prevents the gas from flowing in, and thereby extinguishing the lamp.

Gas-Fittings for Domestic Ranges.

HOWORTH, A., of Fleetwood.

No. 13,964; July 10, 1909.

This invention relates to domestic or kitchen ranges whereby they may be available for heating by coal or gas firing.

It had been previously proposed, the patentee points out, to provide a combined coal and gas fired stove, in which, in addition to the usual coal-fire, the oven may be heated by means of gas-burners disposed along the lower corners of the oven, the burners being fed from gas-pipes passing down the sides of the range, with closable air entrances to the oven in the shape of removable plates below the oven door, and closable vents leading from the oven into the flues—a gas-griller being also fitted to the stove.

The particular features of the present invention relate to improvements in such types of ranges, and consist in the particular means proposed for constructing the removable plate at the lower front part of the oven whereby it may be slid into sockets formed in the wall of the oven front; the plate being adapted to be inserted in position when the oven is to be utilized for coal-firing and removed for gas-firing. Further features of the invention relate to the particular arrangement of a gas-griller on the ordinary hob, and of a gas-burner on the upper plate of the range.

Turning On and Off Gas-Lights at Definite Times.

MEHNE, J. G., of Schwenningen, Wurttemberg.

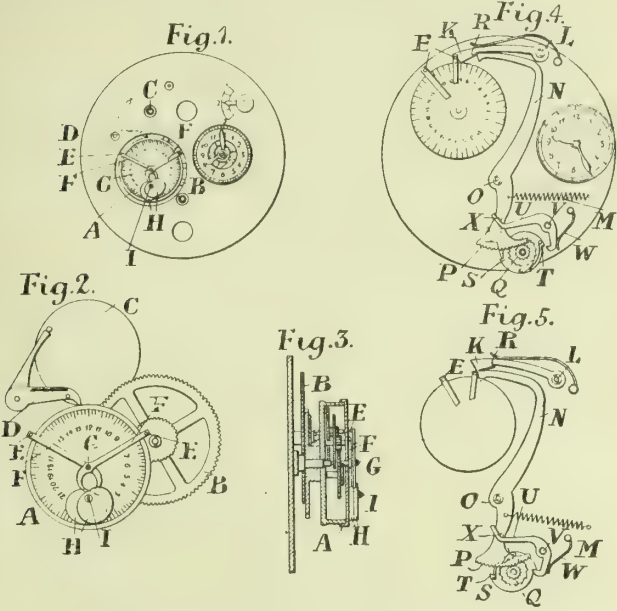
No. 14,052; June 15, 1909.

This invention relates to time switches of the type in which certain circuits are automatically closed and broken by clockwork mechanism at certain periods in the day—these times being made to vary with the season of the year. The arrangement is such that the pin on the twenty-four-hour wheel or the like serves first to lift a catch which releases the operating lever for the switching mechanism, and afterwards serves to press back the lever into re-engagement with the catch.

Fig. 1 shows the time-switch in plan view. Figs. 2 and 3 show the twenty-four-hours wheel with the switch device in plan view and axial section. Fig. 4 is a plan view of the controlling device. Fig. 5 shows the method of operating the pins.

The wheel A makes one complete revolution every twenty-four hours, and is driven in the usual way by a clockwork B of any kind. The movement C is thus released at the desired time and again stopped by

means of the usual stopping lever D, on which the pins E strike. These pins are arranged on levers F, which preferably revolve loosely on a common shaft G, which at the same time forms the spindle of the wheel A. For controlling the levers F, a corresponding number of cams H are provided, the form of which corresponds to the increasing and diminishing length of day. These cams revolve on a common spindle I, and perform one complete revolution in the year. This revolution is preferably effected by gearing firmly mounted on the shaft G, which drives, by suitable toothed wheels, the spindle I and cams H; so that these latter to a certain extent roll on the stationary gear.



Mehne's Gas Lamp Cock Opener and Closer.

In order to drive the apparatus only with the clockwork mechanism, the following arrangement is adopted: The pins E or other eccentric raised portions strike on a pawl K (figs. 4 and 5), which is revolvable on a pin L. The pawl serves for stopping a switch lever N pivoted at O and standing under the action of a spring M, and at the other end is formed as a tooth segment P, which is an engagement with a toothed wheel Q, which drives the switch device of the lighting installation. For stopping the lever N, the pawl K is provided with a shoulder R, in which the end of the lever engages when it has reached its stopping position. The pawl K as well as this end of the lever N have for this purpose preferably inclined or bevelled faces. In order to fix the switch device exactly in the new switching position—that is, to avoid over-rotation—a stopping disc S is provided on the axis of the wheel Q, which is provided with offsets or projections T, the number of which correspond to the two positions of the switch. Further, a locking lever U is arranged which is pivotal on a pin V and under the action of a spring W. This lever is hook-shaped at its end; while the other end projects into the path of a pin X on the lever N.

The mode of action of this arrangement is as follows: If a pin E or the like strikes on the bevelled end of the pawl K, this latter is lifted and the lever N released. It is thereby swung forward by its spring M, and effects the switching on or off of the lighting installation. On the further rotation of E, it encounters the bevelled end of the lever N, pushes this latter back, and simultaneously stretches the spring M. This pressing back takes place to such an extent that the pawl K again falls over the end of the lever N and holds it in the backward position (fig. 4), whereupon the action is repeated.

Incandescent Gas-Lamps.

DARWIN, H., of Gravelly Hill, near Birmingham.
No. 14,767; May 26, 1909.

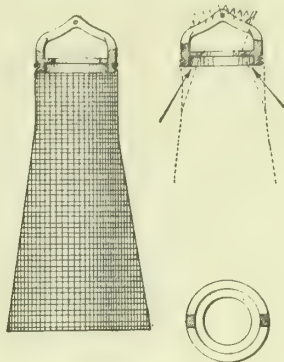
This invention has relation to incandescent and other gas-lamps of the type in which the burner and mantle are enclosed in a glass globe from which the products of combustion ascend into the upper part of the lamp and are utilized regeneratively for heating the mixture of gas and air prior to combustion. The object of the invention is to provide such a lamp, which is particularly adapted for prison lighting and analogous purposes, since it is furnished with means which provide for the light of the lamp being cut off or screened from any desired direction by a warder or attendant, but which do not interfere with the regenerative utilization of the combustion products.

Mantles for Incandescent Burners.

LANGHANS, R., of Berlin.
No. 16,239; July 12, 1909.

This invention relates to mantles for incandescent burners of the type in which the upper or neck portion of the mantle is supported by a ring or annular support consisting of refractory material. The patentee remarks that it has been proposed to suspend a mantle from a conical ring; the upper part of the ring being formed into a dome of smaller diameter than the mantle and having slotted vertical sides. But while such a suspension serves to considerably restrict the upper part of the flame, it has the disadvantage that sooting is occasioned by the amount of surface it exposes to the flame. His invention therefore consists in an improved suspension ring wherein the interior surface at its upper part has an inwardly directed approximately right-angled flange projecting from it, as shown partly in section. The second

sketch is a vertical section through the head portion of the mantle and the supporting ring, illustrating the constricting action of the flange upon the head of the flame. The dotted line illustrates the constricted shape which the flame takes under the action of the flange. It is seen that, by virtue of the constriction, the surrounding air will be sucked into the interior of the mantle, and the annular head of the flame will



Langhans' Mantle Holder.

be kept at a distance from the lower leg portions—the inrush of air increasing the constriction of the flame and preventing it impinging on the ring. The arrows are intended to illustrate the inrush of the outer air through the meshes of the upper portion of the mantle under the action of the flange.

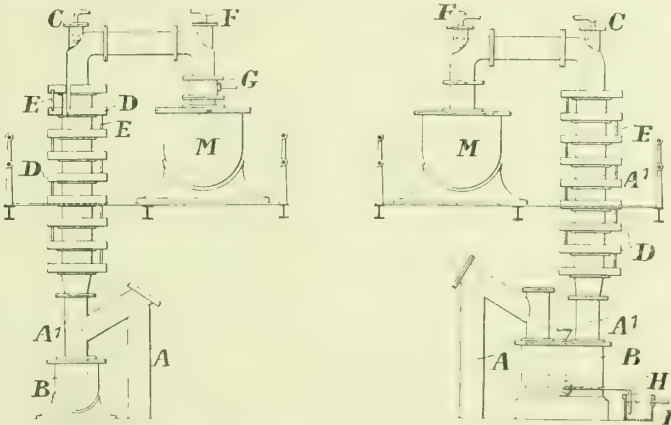
Treatment of Gas Obtained in the Distillation of Carbonaceous Materials.

WILTON, G., of Mark Lane, E.C.
No. 16,355; July 13, 1909.

This "treatment of gas obtained in the distillation or carbonization of coal and other carbonaceous materials" has for its object to dispense with the nuisance caused by objectionable effluent, while at the same time recovering the ammonia in an "efficient and convenient" manner.

As is known (the patentee remarks), a considerable quantity of gas liquor is produced in the distillation of coal—the amount varying (say) between 10 and 30 gallons per ton distilled. The ammonia contained in the gas liquor is chiefly fixed, but some is free. According to the present invention, after first removing the free ammonia from the gas liquor—for example, by bringing the liquor into contact with the hot gas by spraying, or otherwise introducing it into the path of the hot gases in a rising pipe or pipes or other suitable part of the apparatus—he takes the liquor to trays, where it is evaporated in contact with the air by the heat of the hot gases; a cooling effect being at the same time produced on the hot gases by the effect of the evaporation. The free ammonia contained in the liquor is driven off into the gases, and can be recovered; while the water is "conveniently and economically" got rid of by evaporation in the air.

Before the liquor is brought into contact with the hot gases, he prefers to treat it with lime or alkali, as described in patent No. 23,043 of 1908; and in this case, practically the whole of the ammonia will be removed from the liquor and may be recovered from the gas.



Wilton's Gas Liquor Treater.

In one form of apparatus constructed in accordance with the invention, the gases pass by pipes from retorts or ovens into relatively wide ascension pipes connected to a main. From the main, condensers, or other suitable part of the plant, the gas liquor is led by pipes to the top of the ascension pipes, and sprayed into the current of gas rising through them. The liquor is collected at the bottom of the ascension pipes, and is pumped to the top of a series of trays or vessels surrounding each ascension pipe; any free ammonia that the liquor may still contain being first neutralized with acid, if desired.

Two examples of apparatus constructed in accordance with the invention are shown.

In the first, A A¹ are the parts of the ascension pipes leading from the retort or oven and sealed at B by a collecting chamber. The gas liquor (preferably previously treated with lime or alkali) is sprayed into the top of the ascension pipe A¹ as at C, and passes down the inside of it in contact with the hot gases, which drive off the ammonia. The liquor is received in the collecting chamber B, from which it is pumped to the uppermost of a series of open evaporating trays D placed around

the exterior of the ascension pipe A^1 and heated by it. The liquor passes down from tray to tray by overflow pipes E, and is evaporated in its descent. The downward bend of the ascension pipe A^1 , which leads into the hydraulic main M, is also provided with a pipe F for spraying gas liquor on to the valve to keep it clear and in working order. G is a valve for shutting off any particular oven or retort from the hydraulic main.

The second construction is generally similar, but here the valve G is dispensed with, and the liquor collecting chamber B is provided with a hinged overflow pipe H. By raising the end of this pipe, the level of the liquid seal in the chamber B is also raised by the liquor passing down the ascension pipe A^1 ; and thus the particular retort is cut off from the hydraulic main M. The overflow through I enables the character of the liquor to be inspected when required.

The patentee concludes his specification thus: It has previously been proposed to run gas liquor from the hydraulic main into the ascension pipes, for the purpose of clearing away deposits of tar and of cooling the gases; the liquor being evaporated in a pan at the bottom of the ascension pipe by the heat of the gas passing out of the retort, and the resulting steam passing forward through the plant with the distillation gases. In such a case, the water is not got rid of, and has to be removed from the gases; so that the difficulty which is the chief object of the present invention to overcome is not obviated.

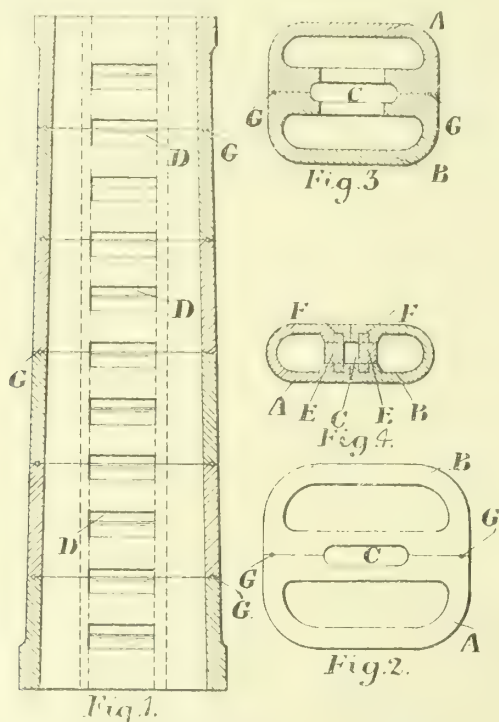
Vertical Gas-Retorts.

GIBBONS, W. P., and MASTERS, J. R., of Palace Chambers, S.W.

No. 16,925; July 20, 1909.

This invention relates to multiple vertical gas-retorts having a vertical duct or ducts between (and common to) adjacent retorts and apertures at intervals in the walls of the retorts communicating with the ducts; and it consists in so arranging the retort that it is divided into sections with apertures preferably upwardly inclined, and with a central gas duct or ducts formed in the dividing partitions. When the retort is of two sections and in one piece, the dividing partition may be built up of tiles, or may be in one piece. When the two sections of the retort are made separately, and set back to back, the gas-duct may be formed partly in one half and partly in the other, by suitably shaping the abutting walls, or it may be formed by separate partitions. The joint between the two sections may be covered by tiles, either flat or curved as required, slipped into vertical grooves in the walls of the gas-duct, or the latter may have a tubular liner.

The jointing surfaces of the two sections of the retort may be corrugated or so prepared as to form a more efficient joint; or, in lieu of such corrugations (or in addition thereto), they may have opposing longitudinal grooves by means of which they may be keyed together with fire-clay. The apertures leading to the central gas-duct are spaced at intervals (preferably about 10 or 12 inches) from bottom to top. The gas may leave the central duct by entering either section of the retort at or near the top, or the gas-duct may communicate with a mouthpiece common to itself and the two compartments of the retort.



Gibbons and Masters' Vertical Retorts.

The illustration shows double retorts, made in two sections, placed back to back. Fig. 1 is a vertical section of such a retort, fig. 2 is a bottom plan view, fig. 3 is a transverse top section, fig. 4 is a view corresponding with fig. 2 showing a modified construction of a smaller double retort.

In both constructions, the retort is made in two halves A B placed back to back, with a central gas-duct C, which communicates with the retorts through upwardly inclined apertures D in the walls or partitions between the retorts and the gas-duct. These walls may be integral with the shafts of the retorts and form the gas-duct, or the inner partitions of the retorts may be separately formed and built up of tiles E dropped into vertical grooves F in the side walls of the retort.

The back-to-back joints of the two retorts, as well as the horizontal

jointing surfaces of the blocks of which the retorts are built up, are preferably grooved and keyed with fire-clay, as at G, and, in addition, these surfaces may be corrugated "so as to form a still more efficient joint."

The gas passes from the retorts through the various apertures D into the gas-duct C, and is conducted away with the gases passing directly from the retorts.

Automatically Actuating an Alarm Signal in Cases of Escape of Gas.

ROBILLLOT, L., of Besançon, France.

No. 26,624; Nov. 16, 1909.

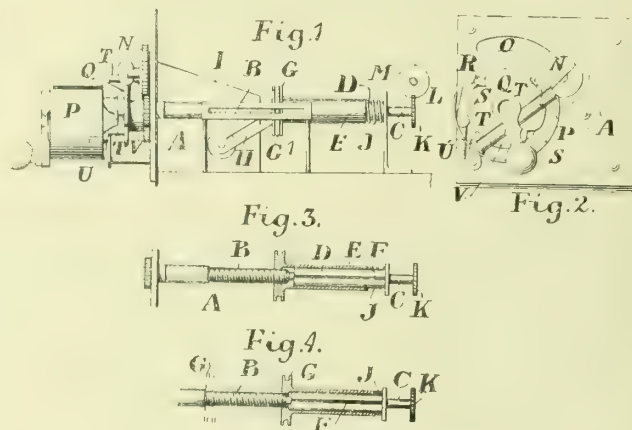
This invention relates to an aëro-electric contrivance for automatically actuating an alarm signal in cases of escape of gas and the like. The contrivance is of the kind in which a light, movable device, sensitive to currents of air, and having the form of a pivoted vane, is adapted to be actuated by currents of air or gas, in order to produce by its displacement the closure of an electric circuit comprising an alarm signal.

Prepayment Meters.

PALMER, W. V., of the South Metropolitan Gas Company, Old Kent Road, S.E.

No. 10,802; May 2, 1910.

The object of this invention is to prevent damage to the mechanism of prepayment gas-meters by the insertion of too many coins at one time; for, as is well known, if the consumer persists in forcing the mechanism, the stripping of the thread of the screw shaft results.



Palmer's Prepayment Gas-Meter Mechanism.

Fig. 1 represents (in side elevation) the prepayment mechanism and the screw connected with it and with the gas-measuring device in accordance with the invention. Fig. 2 is a front view of the prepayment mechanism. Figs. 3 and 4 show (partly in section) the screw and accompanying parts.

To prevent stripping, the screw shaft A is divided into two parts B and C transversely. The adjacent ends of these parts are joined up by a sleeve D. The part of the shaft which carries the thread, being plain at the end, turns freely in the sleeve, while the other part is in one therewith. Upon the sleeve is an outer sleeve E, engaging with the inner sleeve by a groove F and pin (not shown), which arrangement permits of longitudinal movement. The sleeve E has an internal thread, into which works the screw of the shaft A. The outer sleeve is connected to the mechanism of the gas-supply valve by a strap and collar G and slotted lever H, and operates to open and close it by its endway movement, which extends between the dotted and drawn positions of fig. 4.

The screw shaft is rotated by the consumer on the insertion of a coin, and by its rotation moves the outer sleeve E along to open the valve contained in the box I. To avoid moving the sleeve too far (so as to jam the mechanism), the thread of the screw is curtailed, so that it will leave the thread of the sleeve and cease to move it endwise before the sleeve has reached its fixed stop (as in the drawn position of fig. 4). A spring J keeps the sleeve E in reach of the screw, so that it can re-engage when the measuring device rotates the other part C of the shaft, and with it the sleeves D and E; so that the latter winds itself again on to the screw B in the contrary direction.

Ordinary worm gearing K L is arranged between the shaft M of the measuring device and the screw shaft A of the coin-freed mechanism; and the registering mechanism is connected in the usual manner.

The coin-freed mechanism comprises an intermediate pinion N adjustable in an arc O around the centre of the coin-carrier P, to allow pinions of different dimensions on the screw shaft to be employed according to the current price of gas. The coin-carrier co-operates with a notched disc Q concentric therewith. R is a spring pawl adapted to engage with the notches S of the disc Q, which is provided with projections T against which the coin in the carrier P strikes when the carrier is rotated. The rotary movement of the carrier is limited in both directions by a fixed stop U. The usual pinion V is fixed to the notched disc, and forms a part of the train which rotates the screw shaft on the insertion of the coin.

** The specification abstracted last week under No. 14,681 should have been dated June 17, 1910. It was a re-issue, on this date, of an application made on March 27 last year; the complete specification being left on Sept. 27, 1909, and accepted on June 27 of this year.

LEGAL INTELLIGENCE.

APPOINTMENTS OF RECEIVERS AND MANAGERS.

Beaufort Gas Company.

Last Wednesday, the action of *Maddocks v. Beaufort Gaslight and Coke Company, Limited*, was heard before Sir Samuel Evans, sitting as Vacation Judge. Mr. H. J. Mackay said it was a debenture-holder's action, and he applied that a Receiver and Manager might be appointed to carry on the business. The Company was being wound up in the Tredegar County Court; and the Official Receiver had been appointed Provisional Liquidator. He appeared by Mr. Vaughan, and consented to the application that Mr. Edward Rowlands should be appointed Receiver and Manager, with liberty to act forthwith. It was important, in the interests of all parties, that the business of the Company should be continued under a manager. His Lordship made the appointment.

North Oxfordshire Water Company.

His Lordship also had before him the case of *Campbell v. North Oxfordshire Water Company, Limited*. Mr. Tindall Davies said this was an application by first debenture-holders for the appointment of a Receiver and Manager of the undertaking, on the ground that the interest on the debentures was in arrear. The debentures provided that so soon as this was the case the principal sum became due. Demand had been made, and the Secretary admitted that there was no money wherewith to pay interest. Plaintiff held £40 out of £15,000 debentures. There was no opposition; and his Lordship appointed a Receiver and Manager until the end of the vacation, with liberty to act at once.

GAS RECEIVERSHIPS DAY BY DAY.

Under the above heading, the "Financial News" on Saturday made the following remarks.

On Jan. 14, 1909, a reference was made in these columns to an issue of shares by the Beaufort Gaslight and Coke Company; and our readers were warned not to become shareholders. On March 10 last year, when the Company disappeared from its domicile in the office of Mr. Edmund Eaton, 99, Cannon Street, we asked: "What has become of the Beaufort Gas Company?" The question was answered—tardily, it is true—this week, when Sir Samuel Evans, in the Vacation Court, granted an application for the appointment of a Receiver and Manager for the Company; thus justifying our warning not to purchase the shares. The list of misfortunes among gas and water companies of this category is steadily lengthening; but it may be hoped, in view of the constant cautionary notices that have appeared in these columns, that no regular reader of the "Financial News" has lost money in them. The following is an up-to-date list of happenings among this class of gas and water companies in the last two years:—

EAST SUSSEX GASLIGHT AND COKE COMPANY.—A Receiver and Manager on behalf of the debenture-holders was appointed on June 23, 1909.

TICEHURST AND DISTRICT GAS AND WATER COMPANY.—Receiver appointed on Oct. 23, 1909.

RAWCLIFFE (YORKS) AND DISTRICT GAS COMPANY.—A Receiver and Manager was appointed on Nov. 19, 1909.

ROBERTSBRIDGE, SALEHURST, AND HURST GREEN WATER AND GAS COMPANY.—A Receiver has been appointed on behalf of the debenture-holders. He says that the Company "is practically non-existent."

SOUTH LUTON GAS.—Resolution to wind-up the Company agreed to on April 22, 1910.

MID-OXFORDSHIRE GAS.—Receiver appointed on behalf of the debenture-holders on May 11, 1910; order for compulsory liquidation granted on June 29, 1910.

NORTH SUSSEX GAS.—Receiver and Manager appointed July, 1910.

BUCKS AND OXON GAS.—In liquidation; Receiver and Manager appointed July 1, 1910.

BEAUFORT DISTRICT GAS.—Receiver and Manager appointed Aug. 10, 1910.

NORTH OXFORDSHIRE WATER.—Receiver and Manager appointed Aug. 10, 1910.

Of course, the misfortunes of these Companies do not reflect in the slightest degree on the well-known and well-managed gas corporations of the country. They stand in a totally different category from an investment point of view.

Theft from a Gas-Meter.—At the County of London Sessions last Saturday, before Mr. Loveland Loveland, K.C., Jacob Sobriesky, 30, a tailor's presser, was found guilty of stealing 3s. 8d., the property of the Commercial Gas Company, from a prepayment gas-meter. The Judge said such thefts as the one before him were very numerous, and there was no doubt that thousands of pounds were lost in this way. As the prisoner had borne a good character hitherto, he was bound over under the Probation Act.

Theft of Gas-Brackets.—At the Liverpool Police Court last Friday, before Mr. Kinghorn, William Edward Hughes was charged on remand with stealing a number of gas-brackets. Mr. Holbrook, who prosecuted, said prisoner was found disposing of some gas-brackets; and a detective-sergeant had found twenty in his house. The prisoner's mode of procedure was to represent that he had been instructed to find a house for a lady. He then obtained the keys of unoccupied premises, which he entered and took away the gas-brackets left by previous tenants. There were four other charges against prisoner, who pleaded poverty in defence of his crime. The Deputy-Stipendiary (Mr. J. Kinghorn) said that the accused, as a man of intelligence, must have known that poverty was no excuse for taking property belonging to other people. He sentenced Hughes to fourteen days' imprisonment for each offence—ten weeks in all.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Proprietors of this Company was held on Wednesday last, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER (the Chairman) presiding.

The SECRETARY (Mr. F. M'Leod) read the notice convening the meeting, and also the minutes of the last ordinary and extraordinary general meetings.

The seal of the Company having been affixed to the Register of Proprietors, the report and accounts (which have already appeared in the "JOURNAL") were taken as read.

The CHAIRMAN: I have now the pleasure to move that the report of the Directors and the statement of accounts appended thereto be adopted, and the same entered on the minutes. You will notice that the report follows the usual custom of drawing the attention of the shareholders to the financial position of the Company at the close of the half-year's working, and suggests the proper dividend to be declared. We have, as your Directors, honourably fulfilled our obligations to the large staff of employees necessary to carry on your business; we have done our best for the consumers that they may obtain light, heat, and power as cheaply as possible; and we now come before you, as the third partner in this undertaking, with the endeavour to give you a satisfactory account for the capital you have invested in it.

THE DIVIDEND.

I hope old shareholders will forgive me if, for the benefit of new ones, I say a word as to why the dividend is at the rate of £5 9s. 4d. per cent. The standard price of our gas was fixed as part of our parliamentary bargain in 1900 at 3s. 1d. per 1000 cubic feet, with a standard dividend of 4 per cent. Each penny reduction in price carries with it the right to pay an extra 2s. 8d. per cent.; and as our price is now 11d. below the standard, we are able to pay eleven times 2s. 8d., or £1 9s. 4d., in addition to the standard rate of 4 per cent. As the report points out, we must work with an economy of £52,000 a year before we can afford to reduce the price of gas by 1d. We have been able to do this and to increase the surplus carried forward from last half year by about £13,000, which I think is satisfactory.

INCREASED COST OF COAL.

Unfortunately, however, coal is now costing considerably more than under our last contracts. The cause of this is traceable solely to the Miners Eight Hours Act, which came into operation on Jan. 1 last. The Act was not wanted by the mine owners, who foresaw that its operations would enhance their cost of winning coal; and it is very doubtful whether it is now regarded with favour by the men. In addition to other expenditure, it necessitated our laying down the unprecedented stock of a quarter-of-a-million tons; but this precaution, which was suggested by our friends in the North, enabled us to tide over the time when many pits were closed, owing to strikes and rioting, and to defer purchasing until prices were nearer a more reasonable figure.

PORT OF LONDON ACT.

We shall also be hit by the Port of London Act. Five years ago, the tonnage dues in the Thames were doubled, giving an increased revenue, available for dredging purposes, of about £66,000 per annum. We raised no objection to this imposition, as, although the increased depth of water was of no value for the kind of vessel suitable to our business, we recognized the importance of maintaining an effective waterway adequate to the requirements of the port. I ought to say that these rates were based on the net registered tonnage, which, in the case of coal, is about one-half that of the cargo carried. When the Port of London Bill was considered by a Joint Committee of both Houses of Parliament, it was estimated by the promoters that a deficit of £180,000 per annum would have to be met out of revenue on new works, dues, and registration fees. This figure has now been put at £330,000; and if coal paid its share with other commodities on an *ad valorem* basis, instead of contributing over £60,000 a year as it may have to do, its proportion would be less than £5000 (£4281). Now we were quite willing to pay, with other manufacturers, dues on the goods we export, such as coke and tar and ammonia products; but we feel that it is very unfair to put a tax or due on coal in such a disproportionate manner. More than one-third of the coal we purchase is used to provide light and heat to the poorer consumers of South London, who buy their gas through slot meters, and who will, under the new arrangements, have to contribute to the up-keep of the neglected docks, or the construction of new ones on the other side of the river. Besides, most of the improvement in the atmosphere of London is due to gas companies, who sell so large a proportion of their gas nowadays for warming and cooking; and one would have thought that it would have been more for the general weal to assist their efforts in this direction instead of handicapping them in the way I have mentioned. A permanent charge has been added to the cost of our raw material by both enactments; and it is important that you, and still more important that the gas-consuming public, should be made fully acquainted with their effect.

IMPROVED CARBONIZATION RESULTS.

There is fortunately a silver lining to these clouds, in the good work done by our engineering staff, by whose efforts the quantity of gas sold per ton of coal has been increased to the substantial figure of over 11,500 cubic feet (11,543). When you remember that ten years ago this figure was 9300, you will see what a marked improvement has been effected. By our former methods of carbonizing, the gas was partly decomposed before it was collected; and, besides loss in volume, the process had the effect of reducing the purity of our tar.

RESIDUALS.

We have now the double advantage that we have not only an increased yield in gas, but we have also improved the value of our tar. We

have done better too with another residual—ammonia—where we have also been able to perfect our methods of handling and manufacture. The production of sulphate of ammonia is rapidly increasing abroad as well as at home; and I am pleased to inform you that we in Great Britain have lately joined hands with Continental makers in propaganda work, which has for its aims the extension of the knowledge of its value for manurial purposes among agriculturists in different countries. Nothing, however, in the nature of a trust or combination is either contemplated or possible. Our desire is to educate users as to its advantages—leaving prices to take care of themselves. Even if a trust were thought about, it would be quite out of the question, because a large quantity of sulphate of ammonia is produced in municipal works throughout the United Kingdom; and these authorities would not be likely to be parties to a trust. The next item in the balance-sheet to which I wish to refer is that relating to coke. The drop in coke is nearly all accounted for by the smaller quantity of coal carbonized. We have not required so much coal for gas making, and have, in consequence, produced less coke for sale. I need not remind you that our surplus coke is disposed of mainly to cement manufacturers at a low figure; so that the difference will be felt not in the average price of coke as a whole, but the surplus quantity which we sell for cement making.

WORKING EXPENSES.

Turning now to our working expenses, purification is some £4000 higher. We are working to a higher standard of purity, and have increased our expenditure both in experimental plant and in purifying materials. The case of gas is analogous to that of water as regards its purity. We can only deliver through one set of mains; and our water supply has to be pure for drinking purposes, though considerable volumes of it are used for flushing the drains. So, too, with gas. Large quantities are used for heating and power purposes, where a high degree of purity is of little or no moment. On the other hand, about one-half is used for the illumination of dwellings and workshops, &c.; and it is important that regard should be had to this in determining our standard. Carbonizing wages show a reduction of about £7000; and this is a partial set-off to the heavy item of repairs and maintenance of works. We have had to scrap a good deal of out-of-date retort-house machinery, and provide new, in order to meet the altered conditions of working. We have also spent a good deal on coal unloading appliances, owing to the increasing difficulty of obtaining medium-sized steamers to carry coal to our up-river works. Of course, we shall reap the advantage of more economical working when we are in a position to charter the larger vessels.

DISTRIBUTION COSTS.

There is a considerable increase in distributing costs, chiefly under the heading of mains and services and stoves. We have been duplicating a good many of our mains in order to meet the increasing demand of gas for cooking; and we have been substituting new models for a large number of our stoves, in order to put at the service of consumers more efficient appliances for their purpose. I am sure the policy is a good one, and that we shall feel in future the benefit of what we are doing.

SLOT METERS.

I do not think there is any other item to which I need call attention, except, perhaps, the number of slot meters broken open, which is lower by nearly 1000 than a year ago, though we have increased their numbers by some 10,000 in the intervening period.

RESERVE AND INSURANCE FUNDS.

We have again written-down our reserve and insurance funds to current values. This appears in the balance-sheet. The drop is not a large item; but we have followed out the same course that we did a year ago. While on this subject, I might mention the matter of the reserve fund, which was raised by a shareholder at our last meeting. We have considered whether it would be more desirable to invest this to a greater extent than is now the case; but we have come to the conclusion that, in a non-speculative or non-hazardous business such as ours, it is better where it is. We can use the money with advantage; and it must be remembered that we have a considerable amount of capital authorized yet to be issued, which adequately safeguards the shareholders' interests in this respect.

CO-PARTNERSHIP.

Before I sit down, I must say a word about our co-partnership, which attains its majority this autumn, when it will have been in existence for 21 years. It stands firmer to-day than at any period since its inception; and our relations with our workmen were never more cordial. It stands firmer to-day because it stands unaided and not associated, as invariably used to be the case, with the name and individuality of the late Sir George Livesey. I have no hesitation in saying that the greatest debt the Company owes to Sir George's memory is for the magnificent work he performed so thoroughly and so conscientiously in the substitution of co-partnership as the one solid foundation upon which to support the superstructure of this important undertaking; and I am not less confident that the spirit of loyalty it has engendered is largely responsible for the continued success of this undertaking.

REPORT AND ACCOUNTS ADOPTED.

I conclude by formally moving: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. ROBERT MORTON: Your Chairman has entered so fully into the report and accounts, that nothing is left for me which I consider worthy of remark; and I simply second very heartily the motion he has just made.

The CHAIRMAN: Before I put the resolution to the meeting, I shall be glad to hear any remarks that any shareholder may desire to make on the report.

REMARKS BY A SHAREHOLDER.

Mr. EDMUND KIMBER said he quite agreed as to the rather damaging effect of recent legislation upon their industry. But other Acts of Parliament had been passed—for instance, the Roads Improvement Act—

which must operate in favour of all gas companies, as it must create a demand for tar; the object of the promoters of the Act being to prevent dust. There must also be a greater demand for sulphate of ammonia in agricultural manures, because the motor traffic, unfortunately for the farmer and the market gardener, had diminished the supply of stable manure. The orders coming to chemical manufacturers in this country from the Continent were so great that they could not be complied with under two years; and, curiously enough, the Germans had actually come to this country for the purpose of manufacturing chemical manure to export to their own country and to the Continent generally. The supply of stable manure, short as it is in this country, was even shorter on the Continent; and he was very glad to hear from the Chairman that the gas companies of this country had joined together for the purpose of advertising the merits of sulphate of ammonia. As was probably well known, a tenth part of sulphate of ammonia mixed with other things made a magnificent manure, not only for already tilled earths, but made new ground wonderfully fertile; and farmers would find it to their advantage and to the general benefit of the country. With regard to the carbonization results, 11,543 cubic feet sold per ton, he thought the Chairman, as the official chiefly responsible for the conduct of this business, had rather understated the meritorious character of such a production. Were Sir George Livesey, whom he had known personally for many years, now alive, it would be a sort of paradise to him to find that the production of gas per ton of coal had gone up from 8000 or 9000 cubic feet to 11,543 cubic feet; and he wished to congratulate the Chairman and other officers of the Company upon this result.

REPLY BY THE CHAIRMAN.

The CHAIRMAN: With regard to Mr. Kimber's remarks, I do not know to what extent we are under any obligation to Parliament in respect of the Roads Act. I do know that the amount of tar used, like the quantity of sulphate of ammonia, is very rapidly increasing, not only in the United Kingdom, but on the Continent, and in America, too. In a great number of furnaces used for coke and iron production, where the gases were at one time allowed to burn into the air, tar and ammonia are now recovered from these gases; and, consequently, in the future there will be much greater quantities of these products on the market. What the companies are doing in the matter of propaganda in respect of sulphate of ammonia has been found to have had a very good effect; but with regard to the extraction of tar from waste gases, so far as this Company is concerned it is somewhat of a mixed blessing, because we have adequate plant to distil all the tar we produce. I think I may say without fear of contradiction that we have the most up-to-date plant for the distillation of tar in the United Kingdom; and what we want to do is to distil it and obtain these products, and not put it on to the roads. Of course, I am quite alive to this, that the more the surplus production is absorbed by the roads the more is the price likely to be maintained; and, provided we can get a fair price for the products we make, that is all we want.

The resolution was carried unanimously.

THE DIVIDEND.

The CHAIRMAN: I have now to move: "That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." I do not think I need say anything in particular with regard to this resolution. I am going to ask Mr. Austin, one of our Workman-Directors, to second it; but before I do so, I would like to remind you of one circumstance which I have no doubt is present to many of your minds. We have had workmen on our Board now for twelve years; and Mr. Austin has been one of those Directors from the beginning. To-day is the last occasion upon which he will have the honour of addressing you from this table; and that is why I have gone out of the usual routine and asked him to be good enough to second this resolution.

Mr. HENRY AUSTIN: Mr. Chairman, ladies, and gentlemen, I second the resolution with a great deal of pleasure. I am sorry it reminds me that I am growing old, and the infirmities of old age bid me stand aside; and let me here admit that the co-partnership principle has materially assisted me to do so. I shall not have to apply for the old-age pension; I shall not have to apply to any agency to assist me to live comfortably during the remainder of my days. My thanks are due to the gentleman who proposed the co-partnership system, and also to the shareholders for sanctioning it. I am exceedingly pleased that I have taken part in consolidating it, and making it a success. If employees and directors have not succeeded in making two blades of grass grow where one grew before, I can say that each one of them has endeavoured to keep the one blade green and in a healthy condition. For twelve years I have sat upon the Board; and those twelve years have been brimful of interest. It has been a school in which I have learned much, and in which I have had the means of appreciating much; in addition, I have had to unlearn much that I had imbibed previously. I have a grateful feeling, untold, unmeasured, towards this co-partnership principle. It is the best and most ideal employment that I know; and looking to the error committed only recently by the railway men, surely we do not want such errors among ourselves, but to go on in continued prosperity. I thank you all for voting co-partnership with the Workman-Director; and may it long flourish.

The resolution was carried.

SALE OF SURPLUS LANDS.

The CHAIRMAN moved, and Mr. HAWKSLEY seconded, a resolution authorizing the sale of certain lands no longer required by the Company; and it was carried unanimously.

THE SECRETARY'S REMUNERATION.

The CHAIRMAN: I have now to move a resolution of which formal notice has been given—viz., that the meeting consider a recommendation of the Directors to increase the remuneration of the Secretary. I have great pleasure in carrying out this duty. The Secretary has now occupied his position for two-and-a-half years; and he has fulfilled every hope we formed regarding him. He had been for a great many years in the service of the Company, and for a long time occupied the position of the chief officer connected with the Distribution Department. It was a happy circumstance for us that we had not to

do upon this occasion as we had to do on a previous one—go outside the Company when we required a new Secretary. It was a very fortunate thing that among the officers of the Company there was one who was not only qualified to fill the position, but had the unique experience of having had charge for so many years of one of the most, I might say now-a-days, the most important department of the Company—that is, the one which has to do with the outside business. We were very fortunate in obtaining a gentleman with this dual qualification; and our two-and-a-half years' experience of his work has proved that in every way he has been an excellent choice. I need not remind you that the Company's operations are on a very extensive scale. Our net revenue is something like two millions a year; and it is necessary we should have the very best gentleman that money can get in order to properly fill such a responsible position. The Board, in selecting the officers of the Company, are mindful of two things—first that they get the right sort of men, and, secondly, that the right sort of men get the right sort of pay. But with regard to the Secretary, his remuneration has, in accordance with the Act of Parliament, to be settled by yourselves. The Board unanimously agreed to the recommendation I am now putting. I am going to put it in the way that has been customary with my predecessor. It is not altogether a pleasant thing to spread abroad for everybody to read exactly what the income of a gentleman is, whether he is an officer of this Company or not; but you may take it from me that he thoroughly deserves the increase which is proposed. I have pleasure in proposing—"That the salary of the Secretary be increased at the rate of £500 per annum as from the 1st of July last." I hope that when the resolution is put, you will show your confidence in the choice your Board have made, and in the recommendation your Board makes, by unanimously agreeing to the resolution. In the unavoidable absence of the Deputy-Chairman (Mr. Mews), I will ask Mr. John Ewart to second the proposal.

Mr. JOHN EWART: I have very great pleasure indeed in seconding the resolution that has been moved by the Chairman; and I support every word he has said as to the merits of our Secretary. The duties of Secretary of this great Company are, as you know, most onerous and multifarious; and certainly Mr. M'Leod's difficulties have been accentuated by him having had to follow so able a predecessor.

Mr. WASHINGTON, in supporting the resolution, stated that he had known Mr. M'Leod for many years, and intimately for the last two-and-a-half years; and he had never met a man more earnest in the consideration of matters brought before him in contradistinction of those who were earnest in the beginning but whose enthusiasm died away.

The resolution was carried unanimously.

The SECRETARY (Mr. F. M'Leod) thanked the Chairman, Mr. Ewart, and Mr. Washington (for the shareholders), for their very kind and flattering remarks, which were, he feared, far beyond his deserts; but he hoped he would grow to deserve them. He could only claim to have done his duty conscientiously, and to the best of his ability. It was highly gratifying to know that he had the confidence of his Directors; and he thanked them for recommending such a substantial addition to his salary, and the shareholders for their approval of it. He hoped to prove himself worthy of their generous consideration.

VOTES OF THANKS.

Alderman G. HOWLETT proposed a vote of thanks to the Chairman for presiding, and to the other Directors for their conduct of the business of the Company. They had been full of congratulations to-day—all of them deserved. It had been his pleasure, and that of a good many others present, to know the Chairman since his first connection with this Company; and all along the line he had proved himself worthy of his various positions. Now he was at the top of the tree, so to speak; and he did not think any man in the United Kingdom could be more worthy of such an honour. The Company were fortunate in having such a "handy man" on the premises when the late Sir George Livesey passed away. He had known him since he first came into the works at Vauxhall—known him as a hard-working student, as a hard-working junior engineer, and a hard-working chief engineer; and he was sure they would find him as capable and hard-working a Chairman of a public company as any body of shareholders could wish to see—clever and up to date in every point.

Mr. EDMUND KIMBER seconded the motion suggesting an addendum in favour of the staff; a production of 11,543 cubic feet being, he considered, a very great victory, due to the expertness and vigilance and untiring zeal not only of the Chairman, but of the whole staff.

Mr. BEALE supported the resolution on behalf of the shareholders, all of whom appreciated how onerous were the duties the Chairman had undertaken in following such a predecessor as the late Sir George Livesey, and the way in which the Chairman had carried out the duties since he had occupied the chair.

Alderman HOWLETT put the resolution, which was carried unanimously.

The CHAIRMAN: On behalf of myself and my colleagues, I thank you for this renewed expression of confidence. The task has been made easy because of the manner in which our sailing courses, if I may so speak, have been set for reference long ago; it is easy, also, because we are so thoroughly assured of the good will of all who have to work in the interests of the Company. The Board's endeavour is always to work harmoniously together; and I may say again to-day they are united by one common feeling—what is the best course to follow in the interests of the Company. Before I sit down, I want you to allow me to propose one more resolution, and that is a hearty vote of thanks to our officers and staff. This matter has been touched upon by Mr. Kimber and by Mr. Beale; but I do ask you to allow me to usurp the function that they have partly taken upon themselves, and propose that the best thanks of this meeting be given to the officers, staff, and workmen of the South Metropolitan Gas Company. I will couple with the resolution the names of Mr. Doig Gibb, our able Chief Engineer (who, I am pleased to say, has made friends with all with whom he has come into contact), and Mr. M'Leod, who will say a word on behalf of the clerical staff. I shall be very pleased if some shareholder will be so kind as to second this resolution.

Mr. J. A. BUTCHER asked to be allowed to second the motion. As an old employee of the Company, he felt that their thanks were due to the workmen and staff generally, but for whose energy, zeal, persistent and

rightdown heartiness in the Company's welfare, co-partnership would not have flourished as it has done for 21 years, and the Company would not be exemplifying to the world to-day the best means of settling conflicts between Capital and Labour.

Mr. DOIG GIBB said he wished only to make one remark, which he thought it was his duty to make in a personal sense. He had been with the Company now for some considerable time, but certainly could not claim any credit to himself for the extremely good results which had been achieved in the manufacture of the last six months. This was a heritage which had been left to him by the former Chief Engineer. He regretted that it had been so left, because it was really a very high standard for his successor to have to aim for. However, they were a loyal and conscientious staff, and worked like one man for the benefit of the Company; and though he could not promise in their name that they would do better in the future than they had done in the past, the appreciation of the shareholders would encourage them to endeavour to do so.

Mr. M'LEOD, replying for the clerical staff, said he did not think it would be possible to have happier conditions obtaining among a body of men than did exist at the various stations. The officers of the Company, as a body, were keenly desirous to further the interests of the shareholders, and their loyal efforts to this end were very praiseworthy, and richly deserved the shareholders' commendation.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of the Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

PROSPERITY AND A REDUCTION OF TWOPENCE.

The CHAIRMAN, in moving the adoption of the report and accounts, said: In common with our neighbours, we have an exceedingly satisfactory state of affairs to report to you to-day—in fact, I may say that, in the 22 years I have been connected with the Company, we have never had a better account to give than at the present time. And the very best feature of the accounts is that we have been able to announce a reduction in the price of gas of 2d. per 1000 cubic feet. This, as you know, benefits the consumers, the proprietors, and the employees—all three partners in the concern. A penny reduction in a half year represents £6619 to the consumers; while the increase in the dividend authorized by that is only £1475. Therefore, the 2d. reduction will, on the present sales, give the consumers £26,476 a year; it will benefit the proprietors, if we are enabled to pay full statutory dividends, to the extent of £5900 a year; it will give the employees an extra 1 per cent. bonus on their earnings, which 1 per cent. will amount to £1100. So you will see the consumers get five times as much as the proprietors; and the proprietors five times as much as the employees. At any rate, they all get something. The only people who do not get any advantage are the Directors, who have to find £7000 a year more for the proprietors and employees, and have nearly £27,000 less with which to do it. The Board, you will understand, cannot promise that they will be in a position to pay the extra dividend when meeting the proprietors next February. We have, however, made a careful calculation; and we believe we see our way to making both ends meet (in spite of the reduction of the price of gas), with something to spare. At any rate, we have a sum of £43,763 of undivided profits; and we are carrying forward a larger balance than we have had for twenty years. And if we have to take a little bit of this to pay the dividend next time, I do not think we shall mind it. I hope, however, the reduction in price will do something to stimulate our trade, and that the prices of residuals (which are already good) will keep up during the six months. At any rate, I am sure the proprietors will approve and support our policy of selling gas at the cheapest possible price. It is the policy that has been proved over and over again to be the very best for a gas company; and it is especially good for us in view of the competition we have to face from municipal electricity supply.

OIL AND COAL CONTRACTS.

I am happy to tell you we have made more favourable oil contracts, which will last for the next eighteen months. We have renewed our coal contracts, too; but not so favourably. We have had to give more for coal this year than last; and the only reason I can find for this is the operation of the Coal Mines (Eight Hours) Act. I do not think that there is anything else to justify the increased cost of coal. The contracts have been made at almost exactly the average price of the last ten years; or, omitting the year 1900 (when coal was 16s. per ton f.o.b. in the North), it is just about 7d. above the average price of the last ten years. But there is a point that is very remarkable, and not a very gratifying one—that is, that the average price of the last ten years is nearly 2s. 6d. per ton more than the average price of the preceding ten years.

HIGH CARBONIZING RESULTS.

Well, now, the prosperity in our affairs has to be put down mainly to one cause, and for that we have to thank our Engineer, and those who work under him. This cause is extremely good carbonizing results. We are able to chronicle a make per ton of coal of no less than 11,946 cubic feet, which is 543 cubic feet per ton of coal more than this time last year, or an increase of nearly 5 per cent. I may also call attention to the fact that our carbonizing wages are down by £2835—an improvement of 19 per cent. It used to be said that gas profits are made in the retort-house. I believe Mr. Henry Jones will tell us that this is still true to a large extent. [Mr. JONES: "Hear, hear."] This is the result of skill and knowledge on the part of our Engineer and the Managers at the works, and of industry and zeal on the part of our employees. We shall have an opportunity presently of passing a vote of thanks to them; and it has never been better deserved than at the present time. It is also partly the result of the policy of putting in regenerative furnaces in our old retort-houses that were not so equipped. During the last few half years, we have installed improved furnaces at Stepney. Last half year, or the one before, we finished

a retort-house at Wapping, and are now completing one at Poplar, which, I hope, will be ready for use when the winter weather comes on. All our plant has been modernized and equipped with the latest charging and drawing machinery. This has involved considerable expenditure, which has been more than amply justified already; and I anticipate greater results in the future.

WORK ON THE DISTRICT.

We may look forward now to a very low capital expenditure—in fact, as far as we can see, all we shall have to spend out of capital will be on the district in the way of providing more distributing plant; and we—Directors and Managers—must also expend our energies on the district. We shall have to go to potential consumers and convince them of the advantages of our cheap gas; and there is still room for expansion even in our circumscribed area. I notice that only 61 per cent. of our consumers have stoves; while one of the other Metropolitan Companies has a percentage of no less than 87. There is a large field for improvement there, which we must develop to the greatest possible extent. There are still some belated consumers who use flat-flame burners. We must try to get them to have new inverted burners put in. This helps to make people contented with our gas. So far as I can see, the present position of the Company is thoroughly sound; and we never have had a more satisfactory outlook than at the present time.

THE ONLY CLOUDS.

The only clouds on our horizon are, like the natural clouds of which we have seen far too much this so-called summer, altogether beyond our control. One of the principal ones is the Coal Mines (Eight Hours) Act. This, I fear, has permanently sent up the price of coal. Yesterday I was (I was going to say) disgusted to find how our shipping charges have gone up the last six months—to an extent of no less than 3d. per ton of coal carbonized. This was wholly due to the disturbances caused in the North by the coming into operation of the Act. You know we take great pride in our freight charges. We are the only gas company who own steamers; and we ran some considerable risk in taking our steamers up to Poplar. Therefore we look jealously at anything that hinders the good working of these steamers. We have saved a large amount by having them; and it is a great gratification to us that our policy in this direction has been so successful. Then there is the Port of London Act, which imposes an extra charge upon all our coal coming into the port, or going through it. But I do not think we shall derive the least benefit from anything that the Act will bring about. Then there is still another thing over which I have a perennial grumble here. That is the extravagance of the rating authorities, who spend our money, and yet we have no voice or control in the matter. In addition, we have the unfair competition of electricity, which is owned and supplied by the municipal authorities. If they make mistakes, then their mistakes have to be paid for out of the rates, of which we have to provide a large share. These are things over which we have no control. No knowledge or skill, or industry or zeal on our part will do anything to remove them from us. All we can do is to use our utmost efforts in other directions to minimize their ill-effects.

SALIENT ACCOUNT FEATURES.

If you will turn to the accounts, there are one or two things I should like to point out. For the first time in the history of the Company the number of our consumers exceeds 100,000—actually it is 100,694. Looking at the net revenue account, the net profit is £74,451, which is £10,529 more than it was at this time last year. Coal and oil show a saving of nearly £10,966. We saved £2835 in carbonizing wages; and spent £5410 more on repairs. A good deal of this went towards the conversion of the retort-house at Poplar. So that, while half-a-million cubic feet more gas was made, the cost was less by £7943. Looking at the distribution costs, £1664 more was spent, because we have more stoves and meters to handle. On the other side of the account, there is about the same revenue as last year. The stove and meter rental increased by £1574; and residuals gave £3291 more. Altogether, as I say, the profit is about £10,500 more than this time last year. And that is the highest amount of profit we have ever had the privilege of chronicling. Regarding the net revenue account, the result of the half-year's operations is as follows: Profit, £74,451, less interest on debenture stock and floating loans, £9082. This leaves £65,369. Deducting the full statutory dividend, which amounts to £53,345, we have a surplus on the half-year's working of £12,024. We brought forward from the previous half year £31,739, and carry forward to next half year £43,763. I think you will agree with me that these results are very satisfactory. They are eminently satisfactory to me, because it enables me to indulge the hope—I say "hope," and not "prophecy"—that when we meet next February, in spite of the diminished price of gas, if the value of residuals keeps up, we shall be able to recommend the increased dividend which increase will amount to 5s. 4d. per cent. on the 4 per cent. stock and 6s. 8d. on the 3½ per cent. stock. This will be equivalent to 13½ per cent. on the unconverted stock, as it used to be. If this is so, our dividend will be approximately the same as it was twenty years ago when the cost of coal was much less than it is now. Twenty years ago, we were paying 5s. 6d. per ton for our coals; and now the price is nearly double. This speaks volumes, I think, for the skill of our Engineer, for the stability of the gas industry, and it also says something for the care with which this Company has been administered.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter), in seconding the motion, said he should like to bear testimony to the skill and ability with which the officers had worked together. As to the workmen, owing to a slight accident a short time ago, the Chairman was unable to go down to meet the Profit-Sharing Committee. He (the Deputy-Chairman) had to take his place, accompanied by Mr. Henry Jones. The Committee were very glad indeed to learn that there had been an additional bonus for the workmen at the end of the year; and they expressed themselves absolutely gratified in every way. He thought the proprietors would all like to know how admirably the profit-sharing scheme was working.

Mr. GEORGE ENNIS complimented the Board upon the results of the half year. The reduction in price was a pleasant event to all con-

cerned; and especially so to the consumers in what was, comparatively speaking, a very poor district. The proprietors would fully endorse the Chairman's comments on the Coal Mines (Eight Hours) Act.

Mr. ARTHUR HARSTON spoke of municipal authorities placing advertisements on the electric light standards, and so pressing upon the notice of the people of the district the statement that "electricity is cheaper than gas." As gas companies were large ratepayers, they ought to have the right of putting notices, either above or below the electrical ones, to the effect that "gas is cheaper than electricity." He had seen these notices at Hackney, and that he believed was in the district of the Gaslight and Coke Company.

The CHAIRMAN: And the gas companies have to pay for this sort of thing. Proceeding, he said he did not think they had advertisements of the sort in their own district. The Directors had been discussing with the Engineer whether they could not do something with gas in the way of flashing advertisements. They were abominations for the general public; but if electricity could do it, gas could do it, too. There was, in fact, nothing that electricity could do that gas could not do better and cheaper—excepting perhaps traction. At any rate, they were going to see what they could do to bring the advantages of cheap gas more prominently before the public.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the rate of £5 4s. per cent. per annum on the 4 per cent. stock and at the rate of 5 per cent. on the 3½ per cent. stock, both less income-tax.

Mr. ENNIS proposed a vote of thanks to the Chairman and Directors. The past half-year's results, he said, had been remarkable; and especially the carbonizing results. It was within his memory, and that not very remotely, when it was considered highly satisfactory to get 9000 cubic feet of gas from a ton of coal. There was in the past half year an actual increase upon that approaching 33 per cent.

Mr. FRANK JONES seconded the proposition, which was unanimously agreed to.

The CHAIRMAN, having acknowledged the vote on behalf of himself and his colleagues, moved a similar recognition of the services of the Engineer (Mr. Stanley H. Jones) and the Secretary (Mr. H. D. Ellis), and all those who worked under them. He said the vote had never been more deserved or better earned than on this occasion. It was now quite delightful to go upon the works and meet men happy and contented, and glad to see their employers. A great deal of this happy state was due to the profit-sharing scheme. The interest of the employees in the Company now amounted to £50,000; while this time last year it was £44,000. Most of this was derived from the profit-sharing scheme; but part of it came from the savings of the mer—the Company acting as a sort of savings bank for the employees, and giving encouragement to thrift in every way. The chief praise must be accorded their Engineer. But he ought to say that Mr. Henry Jones laid the foundation-stone on which Mr. Stanley Jones had built up the good results before them. He must not forget their oldest officer, Mr. Ellis, whom they were all glad to see still with them.

Mr. H. E. JONES asked to be allowed to second the motion though his son was concerned in it. He was not going to boast; but he should like the proprietors to remember that the Company was distinguished for its low capital. His father (Mr. Robert Jones) laid down the principle, which he (the speaker) endeavoured to follow, with a result that was a credit not only to this Company but to others: "Conserve your capital; and you will realize good results." There was no gas company that gave him more pride than the Commercial Company. Forty years ago his father and himself worked the undertaking with 20,000 consumers; and there were now upwards of 100,000, 75,000 of whom were working men. This result had been chiefly realized during the time of the present Engineer, who was deserving of the praise the proprietors were giving him. The Chairman had spoken about regenerative furnaces. The later built works of the Company—Wapping and Poplar—had regenerative furnaces; but these had been added to and extended, and in the more ancient part of the works regenerative furnaces of a newer type had been adopted. The fruits of this work were seen in the results before the meeting. He wished to add his encomiums to those already expressed, for the staff were working in a meritorious manner, and were deserving of all praise.

The motion was cordially passed.

Mr. ELLIS, in responding, thanked the Chairman for his kind words, and the proprietors for their reception of the proposition. They had heard from the Chairman an eloquent and lucid address concerning the affairs of the Company; and perhaps he (Mr. Ellis) might be allowed just to touch upon the question of legal decisions affecting companies like theirs during the past half year. There had been quite a crop of them; and some of them were very interesting. One Act had specially come into prominence. That was the Workmen's Compensation Act, many cases in connection with which had been taken up to the House of Lords. The House of Lords had always shown itself the friend of the working man, and had in these cases given the working man justice, and sometimes even a little bit more. The question was not now, What is an accident? but What is not an accident? Then the Act affecting the Metropolitan Water Supply had also proved a very thorny one; and there had been most conflicting decisions in connection with it during the past half year. It was not to be wondered at that no less a personage than the Master of the Rolls, in deciding one case, condemned the Act in the strongest terms, declaring it had seldom been his fate to attempt to construe an Act more difficult, and characterizing one section as being almost more confusing and more absurd than could be imagined.

Mr. STANLEY JONES, in replying on behalf of himself, the staff, and workmen, said he was bound to say, concerning remarks that had been made, that his grandfather's and his father's work for the Company was carried on in stormy times, while his had been in calm times, and under blue skies. While the present accounts were good, he and the staff were hoping to show even a little better working in the present half year. They did not by any means think they had reached the limit of good returns. Though the balance of profit would not perhaps be so good with the 2d. reduction for the current half year, there would, in his opinion, be the money with which to pay the increased dividend, and something besides to carry forward. As to the percentage of stoves in relation to the consumers, it must be remembered

that their seven square miles was largely industrial; and they had not a big residential population of the type that took an expensive stove. They fitted stoves in every tenement that was considered suitable; and, in fact, pushed the stove business for all it was worth. A field was opening in their district, being an industrial one, that was going to be a fine thing—that was in smelting, by which there would be displacement of solid by gaseous fuel. The Company's prospect was, generally, in his opinion, a very bright one.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the number of consumers increased in the past half year by 636, and that of stoves on hire by 561; while 307 were sold to consumers. The sale of gas was practically the same as in the corresponding period of 1909. The re-modelling of No. 2 retort-house, and the installation therein of stoking and coke-conveying machinery, has been completed; and this plant will be brought into use in the coming winter. The Directors had on the 17th of June the pleasure of receiving, on behalf of the Company, at the works, a large number of members of the Institution of Gas Engineers; Mr. J. W. Helps, the Engineer and General Manager of this Company, being the President of the Institution. Referring to the standard burner question, the Directors say: "The Bill promoted by this and other gas companies to legalize the use in their respective districts of the 'Metropolitan' No. 2 standard burner for gas testing has been passed by the House of Lords; and, after full investigation of the case made by certain local authorities against it, the House of Commons Committee unanimously resolved that it be reported for third reading. No opposition was made by any local authority in the Company's area. Notice of intention to oppose the Bill having, however, been given by three private members, the exigencies of public business have necessitated the debate on third reading being deferred till the autumn session of Parliament." The Directors express their pleasure in announcing that they have decided to reduce the price of gas by 1d. per 1000 cubic feet as from Oct. 1—viz., to 2s. 7d. in the Croydon and Carshalton districts, and 3s. 1d. in Caterham.

The accounts accompanying the report show that the total revenue was £118,233, of which £84,309 was derived from sales of gas, £9229 from rental of meters and stoves, and £24,575 from the disposal of residuals. A sum of £55,591 was expended on manufacture, and £18,430 on distribution; rent, rates, and taxes came to £4789; management cost £4306; and the total expenses (inclusive of £705 for the co-partnership scheme) were £89,312. The balance carried to the profit and loss account is £28,921; and the amount available for distribution is £32,295. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,624, and leave a balance of £9671.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 40,218 tons of coal and 575,303 gallons of oil were used during the half year to manufacture 664,857,000 cubic feet of gas, of which 620,560,400 feet were sold and 629,581,800 feet accounted for. The estimated quantities of residuals produced were: Coke, 24,130 tons; breeze, 5400 tons; tar, 487,269 gallons; ammoniacal liquor, 1,108,244 gallons—the make of sulphate being 435 tons.

PORTSEA ISLAND GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Saturday—Mr. R. E. Hellyer in the chair.

In their report for the six months ended June 30th, the Directors stated that the consumers, under both the ordinary credit system and the automatic prepayment system, had substantially increased in number; but, owing principally to the exceptionally mild and open winter, the quantity of gas sent out was less than in the corresponding half of 1909. The Engineer and General Manager (Mr. J. D. Ashworth) reported that the buildings and plant, as also the pipes and meters, had been adequately maintained, and were in efficient working order. The accounts accompanying the report showed that the sale of gas produced £81,659, and residuals, £31,643; and that the total receipts were £120,744. Expenditure on manufacture was £76,460; on distribution, £17,843; and on management, £3238—the total expenses being £101,585. The balance carried to the profit and loss account was consequently £19,159; and the amount available for distribution was £40,800. The Directors recommended dividends at the rates of 13, 12, 10, and 5 per cent. per annum (less income-tax) on the several classes of shares, after payment of which there would be a balance of £22,868. The quantity of coal carbonized in the half year was 52,922 tons; and, in addition, 534,636 gallons of oil were used. The make of gas was 654,719,000 cubic feet, of which 614,694,800 cubic feet were sold, and 625,555,200 cubic feet accounted for.

The CHAIRMAN, in dealing with the results of the half-year's working, expressed satisfaction at the continued development of the Company's business, as indicated by an increase of 1802 in the consumers since June, 1909, and also in the larger number of cookers and other heating appliances supplied on hire. He pointed out that, notwithstanding these facts, the gas sold showed a decrease of 15 millions compared with the corresponding period of last year, which he attributed to the mildness of the weather during the March quarter and the development of the Company's system of burner maintenance, which secured for the consumers a maximum of light with a minimum consumption. He stated that had last year's consumption per meter been maintained, the total quantity of gas sold—instead of being 15 millions cubic feet less—would have been 25 millions more than for the corresponding period of 1909. Owing to the reduced demand, the revenue from gas was £1110 less; but this was largely counterbalanced by an improved yield from

the sale of residuals. So that the gross income showed a decrease of £276 only, against which there was a reduction of upwards of £1900 in expenditure, mainly due to a saving in fuel and maintenance. The interest charges on borrowed moneys were also less; and the Directors were thus able to transfer a sum of £2000 to the extraordinary renewals fund. After payment of the usual dividend, the amount carried forward would exceed last year's balance by £336. Dealing with the expenditure from the extraordinary renewals account during the year, the Chairman remarked that the action of the Admiralty in terminating the agreement under which the Company reclaimed and used part of the foreshore adjoining the Flathouse works, and requiring the removal of the coal jetty at the same works, had involved an expenditure to date of over £12,000. In reply to various shareholders, the Chairman said that no compensation had been received or was recoverable from the Admiralty in respect of the outlay. He defended the principle of charging rent for meters, and quoted figures showing that the Company's charges were below the average. With regard to the contracts for coal supplies during the current year, he said they had been made at prices slightly in excess of those for last year. He then formally proposed the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. F. M. Aylen) seconded the motion; and it was carried unanimously.

The dividend recommended was afterward declared; and the customary donations of £50 and £5 5s. to the Portsmouth, Portsea, and Gosport Hospital and the Portsmouth Eye and Ear Infirmary respectively were authorized; as was also the gratuitous distribution of coke to the value of £100 among the deserving poor resident within the limits of the Company's supply, during the coming winter.

On the motion of Mr. A. W. Oke, a vote of thanks was passed to the Chairman and Directors, the Engineer and General Manager, the Secretary (Mr. H. A. Stubbs), and the staff generally, for their efficient management of the Company's business.

The CHAIRMAN acknowledged the vote, and the meeting terminated.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the Bournemouth Gas and Water Company will present at the half-yearly meeting next Friday, they inform the shareholders that the Gas Companies (Standard Burner) Bill (No. 1), promoted by the Company in conjunction with a number of other gas companies, has passed the Committee stage of both Houses of Parliament; and they express the hope that it will become law on the reassembling of Parliament. The Directors reduced the price of gas by a further 2d. per 1000 cubic feet at Lady Day—making the price 2s. 7d. in Bournemouth and 2s. 11d. in Poole. This will, from that date, increase the bonus payable to the employees under the co-partnership scheme, which they say is "undoubtedly working with beneficial results both to the consumers and the Company alike."

The accounts accompanying the report set forth that the revenue from gas was £49,617, and from water £19,491; the sale of residuals produced £11,541; the total receipts were £88,281. The expenditure (including £867 for the co-partnership scheme and expenses) was £60,887; leaving £27,394 to go to the profit and loss account. The balance available for distribution is £52,458; and the Directors recommend the payment of dividends (less income-tax) for the half year at the rates of 6 and 7 per cent. per annum on the preference and "B" ordinary shares respectively, including dividend at 7 per cent. on 2019 shares issued in March last, calculated from the due dates of payment on the shares, and at the rate of 15 per cent. per annum on the original share capital of £50,000. These dividends will amount to £17,148; and leave £35,309 to be carried forward.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager of the Company, 22,911 tons of coal, 35 tons of cannel, and 337,916 gallons of enriching oil were used in the production of 389,762,000 cubic feet of gas, of which 363,972,553 cubic feet were sold and 375,598,353 cubic feet were accounted for. The residuals produced were: Coke, 13,474 tons; breeze, 1994 tons; tar, 276,057 gallons; sulphate of ammonia, 235 tons.

LEATHERHEAD GAS AND WATER SUPPLY.

An excellent report was presented by the Directors of the Leatherhead Gas and Lighting Company at the recent annual meeting. The receipts for the year ended June 30 last amounted to £9648, and the working expenses to £7057; leaving a profit of £2591. To this had to be added £1853 brought forward; making a total of £4444. Deducting interest on loans and debenture stock, and the interim dividend of 2½ per cent. paid in February, there was a balance of £3163 available for distribution. The Directors recommended payment of a further dividend of 2½ per cent. (making 5 per cent. for the year), which would absorb £934, and leave £2229 to be carried forward. The Consulting Engineer (Mr. F. Southwell Cripps, Assoc. M. Inst. C.E.) reported that the new show-room, works offices, &c., had been completed, and had been in use some time. A new regenerator setting had been erected, and two other settings renewed. About 800 yards of 6-inch and 3-inch mains had been laid in various parts of the district. The Chairman (Mr. F. Hue Williams), in moving the adoption of the report, said the profit and loss account showed an increase of £152 in the year, and there had also been a saving in expenses. During the year the quantity of gas sold showed an increase; and their ordinary consumers had augmented by 25 and their prepayment customers by 23. The Directors had considered the position of the Company so satisfactory that they had decided to lower the price of gas by 2½d. per 1000 cubic feet to ordinary consumers, and to make a further reduction in the case of gas supplied for power purposes. Dr. Potts, in seconding the motion, remarked that the undertaking was now in a more satisfactory position than it had ever been before. The plant was quite up to date; and he was fully confident

that, with the exertions of the Secretary (Mr. John Young) and officers, the prosperity of the Company, especially now the price of gas had been reduced, would continue. The report was adopted unanimously.

The report presented by the Directors of the Leatherhead and District Water-Works Company at the half-yearly meeting on the 4th inst., set forth that the receipts amounted to £4591 and the working expenses to £2244, leaving a profit of £2347. To this sum had to be added £497 brought forward; making a total of £2844. Deducting £227 for interest on debenture stock, there remained £2617 available for distribution. The Directors recommended dividends at the rates of 10 per cent. per annum on the original shares, and 7 per cent. on the rest. This would absorb £2050, and leave a balance of £567 to be carried forward. The Consulting Engineer (Mr. F. Southwell Cripps, Assoc. M. Inst. C.E.) reported that the water supply during the past six months had been satisfactory both in quantity and quality, and that the plant generally had been maintained in good working order. In moving the adoption of the report, the Chairman (Mr. Arthur Bird) said that, though the Company had not had a very good half year, the growth was fairly satisfactory. For instance, in the twelve months ending June, 1900, they had 1734 consumers; now they had 3491. The capital expenditure in June, 1900, was £49,150; now it was £78,841. Then they pumped 111 million gallons of water; whereas in the past half year it was 209 million gallons. The water-rentals in 1900 were £4350; and last half year they were £8594. The profit in 1900 was £2030; and this year it was £4633. They had had a little question with the Inland Revenue authorities regarding the amount which should be allowed for depreciation. Hitherto £300 had been allowed; but orders had been issued to the Surveyors not to allow for depreciation except in regard to what had been thrown upon the scrap heap. The Directors felt this principle was not right, and were taking steps to appeal to the Commissioners. The report was adopted.

POSITION OF THE BUCKS AND OXON GAS COMPANY.

There seems to be no doubt, says the "Financial News," that a petition for the compulsory winding-up of the Bucks and Oxon District Gas and Coke Company will be made before long. To elucidate the present position, it may be recalled that the Company went into voluntary liquidation some time ago, Mr. G. M. White being appointed Liquidator. On July 1 last, Mr. White was appointed Receiver and Manager, on the application of a debenture-holder before Mr. Justice Joyce. At a meeting of the debenture-holders and creditors of the Company on July 12, it was unanimously agreed that a petition for compulsory liquidation should be made, the suggestion coming from the Liquidator and Receiver himself, who considers that there is every need for proper investigation. Messrs. Corbould-Ellis and Mitchell, Solicitors, of No. 14, Clements Lane, E.C., who were instrumental in obtaining the appointment of the Receiver and Manager, have been in communication with the largest debenture-holders and creditors, with a view to the application for a compulsory order, and have received many promises of support. Any creditors or debenture-holders who are in favour of a compulsory winding-up should therefore communicate with the firm, if they have not already done so. Our contemporary adds: "It may be mentioned that another firm, Albrecht and Co., have been circularizing the debenture-holders and preference shareholders, inviting them to contribute 2½ per cent. on their holdings for the expenses of a petition and investigation. It need hardly be pointed out that one petition will be quite sufficient, and 6d. a share agitation schemes do not commend themselves to support."

NORTH SUSSEX GAS AND WATER COMPANY.

Alleged Mismanagement.

A Meeting of Shareholders in the North Sussex Gas and Water Company was held at the offices of Mr. Matthew J. Jarvis, Solicitor, 4, Finsbury Square, E.C., last Wednesday. It was convened by the circular issued by Mr. Jarvis, referred to last week (p. 419), in which he stated that a Receiver had been appointed by the Court of Chancery at the instance of a client of his who represented £4500 of the £5000 of debentures issued. It was further stated that the object of the meeting would be to consider whether the present Directors should be called upon to resign. There were about a dozen shareholders present.

At the outset of the proceedings,

Mr. BIRCH, who said he had been a Director of the Company from the first, complained that the meeting was not a statutory one, as only six days' notice had been given of it.

Mr. JARVIS replied that he was aware of this, but said there was no time to lose in putting the matter before the shareholders, as their interests were in jeopardy. It was found that the debenture holders were not properly secured; and he wanted at the earliest moment to tell the shareholders what their security was.

Mr. BIRCH pointed out that the meeting could do nothing.

The speaker was asked to sit down or to act as Chairman; but he declined the offer to preside, and Mr. JONATHAN WESTLEY was elected Chairman.

Mr. JARVIS said that the assets of the Company were in danger, as Mr. Justice Swinfen Eady had appointed Mr. A. W. Lunt as Receiver on the application of a debenture holder, and it was necessary for the shareholders to decide on a course of action. It was desirable, if possible, to retain the business; for, if carried on under proper management, it might yet show a profit in time to come.

Mr. V. C. JACKSON then read a report of his valuation of the business. It showed that at Billingham the Company have mains along the main road for 1½ miles for gas and water. The population is 2000; and extensions could be profitably carried out. There are three other villages from three to six miles distant; but it was problematical whether it would pay to extend mains to them. The Company have

at present 151 gas consumers, and the annual income from this source might be put at £400. This number could, in Mr. Jackson's opinion, be increased if the price of gas, which is now 5s. per 1000 cubic feet, were reduced. The Company used 5 tons of coal a week, which they purchase locally at the absurd price of 27s. per ton. Mr. Jackson gave the following estimate of expenses for the year: Wages, £126; coal, £305; rates and taxes, £20; residuals, £25. He estimated the receipts as follows: Gas-rentals, £400; water, £80; residuals, £60. No charge was shown for management. He was of opinion, however, that a small outlay for the extension of the service would be advisable, as they would get more income without increasing establishment expenses. He did not see any prospect of the shareholders getting anything; but he thought with more outlay the works could be made to pay interest on the debentures.

Mr. C. BEASLEY followed with a report on his audit of the Company's books. He pointed out that the Company was promoted by the Finance and Construction Company; and under an agreement dated July 3, 1905, the promoting Company undertook to pay for a period of five years a sum equal to 5 per cent. on the Sussex Company's ordinary shares. In his opinion, the Company had been brought to its present position in the first place by lack of proper supervision by the Directors; and, secondly, by an insufficiency of consumers to provide a revenue on a capital of £18,000. The books were incomplete, and had not been properly posted for a year; and it was impossible to get proper details from them. The Company was authorized to raise capital to the extent of £32,000, and they had called up £20,620, as follows: Ordinary shares, £6990; preference shares, £8530; mortgage debentures, £5100. Of the £20,620, a total of £17,000 had been paid over to the Finance and Construction Company. It was not possible to arrive at the number of creditors of the Company, because of the neglect of the office work.

The CHAIRMAN remarked that the Act of Parliament only authorized the Company to charge 4s. 9d. per 1000 cubic feet for gas; and he wanted to know who was responsible for the charge of 5s. The business had been conducted in the worst possible way. It was one of the most scandalous things that had ever been put before a meeting. He was sorry they had been fools enough to invest their money as they had done. Reading from the 1908 balance-sheet, he pointed out that the gross receipts from gas that year were £360; and yet they paid their engineer £500 per annum. This was a sample of what was being done. He suggested that a Committee of Investigation should be appointed. Addressing Mr. Birch, he asked: "Who are the Finance and Construction Company?"

Mr. BIRCH: I am not here to answer that question. (Laughter.)

The CHAIRMAN said he had searched the Post Office Directory, and could not find any such Company in existence. Continuing, he called attention to a circular issued by the Gaslight and Coke Company, in which it was stated that since the Courts had decided that anybody was entitled to a list of shareholders in a company, people obtained the names of holders of good gas stock, and circularized them on behalf of new speculations. He believed this was done in the present case.

Mr. JARVIS informed the Chairman that they could not appoint a Committee of Investigation without statutory notice. He said the debenture holders were willing to carry on the business, and they would oppose any winding-up proceedings. Mr. Lunt, who was the Receiver, had acted as Manager of the Ticehurst Gas Company, and in nine months' working had turned a loss of £800 a year into a profit of £500. He thought something like this might be done for the North Sussex Company under a new Board of Directors.

Mr. BIRCH said he would resign his position as a Director, and he believed Mr. Martin, his co-Director, would do the same. The third Director, Mr. Wilson, had already resigned. He added that he had no idea or knowledge of the Finance and Construction Company beyond that they were a limited Company who had executed a number of similar works.

Mr. JARVIS said that, as Mr. Birch had promised that the present Directors would resign, it would only be necessary for the meeting to appoint three gentlemen to take their places.

Mr. BIRCH expressed his assent to this course.

The meeting then appointed Messrs. Albert Evans, George Killick, and Jonathan Westley to act as Directors; and the business terminated.

Stockport Gas Undertaking.—According to the report of the Borough Treasurer of Stockport (Mr. Harry Grundy) for the year ended the 31st of March last, which has just been issued, the total income of the gas undertaking for the year was £115,822, and the expenditure on revenue account £74,745; leaving a gross profit of £41,077. This has been appropriated as follows: Depreciation, £12,115; interest on capital, £7908; reserve fund, £3054; and local rates, 1910-11, £18,000. Out of the reserve fund, £1288 was expended during the year; and the balance to the credit of this account is £8878. The capital expenditure during the year amounted to £5316; making the total capital outlay on the gas undertaking £458,959.

Unventilated Gas-Stoves.—Dr. F. J. Allan, the Medical Officer of Health for Westminster, in his annual report, which has just been issued, says that the danger of using gas-stoves which are not provided with proper means of ventilation has been emphasized by the deaths of three persons—one being in Westminster—due to poisoning from the fumes. An analysis made by the Home Office of the air of three large workrooms in Westminster, in which a particular form of stove was being used without any special means of ventilation being provided, showed that the amount of carbonic acid in the air immediately over the stove was 34 parts per 10,000 in one case, 56½ parts in another, and 87½ parts in the third. The Home Office Inspectors (who are concerned with the warming of workshops) held that the use of such stoves is an infringement of section 6 of the Factory and Workshop Act; and they requested that the stoves should be replaced by a better system of heating, or so efficiently ventilated as to prevent them interfering with the purity of the air. It is pointed out that there are now available good forms of gas-stoves with proper means for carrying off combustion products. If properly fitted, so as to ensure a sufficient flue draught, no vitiation of the air of the room need ensue.

SOUTHPORT CORPORATION GAS SUPPLY.

Progress of the Undertaking—Position of the Engineer.

At the Meeting of the Southport Town Council last Tuesday, the report of the Gas Engineer (Mr. John Bond), on the working of the gas undertaking in the past financial year, was presented.

In the course of the report, it was stated that in 1884 the total make of gas at the Crowlands works was 184,238,000 cubic feet; while last year it was 535,121,000 cubic feet. The make last year was not the record one, though it was upwards of 800,000 cubic feet more than that of 1908-9; for in 1907-8 it was 542,352,000 cubic feet. For the 26 years, the increase has, in the main, been progressive. The unaccounted for gas last year amounted to 13·6 million cubic feet, against 17 millions in 1907-8, 15 millions in 1908-9, and 14 millions in 1906-7. In 1901, only 1,909,410 cubic feet of gas were unaccounted for. The gas-works capital account now stands at £298,428; a sum of £2504 having been expended during the past year. Of this total, £749 was spent on new mains, £489 on meters, and £1265 on cookers. Meters now stand at £38,682 in the capital account, and cookers, gas-fires, &c., at £29,928. In 1884, the capital account was £158,683. Then, however, though the price of gas was 3s. in the borough and 3s. 3d. and 4s. 6d. outside, the net profit was £4646, against £13,112 last year, and the capital employed was £298,428, and the price of gas 2s. 8d. in the borough and 3s. 2d. outside. With the exception of 1908, when the net profit was £14,319, that for the past year is the largest since the price of gas was reduced in 1904. Indeed, only once—in 1899, when it was £15,147—was last year's figure exceeded in the period from 1896 to 1903, when the price of gas was 3s. in the borough and 3s. 6d. and 4s. outside. This figure again has only been beaten once during the last 26 years—viz., in 1895, when the net profit was £16,256, and the price of gas was 3s. 3d. in the borough, and 3s. 9d. and 4s. outside. From the standpoint of net profit, the past year's working is the fourth most successful in the history of the gas undertaking. Though Southport supplies gas to Birkdale, the mains there are the property of the District Council; and there are 17 miles 109 yards of them, compared with 80 miles 1360 yards in Southport. None of the Birkdale mains are more than 16 inches in diameter; while the Southport mains go up to 42 inches. During last year, 214 yards of new mains were laid in Birkdale, whereas in Southport 2040 yards were put down. At present the number of consumers of Southport gas is 11,478 by ordinary and 4706 by prepayment meter. The number of meters in use is 18,856, of which 1119 are privately owned, and 17,837 are the property of the Southport Corporation.

Alderman GRIFFITHS, the Chairman of the Gas Committee, in moving the confirmation of their minutes, said he thought it was unnecessary for him to speak upon the report of the Gas Engineer. The original capital invested in the undertaking was £298,000; and it was now reduced by the sinking fund to £197,725. There was a slight increase in the make of gas; and, taking into consideration all the circumstances relating to the competition of electricity, and other things, any increase was a sign of progress, and was satisfactory. Residuals had produced more money; and the gas estate was in a very healthy condition. There was one minute to which attention might be called, and it was as follows: "Resolved that Mr. John Bond, the Borough Gas Engineer, be empowered to accept some consulting work outside his duties, on condition that he should confer with the Committee on each occasion before accepting any outside work." Mr. Bond had been with the Corporation for rather more than six years. They had had large reconstructions in the retort-house; and he (Alderman Griffiths) ventured to say that the gas estate was, considering its age, equal to any other gas undertaking in the United Kingdom. Mr. Bond had earned, and had thoroughly deserved, the absolute confidence of every member of the Gas Committee, and he thought he might say of the Council. Mr. Bond had arrived at an age when it was almost incumbent upon any man holding a position—a man of ability and understanding—to decide what course he would take for the future. It had been suggested to him that he should apply for the Belfast appointment; but he had declined to become a candidate for it. He had also had an invitation to go in for the vacant position at Leicester. But after being one of the final four selected, he withdrew his application; expressing a desire to remain at Southport, but to be granted opportunities for carrying out research work in connection with gas manufacture, chemical analysis, &c. He (Alderman Griffiths) was opposed to the principle of employees of the Corporation taking outside work; but in this case he believed it would be to the advantage of the ratepayers that the resolution should be confirmed by the Council. Mr. Bond was not to take on any kind of work without conferring with the Committee; and he (Alderman Griffiths) thought the Council could trust the Committee not to let the interests of Southport be in any way interfered with.

The minutes were confirmed.

FREIGHT RATES FOR INVERTED MANTLES.

Some correspondence on this subject has lately taken place between Mr. L'ce. Fletcher, the Managing-Director of the Welsbach Incandescent Gas-Light Company, Limited, and the Assistant Goods Manager of the Great Western Railway Company (Mr. Hennell). Early this month, Mr. Fletcher sent a circular letter to all the railway companies in the kingdom, pointing out that the maximum rate payable for the carriage of gas-mantles is at present applicable to those of the inverted type; and that as the weight of these, owing to the fire-clay ring employed, is just double that of an ordinary mantle—a fact which had, he thought, been overlooked—it followed that the maximum rate was being levied upon fire-clay. Mr. Fletcher also called attention to the fact that the space taken up by a given number of inverted mantles is very considerably less than that occupied by a like number of ordinary mantles; and he expressed the hope that consideration of this matter would ensure a substantial modification of the rate. The letter was acknowledged by Mr. Hennell, who said that as the question

raised was one which affected all the railway companies equally, he was arranging for the letter to be submitted to the next meeting of the Associated Railway Companies in conference. Mr. Fletcher, in reply, expressed his pleasure at this action, and said he trusted it would be possible to arrange a substantial modification of the rate for the benefit of the trade. Should the steps already taken be unproductive of a change, it may be necessary ultimately to press the question upon the railway companies through the medium of the Chamber of Commerce.

TESTS OF CHARCO

By the Coal Smoke Abatement Society.

A report has just been issued of a series of tests of "Charco," carried out in June, under the direction of the Coal Smoke Abatement Society, for the Company that was formed to work a patent for the treatment of coke in the way described in the "JOURNAL" for Nov. 9 last year, p. 385. The tests were conducted, under the supervision of representatives of the Society, by Dr. John S. Owens and his assistants.

The Society was not asked to report upon the process by which charco is manufactured, but only to test a sample submitted by the Company with the object of ascertaining the value of charco as a fuel for ordinary household fires. In order that the tests might be of comparative value, the charco was tested under similar conditions against two other solid fuels used in domestic heating—viz., bituminous coal and gas coke.

Although coke is not largely used for domestic heating purposes, the report states, the fact that charco is called a modified form of coke suggested that a comparative test should be made of the two fuels, so that it would be possible to form an opinion whether the superiority claimed for charco over untreated coke was capable of demonstration. The points to which the greatest attention was paid were:

- (a) The value of charco as a heating agent for ordinary rooms compared with coal and coke, on the basis of heat radiated into the room in proportion to the amount of fuel consumed.
- (b) Its heating effect on the air of the room in proportion to the amount of fuel consumed.
- (c) Its effect on the air of the room, considered from a hygienic standpoint.
- (d) Whether charco is, as was claimed for it, a smokeless fuel.

After dealing at great length with the arrangement of the testing-rooms and the way in which the testing was carried out, the Society present a series of curves showing the results obtained. The conclusion is that, compared with coal, the sample of charco tested lighted easily, and required less attention when burning; while compared with coke, it lighted much more easily and burned into a brighter and hotter fire. Both the charco and coke tested emitted no smoke whatever, except during the time the wood used to light them was burning. The coal, on the other hand, emitted a considerable quantity of smoke throughout most of the day.

The total of the thermopile readings for charco and coal for two days was: Charco, 1907; coal, 1542; or if the coal readings be taken as 100, the charco gave 123·7. This figure has, however, to be divided by the amount of fuel actually burned while the readings were being taken—that is, the weight of fuel stoked less the weight of cinder left after the last reading. This figure was for charco 39·485 lbs., and for coal 45·53 lbs. When, therefore, the total readings are treated in this way, a figure is obtained showing the comparative radiation per pound of fuel burnt. This is for charco 48·3, and for coal 33·8; or an excess of 43 per cent. in favour of the sample of charco compared with the coal tested.

When charco and coke were compared, the total readings were: Charco, 697; coke, 310. The amount of charco burnt was 15 lbs.; of coke, 9·53 lbs. This gives, per pound of fuel burnt, 46·5 for charco and 32·5 for coke, or an excess of radiation of 43 per cent. in favour of charco over coke—exactly the same percentage excess as was obtained by charco over coal. The coke did not at any time give a satisfactory fire; and as it had to be relighted twice, the test was not so satisfactory as that of charco and coal, nor the comparative figures so reliable.

The temperature of the room in which the fuels were burned was taken at three different points, about 5 feet above the floor and 3 feet away from the walls. Protection from radiation direct from the fire was given to the thermometers where necessary by means of screens. Observations were taken at half-hourly intervals; and the average of the three thermometer readings was taken as the temperature of the room air at any time. The results show that the fire of the charco tested raised the temperature of the room air more rapidly than either the coal or coke fires, and maintained it at a higher level, although in the case of the coal fire more fuel was burnt per hour.

The Society desires to call special attention to the fact that these results were obtained from the various fuels when burnt in ordinary open fireplaces; and that when the fuels are used in other forms of fireplaces or stoves the same results may not be obtained. As, however, the ordinary grate is designed to burn bituminous coal, the test of charco against coal in such grates is, if anything, placing coal at an advantage. Coke, on the other hand, would certainly have shown better results if used in a fireplace or stove in which the draught could be forced if necessary. The scope of the inquiry did not embrace a test as to whether the fuel would be of use in an ordinary kitchener designed to burn coal.

Quality of Walsall Gas.—In a report just issued, the Walsall Corporation Gas Committee state that they have, without any solicitation, received a letter from Mr. A. Cresswell, of Birmingham—an independent gas examiner—who, in view of certain strictures recently made upon the quality of the Walsall gas, expresses his personal opinion with regard to it. He states that he considers that, so far as illuminating power is concerned, the gas will compare favourably with any he tests in the Midlands. As to its purity, it is quite free from sulphuretted hydrogen—the only impurity for which he tested it.

MUNICIPAL ELECTRICITY SUPPLY AT SOUTH SHIELDS.

An Adverse Balance Last Year.

At the Meeting of the South Shields Town Council last Wednesday week, the minutes presented by the Electricity Committee embodied the annual report on the undertaking. Alderman Rennoldson, when moving its adoption, expressed regret that the Committee had to appear before the Council with a small adverse balance, because it was the first time for a period of ten years that they had been in this position. For nine years they had had continuously a balance to their credit; and in these years they had made a clear profit, after providing for interest and redemption and all other charges, of £13,990—an average of £1550 per annum. While they had a small adverse balance this year, which on the electrical undertaking proper only amounted to £106, there were ample justifications for the position. When they considered all the circumstances which prevailed in the electricity supply industry throughout the length and breadth of the kingdom, they might congratulate themselves that they were not in a worse position. In 1908, their revenue from lighting only was £14,360. In 1909, it fell to £13,111; making a deficit for the year of £1249. During the year ended March last, the revenue fell to £12,412; showing a deficiency of £699. The Council would thus see that the loss was diminishing; and he thought that they had about touched bottom. Metallic filament lamps had come into such common use, that the declension due to this cause could not go very much farther. They had last year 161 more consumers than there were two years ago; but, notwithstanding this, the revenue had fallen. They had had a very fair increase in the production of current during the three years 1908 to 1910; the figures being 1,080,500 units in 1908, 1,245,700 in 1909, and 1,448,803 in 1910. The revenue from all sources of light and power had not varied very much; but the price per unit obtained had steadily decreased. It had gone down from 3.16d. in 1908 to 2.73d. in 1909, and this year it was 2.42d. The total cost per unit in 1910 was 1.91d., and private consumers paid 2.42d., public lighting paid 1.60d., and traction paid 1.40d.; so that both for lighting and traction the current had been supplied at less than the actual cost. With regard to the capital account, the total expenditure on the undertaking to date was £184,627. Of this, there had been paid to sinking funds £52,350. There had been paid out of the profits of the undertaking £13,716; and if they took these two amounts from the £184,627 it would leave £118,561. Of this capital cost, they had in land and buildings, which were not depreciatory, a sum of £19,000, which brought the total indebtedness of the undertaking at the present time to a little below £100,000. He considered that the concern, in this respect, was in a very satisfactory condition indeed. During the past year, they had provided for interest £52,046, which was equal to 4½ per cent. on the £118,000; and in addition they had carried to the sinking fund and repayment no less than £6500. He ventured to say, if this had been a private or a public company, they would not have carried anything like this sum to reserve or depreciation; hence they would probably have been able to show a profit on the undertaking of something like 7 or 8 per cent. He was sorry the little balance referred to was against them. It was not so good as being on the right side; but still the Committee and himself were perfectly hopeful. They were looking forward to the next year as bringing them a return of the former happy state of things; and up to the present the indications fully justified the expectation.

Mr. Henderson, in seconding the motion, referred to the effect on the undertaking of the introduction of the metallic filament lamps; and said the Committee had been told that they ought to have counteracted it. The only way to do this was to put up the price; and, as a business man, he found that if this were done in any case the sale would be less. He did not think it necessary to counteract the effect of these lamps; they were really "blessings in disguise." Mr. Dowson pointed out that 1.91d. per unit was being paid for current for power, when they could get it at half the price from outside; and, in his opinion, this was not business. If any tradesman conducted his affairs on these lines, he would soon be landed in bankruptcy.

After some further remarks, the report was adopted.

In the course of a leading article on the subject, the "South Shields Daily Gazette" last Thursday said: "The South Shields Town Council was last night busied with the endeavour to put the best face on matters in connection with their electricity undertaking. Over £180,000 of the ratepayers' money has been sunk in that undertaking; and the result of the past year's working is that, after paying working expenses and interest and sinking fund alone, there is a deficit on the year of a little over £200. The undertaking has now been in operation nearly fourteen years. For the past ten years, the total profit, after paying interest and redemption, has amounted to less than £14,000—an average of £1378 per annum, or, roughly, about three-quarters of 1 per cent. per annum. It is being sought to excuse this year's deficit on the ground that it is a very small one; and elaborate arguments were adduced to show that the Corporation have redeemed roundly £34,000 of the capital expenditure on the electricity undertaking, and therefore are nominally in possession of property to that amount free from encumbrance. We say nominally, because, of course, the electricity works, if regarded as an asset, must be taken as a going concern. The buildings cannot be separated from the plant, and the plant cannot be separated from the buildings. The whole must be taken together, either at its market value or at its value as a revenue-earning undertaking. And from either point of view, we imagine that the undertaking is, to say the least of it, not undercapitalized. But even to take the line of argument adopted by the apologists for the electricity works, it is of very little advantage to the ratepayers to be informed that they possess £34,000 of property clear of encumbrance, if the property is bringing them in no return. There are a great many property owners in the town to-day in precisely the same position. They own property representing a very considerable amount of capital, which is yielding them no return whatever, or at best a very small return; and they are naturally not inclined to regard this in any sense in the light of a profitable investment."

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons, presided over by Lord MACDONNELL, resumed consideration on July 7 of the above Bill (see *ante*, p. 401).

Mr. BALFOUR BROWNE, K.C., who stated that he appeared at the request of the Parliamentary Agent to the Provincial Water-Works Companies, said he had had considerable experience in promoting and opposing Bills with regard to supplies of water. There were a large number of problems outstanding in regard to water supply which he thought ought to be dealt with by Parliament. But the Bill did not touch most of them; and where it did touch them, it did not do so satisfactorily. Cases should be dealt with individually, and not by a hard-and-fast rule as proposed by the Bill. The Bill proposed to give to landowners a right, or property, which they did not at present possess. This property could only be bestowed by Parliament at the expense of somebody; and the somebody, he took it, would be largely companies and local authorities. It had been suggested that local authorities who did not apply to Parliament for powers should be exempt from the Bill. If this were so, these local authorities would be able to do what they liked. Supposing such authorities were prepared not to borrow but to raise the necessary money out of the rates, they could sink a well and do the very damage which the Bill was intended to prevent. It was a very serious matter that the Bill would leave the whole power in every landowner to do what he willed with his own. Any landowner could not only sink a well, but he had a perfect right to sell water. Supposing a large corporation said to him: "We do not want to go to Parliament. You are a landowner. Will you sink a well and pump 2 million gallons a day?" And supposing he said: "I will. The well will cost £100,000. Will you guarantee me £10,000 a year?" The corporation could accept. In that case, the landowner would sink a well, and, though he might do a great amount of damage to neighbouring wells, he would be protected by the Bill. In one case, the owner of a gathering ground which supplied water to the Bradford Corporation went behind the spring, as he was entitled to do, and obtained water (about 200,000 gallons daily) and sold it to the Shipley Urban District Council. There was nothing in the Bill to prevent this. But the damage was done, whether it was done by a company or by a landed proprietor. He objected to making one law for landed proprietors and another for companies. There was a case in which the Liverpool Corporation purchased the gathering ground round one of their reservoirs. A gentleman who had a bungalow there claimed an absolute right to divert the water and sell it; and compensation had to be paid to him by the Corporation on that basis. The Bill did not touch such a case as that. It would put companies in a very serious predicament. If the Bill was a proper one, it should apply all round, and not merely to England and Wales. If passed, the Bill would to a large extent take away rights which had been conferred by Parliament. Clause 3 would have a retrospective effect; and while it was applied to everybody, it was inapplicable in a great number of cases. The Lord Chairman's clause, like every other clause in the Model Bill, was one to be adopted under certain circumstances. If they pointed out, in a particular case, that the clause was not applicable, it would be varied. If, however, the clause were embodied in an Act, it would not be susceptible of modification in accordance with the particular circumstances. The words "any other works" were far too wide and far too restrictive. These words would make it essential, for instance, to indicate the exact adits which were to be driven, although until a shaft had been sunk an engineer did not know where the adits would be driven. The principle of compensation for injury done appealed to him, as a general proposition, as reasonable. He objected to the clause in the Bill because it was one-sided. He did not agree that compensation should be given in a case in which the owner of land had for 50 or 100 years enjoyed the use of water from a well, and in which a water undertaker or brewer or other trader established works in the immediate neighbourhood with the result that the water of the well was depleted. The brewer or other trader had the right to sink a well; and it was proposed to take that right away from him and give it, without compensation, to the other man who had enjoyed it for 50 or 100 years. The man who had sunk the well and enjoyed it for 50 years had no right to the water while it was underground flowing in an undefined stream. He did not think the circumstances which had arisen in the last hundred years or so—the establishment of great industries, the creation of great water-works which took water in vast volumes from the subsoil—justified altering the law. Clause 5 seemed to have got into the Bill by accident. It had nothing to do with the law of underground water. Undertakers only went a great distance in order to obtain gravitation supplies. The clause was a very serious departure from the ordinary law. Apparently any one along a line of pipes was to have the right to demand a supply of water. Did this mean that the promoters, when seeking power originally for their scheme, were to calculate merely what their own wants were, or were they to calculate what everybody between their town and the source wanted? If an authority went to a great distance, and established works to supply every place between, it was just in this case that nobody would want a supply owing to the cost. The more the authority prepared to give a supply, the less it would be taken by the places *en route*. The people in districts from which the water was obtained had a better right to a supply than those *en route*. Small district councils, if excluded from the operation of the Bill, might do the very damage which the Bill was designed to prevent. He would not have the Bill at all; but, on the assumption that protection was necessary, he would not exempt these small bodies from its purview. It would be monstrous, however, if they were compelled to apply to Parliament in every case. In all cases, there ought to be adequate inquiry. With reference to small local bodies, there was another question which Parliament would have seriously to consider, and this was why a Bill dealing with one aspect of water supply was premature. Two large counties, Monmouth and Glamorgan, had recently promoted Bills to become the water authority for the whole county. Both failed. It did seem, however, that possibly the unit of a small local authority, such as a village, was too small, more especially having regard to the difficulty of getting water close to one's door. A larger unit would probably have to be

formed to get water from an outside district. There was water in Wales still, but no small authority could go there. He was entirely in favour of a more thorough investigation of the whole question of water supply. The conservation of water generally was a most important matter. In many parts of the country there was a large body of water flowing underground which was not utilized by any surface proprietor at all, because it escaped into the sea. If this was the case, he did not see why compensation should be paid to landowners.

By Lord DESBOROUGH: After the Bill had passed, neighbouring proprietors would be able to sink wells against one another.

Lord DESBOROUGH: You think any water company who acquired land should have the power absolutely to drain the whole of their area as dry as they can?

Mr. BALFOUR BROWNE said he only claimed for water companies what the man who sold them the land had. He had the power to do it. If they were going to alter the law against the company, they should alter it against the man also. It was decided in the case of *Pickles v. Bradford Corporation* that a man could do it out of "mere cussedness." There was a great deal of difference of opinion as to whether any injury whatever was done in Hertfordshire by pumping. It was most important that Parliament should know what was going to take place in connection with a water scheme. If he were Parliament, he would interfere in certain cases. If any authority came, as Nottingham did, to sink a well which would take water from a flowing stream on the surface, he would prevent them. It was a very important matter for the Thames Conservators that Bills were frequently brought forward to tap the feeders of the Thames or to get down to the gravel; but if a company or local authority applied to Parliament, they had to prove that it would be necessary to get water, and if the company or authority was only taking the water in its own area, he did not see, notwithstanding the duties of the Conservators, that the necessity of the company or authority should not be considered by Parliament. If water could be taken without damaging a legal right, he would let it be taken.

By Sir W. CROSSLEY: He thought the law with regard to underground water, as it stood, was good.

By Mr. HOLT: Clause 3 looked as if it would stop the procedure by Provisional Order. It would be absurd to stop such procedure. It would also prevent an undertaker who had bought a watershed from constructing supplementary works. The obligation with regard to compensation would extend to anyone who was within two-and-a-half miles of a pipe-line bringing a supply from a distance and who was injured.

By Sir J. ROLLESTON: He believed we were getting so near the end of our available water that the matter should be inquired into, and settled before matters such as were dealt with in the Bill.

Mr. WILLIAM BOOTH BRYAN, the Chief Engineer to the Metropolitan Water Board, gave particulars with regard to the Board's sources of supply. He stated that the promoters proceeded on the assumption that it was in the public interests that private water supplies should be compensated and protected at the expense of public water supplies. This assumption would not be accepted by the numerous authorized water undertakers throughout the kingdom who were under statutory obligation to carry out a valuable public service in the general interests of the community, and who, if they failed, or were negligent in carrying out their statutory obligation, were liable to heavy penalties. It had been the custom of the Legislature to afford to a statutory authority carrying out statutory obligations in the interests of the public a protective position—that was to say, a water authority was not liable for any damage to private interests, unless the private interests aggrieved proved that the water authority had been guilty of negligence. He saw no objection to clause 3 so far as the Metropolitan Water Board's interests were concerned, provided it was amended so as to comply with the form of the Lord Chairman's clause, and so long as it was made clear that the clause was not retrospective. The clause should also safeguard existing rights of water authorities where such authorities had the express general right of exercising the powers of section 12 of the Water-Works Clauses Act, 1847, or similar powers on lands already acquired by them for the purpose. In the year 1907, when the Metropolitan Water Board's Various Powers Act was considered by the Joint Committee presided over by Lord Cross, the Committee, having regard to the Board's existing rights with regard to sinking wells, inserted the following clause: "The Board shall not sink any well upon, or construct any works for taking or intercepting any water from, any lands acquired by them after the passing of this Act, unless the works and the lands upon which the same are to be constructed are specified in this or some other Act of Parliament." This clause was limited in its application to any lands acquired by the Board "after" the passing of the Act. Prior to the passing of the Act, the Board, as the successors of the late Metropolitan Water Companies, had vested in them certain lands throughout their area on which they had express power by the Companies' Acts to sink wells, but which powers had not, at the passing of the 1907 Act, been exercised. These rights Lord Cross's Committee thought fit to preserve when they inserted section 34 (quoted above), as it was strongly urged by the Board, on behalf of the ratepayers of London, that the undertakings of the Water Companies were acquired by the payment of very heavy compensation awards on the basis that the Board acquired the rights of obtaining water and were entitled to exercise them. If clause 3 passed without amendment, the express rights for which the Board had paid large sums of money, would be prejudicially affected. There was no precedent for rights acquired under Private Acts of Parliament (especially after purchase for valuable consideration by the ratepayers) being in this way restricted or interfered with by a clause in a Public Act of Parliament. He strongly objected to the Lord Chairman's clause being embodied in an Act. Each case should be considered on its merits before the exact wording of the clause was decided on. He was not averse absolutely to the payment of compensation for injury suffered; but the onus of proof should rest with the claimant, and the liability to compensate should be general. The protected area would have to be very carefully considered in each case. The question of supplying in transit would have to be carefully dealt with in the first instance. He would object to the Local Government Board having power to order distribution from a conduit pipe after a supply had been established. He was absolutely

opposed to the Bill being proceeded with. In the Water Board's Kent district, there was far more pumping by industrial enterprises than by the Board; and the pumping by industrial concerns was increasing. This emphasized the difficulty of giving compensation.

Sir J. COMPTON-RICKETT, M.P., gave evidence in opposition to the Bill, on behalf of the Goole Urban District Council. He apprehended that the sinking of colliery shafts in the vicinity of the Goole Council's water-works would cause damage to other water supplies, the responsibility for which would fall on the Goole Council. Water-works should not only be open to a claim for compensation, but should be able to claim compensation. There was no doubt coal existed beneath the new red sandstone—the source from which water in this area was drawn; and if shafts were sunk to the coal measures, water would be drawn away, and Goole might be unable to comply with their statutory obligations. To meet the position, he suggested that Goole might be exempted from the operation of the Bill. Or possibly the collieries might to some extent be made responsible.

The CHAIRMAN, on the conclusion of Sir J. Compton-Rickett's evidence, intimated that the Committee did not desire to take any further evidence. They then proceeded to consider their report, which was given in the "JOURNAL" for July 26, p. 280.

COLNE VALLEY WATER COMPANY.

An Expanding Business—Retirement of the Secretary and General Manager, and Appointment of Successor.

The Chairman of the above-named Company (Mr. C. E. Keyser) had nothing but good, regarding the business operations of the concern, to tell the shareholders at their half-yearly meeting on Tuesday week. He stated that the total amount of the water-rates for the six months amounted to £23,380, compared with £21,736 in the corresponding period of last year—being an increase of £1,644. This increase was most satisfactory; being within £35 of the highest previous increase when the rates were calculated on the higher scale. During the half year, 632 new supplies were laid, representing an estimated total annual water-rental of £1485. Only once before had this amount been exceeded. That was in 1906; and then, of course, the rates were being calculated on the higher scale. The amount received from building supplies was £754, which was the best half year experienced in this respect other than the one ending December last, when the amount was £819. In regard to expenditure (£9771), this was £622 more than in the corresponding half year; but income-tax and rates and taxes amounted to £468 more. In this, the Company suffered in common with the general community. The average daily supply of water increased again very slightly, notwithstanding the large number of new consumers; the smallness of the increase being mostly due to the cold wet weather. For domestic purposes, the consumption per head per day was lower than it had been before; it was just under 22 gallons per head. This was partly due to the great exertions made to prevent waste; and partly, he thought, to their water being always under constant pressure. The new softening reservoir and lime tanks had been in regular use the last two or three months—in all respects satisfactorily. As to the capital account, it was slightly overdrawn—to the amount of £2551; but it would not be necessary to issue additional stock till about the end of the year. The adoption of the report and accounts was seconded by Mr. A. Helsham Jones, after which Mr. Burge and Mr. W. B. Bryan made some congratulatory remarks. The motion was then agreed to.

A resolution was carried declaring the payment of full statutory dividends at the rates of 10 and 7 per cent. per annum on the several classes of ordinary stock, and, in addition, 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks; leaving £4268 to be carried forward.

The Chairman then brought forward the question of the retirement of Mr. W. Verini, after 38 years' service, during a considerable part of which time he had been the Company's Secretary and General Manager. He said that only the Directors could appreciate what an important factor Mr. Verini had been in the success that had attended their efforts; and it was a matter of great regret to the Board that he had been compelled to write and say that, owing to his health not being so good as he could wish, he thought it would be wise for him to give up now, though willing to offer the Company the benefit of his services in future. The Directors considered that the least they could do, in recognition of his great services to the Company, was to propose a retiring allowance of £400 a year; and they were deliberating upon how best they could avail themselves at their Board meetings of his advice and great grasp of their affairs. Mr. W. B. Bryan, in cordially seconding the proposal, spoke of the great expansion of the Company's work from the time when the revenue was comparatively small until now when it was something like £46,000 a year, and said the difficulties of the concern had been pulled through by Mr. Verini and the other officers until now they were in possession of one of the best-managed water companies. He thought that it would be most unfortunate if Mr. Verini's services could not be relied upon in future, in some way or other, in view of the difficult and delicate questions that must arise in the next few years in connection with private water authorities. There was hearty agreement with the resolution; and Mr. Verini feelingly made acknowledgment—concluding with the remark that the Company could never have anyone who had their interests more at heart than he had had, and always would have. Succeeding, a resolution was proposed by the Chairman that Mr. C. P. Sinclair should be appointed to the position to be vacated by Mr. Verini at Michaelmas, at a salary at the rate of £500 per annum to June 30, 1911, afterwards increasing by £25 per annum to a maximum of £800—the Chairman remarking that possibly the success of the Company would then be such that this maximum would not be adhered to. It was mentioned, in reply to a question, that Mr. Verini's salary had reached £900; but his services had extended over 38 years. Mr. Bryan seconded the proposition, and also referred to

Mr. Sinclair's experience in connection with the New River Company and the Metropolitan Water Board. The Metropolitan Water Board, he added, had passed a very flattering resolution regarding the services of Mr. Sinclair when they heard he was leaving them for the Colne Valley Company. He himself had known Mr. Sinclair so long that he could heartily congratulate the Company upon having secured his services. The motion was unanimously carried. Mr. Sinclair, in his acknowledgment, said he felt his experience in connection with the Metropolitan Water Board would enable him to tackle some of the serious questions that would come before the Directors. His endeavour would be to give as faithful service to the Company as his predecessor had done.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow seem to be drifting from a financial anchorage which they have occupied for many years with credit to themselves. At their meeting on Thursday, Treasurer Graham moved that the surplus revenue on the Common Good account, amounting to £43,995, and which included a contribution of £3236 from the Gas Department, be voted in relief of the rates; the particular relief being given to the Parks and Tramways Departments. After much discussion, the motion was agreed to by forty votes to fourteen. The effect of the vote is seen in a letter from Mr. D. M. Stevenson, an ex-Treasurer of the City, which was published in the "Glasgow Herald" on Thursday morning. Mr. Stevenson explained that he wrote the letter because of his inability to be present at the Council meeting. The writer stated that it was proposed to take the whole surplus of the Common Good, £40,758, plus £3236 of surplus from the gas undertaking, and to apply both to the relief of rates. The latter was done in spite of the fact that the Corporation emerged from Parliament only the other day with the power taken from them once and for all of applying profits from the Gas Department otherwise than to the reduction of future gas charges. In fact, Parliament seemed now to have come to the conclusion that the financial system so long in vogue in Glasgow, of making the so-called commercial departments apply their surpluses to the reduction of charges, was the only sound one. The most enlightened members of the leading English Corporations were more and more taking this view, and pointing to Glasgow as an outstanding example of sound finance. "Yet here we are," according to Mr. Stevenson, "deliberately turning our back on it all at the instance of what I can only believe to be a temporary majority." It was, he went on, admittedly a subtle and insidious form of indirect taxation; but none the less it hoodwinked the untinking and ignorant among the electors, who believed that they were getting an advantage, when in reality they were being bled for the benefit of those who were best able to pay. It could not be too often repeated that working-class families used the tramways at least as much as the wealthy ones. Therefore, while they paid as much in tramway fares as their richer neighbours, the £12 householder stood to save 2s. in rates, where the £120 householder saved £1. One of the saddest things about the Corporation's decision of June 16, to make a grant from the Common Good in reduction of assessments, was the fact that every one of the 42 who voted for it would gain by it personally. In so doing they were acting in the interest of about 15 per cent. of the electors, and in direct opposition to the interest of the remainder. In the Town Council, Mr. Stevenson's letter was referred to; and the opinion was expressed by several members that it would cost him the provostship.

In the Dumfries Town Council last week, a letter from Mr. John Smith was read, resigning his post as Joint Manager of the Corporation gas undertaking, upon his appointment as Manager of the Stirling Gas-light Company. Judge Thomson, the Convener of the Gas Committee, in moving that Mr. Smith's resignation be accepted, said that, though so young, he had a way of dealing with the men which commended itself to every right-thinking person—dealing with them gently but firmly. He expressed regret that he was leaving them; but congratulated him upon his appointment, and trusted the future would be as successful for him as the past had proved to be.

The Auchtermuchty Gas Company, Limited, have reduced the price of gas from 6s. 8d. to 6s. 3d. per 1000 cubic feet; and the Gourrock Town Council by 2d., making it 3s. per 1000 cubic feet.

The Hamilton Gas Committee this week recommended the Council to dispose of the surplus of £2966 upon the gas account, by handing over £1200 to the revenue of the Common Good of the burgh, and carrying the balance forward. This was agreed to. The prices to be charged for gas were continued at the same rates as last year.

The half-yearly ordinary general meeting of the Coatbridge Gas Company was held last Tuesday. Mr. James Johnston, J.P., Chairman of the Company, presided over an average attendance of shareholders. In submitting the report of the Directors, the Chairman referred to the cheering nature of the minutes of the last shareholders' meeting; but only two days elapsed after that meeting when they had to face the misfortune of a serious explosion, which, while disastrous enough from the point of view of loss, and necessarily causing some inconvenience to consumers for a time through the lack of adequate purifying plant, was happily free from loss of life. They were fortunate in having a good insurance fund, which would more than meet the loss. After paying a compliment to Mr. Alexander Wilson, the Gas Engineer of the Glasgow Corporation, for his neighbourly action in giving every assistance to their own Manager, the Chairman said that the serious position in which they had been placed had occasioned considerable anxiety and extra work to the Directors and officials; but he was glad they had overcome the difficulty, and the new plant was now working satisfactorily. He concluded by moving the adoption of the report and the declaration of dividends at the rate of 12 per cent. per annum on the original stock, and 8½ per cent. per annum on the three issues of £10 shares, less income-tax. Ex-Provost Sharp seconded the motion; and it was unanimously agreed to. A vote of thanks was accorded to the Chairman and Directors for their services; and this

having been acknowledged, the meeting terminated, and those attending it proceeded to inspect the new plant.

In the Arbroath Town Council on Monday, the Gas Committee reported that the Town Clerk and the Gas Manager had had repeated meetings with the Surveyor of Taxes with reference to the assessment for income-tax, and that they had now come to the conclusion to recommend that the assessment proposed by the Surveyor of Taxes, of £308 10s. 6d., be acquiesced in for the current year, without agreeing with the particulars of the allowances and deductions made by the Assessor, or the principle on which this assessment had been arrived at; and they further recommended that a new valuation of the gas-works and plant be obtained before next year's assessment is made, and that application be made to the Income-Tax Special Commissioners to make the assessment. These recommendations were adopted by the Council. In June last, a claim was intimated by a firm of Solicitors on behalf of a client named Murdoch Barnett, who resided at 64, St. Mary Street, for compensation in respect of damage caused by an escape of gas and water from a gas-meter in his house. It was stated that Barnett was found in bed unconscious by his daughter, on the morning of June 14. The room was full of gas. One of the plugs in the meter had been blown out, and the water forced through the indicator; thus allowing the gas to escape. In the opinion of the Solicitors, this happened through the fault of the Corporation's servants in putting on an excessive pressure of gas. The Gas Manager submitted a written explanation on the subject, which was to the effect that the gas-works foreman overloaded the station governor with water on June 13, which caused the governor to be put out of action. The result was that the pressure was increased from the normal maximum of 3 inches to 6 inches head of water. The Manager also pointed out that there were still a number of old 2-light meters in the town, which did not stand a higher pressure than about 4 inches, and that one of these was in use in the house in which Mr. Barnett lived. After negotiation, Mr. Barnett's claim was stated at £37 13s., and his lawyers' fees, if paid within seven days. The Gas Committee recommended that he be offered £15 and an allowance of two guineas for expenses. The Council approved of the action of the Committee.

The Newport (Fife) Town Council had before them on Monday the annual laying on of assessments. Dealing with the Gas Department, Mr. Leitch, the Convener of the Finance Committee, said that the estimates had been based on conservative lines, showing that satisfactory provision had been made for the maintenance, upkeep, and other charges out of revenue. The Gas Committee recommended a reduction in the price of gas by 3d. per 1000 cubic feet, less the usual 5 per cent. discount, and that £250 be added to the reserve fund. Last year stove and meter rents were abolished, which was equal to a reduction of 3d. per 1000 cubic feet, and, combined with the present reduction, represented a total reduction in two years of 6d. per 1000 cubic feet. Next year the Gas Committee hoped to give consideration to the relief of prepayment meter consumers. The special reserve fund would now stand at £1250, and, in addition, there was the reserve fund for stoves and meters—about £550; so that the reserves, amounting in all to £1800, were equal to about 10 per cent. of the outstanding debt of £18,675. In addition to this reserve of £1800, borrowed money had been paid off to the amount of £3675—equal to about one-fourth of the original capital expenditure. The recommendations were agreed to. Ex-Bailie Young, the Convener of the Gas Committee, pointed out that, through the Manager's enterprising suggestion in regard to the manufacture of sulphate of ammonia, about £348 a year was now brought in, or an increase of almost £150 upon the former arrangement. Mr. Young specially emphasized the fact of the idea for this increased income having come from the Manager—Mr. John F. Black; and in respect of it, he moved that £20 a year be added to his salary. The motion was agreed to unanimously.

A regrettable incident has occurred in connection with the vacancy in the post of Manager of the Ardrrossan Corporation gas undertaking. For many years the management was in the hands of Mr. W. Galbraith, who was a capable gas official, and was highly esteemed by all. For some years past, Mr. Galbraith has had associated with him in the managership Mr. J. Mitchell, a son of the late Mr. Robert Mitchell, of Edinburgh. Mr. Mitchell has recently been appointed Assistant-Manager at Dundee; leaving Mr. Galbraith again sole Manager. Last week, the announcement was made that Mr. Galbraith was about to retire, and that the Town Council had chosen from twenty-five applications a short list of five. As will be seen from the "Personal" column, Mr. J. D. Keillor, of Lochgelly, has received the appointment. The regrettable incident is that, in a letter by Mr. Galbraith in the "Glasgow Herald" of yesterday, the statement is made that he is not retiring, but that he has received a letter from the Town Clerk stating that the Town Council had resolved to terminate his engagement with them as Gas Manager, and giving him six months' notice, which he considers very different from retiring. The reports that have been appearing are therefore, in his opinion, entirely misleading. It is one of the most melancholy spectacles in life to see a man who has given of his best in public service ruthlessly dealt with in the end. There is much sympathy with Mr. Galbraith in the trouble which has befallen him.

Leakage in Water-Mains.—The following remarks appeared in the "Engineering Supplement" to a recent number of "The Times":—"The ordinary method of searching for leakages of water is by listening attentively to the rustling sounds made by the issue of water through a small orifice. But this system presents many difficulties in its application, because it is rarely possible in towns to obtain the perfect quiet needed to perceive the slight sounds of leakage; moreover all leaks do not necessarily cause audible noises. The plan introduced with marked success by M. Laplanche, of Geneva, is based on an entirely different set of observations. He has found that a layer of snow which in consequence of a rise in temperature, is nearly at the melting-point, presents the appearance of greyish patches at any spots where there happen to be leakages in the water-mains or drains, because the snow tends to melt faster at these points. These patches are certain signs of an escape of water in the subsoil, even in places where there are no surface indications whatever of the presence of water."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 13.

Sulphate of Ammonia.

During the past week, there has again been an active market, and a good business has been done for near delivery. The tendency has been towards still higher prices; and the closing values are £11 18s. 9d. to £12 per ton f.o.b. Hull, £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Liverpool, and £12 3s. 9d. to £12 5s. per ton f.o.b. Leith. There has been some inquiry for future delivery; but the views of consumers and manufacturers are apparently too divergent to admit of first-hand sales being made.

Nitrate of Soda.

The position of this article continues without alteration; and the quotations on spot are still 9s. 3d. and 9s. 6d. per cwt. for ordinary and refined qualities respectively.

Tar Products.

LONDON, Aug. 15.

The market for tar products has remained steady during the past week, but the volume of fresh business is small. Pitch has slightly improved in value, which is mostly due to the home trade. Benzols are steady, and the inquiry is fairly good. In solvent naphtha, the market for prompt delivery remains firm; but for the forward position, buyers will not contract at the present prices. Crude carbolic is of very little interest, and no fresh sales of importance are reported.

The average values during the week were: Tar, 16s. 9d. to 20s. 9d., ex works. Pitch, London, 34s. 6d. to 35s. 6d.; east coast, 34s. to 34s. 6d.; west coast, 33s. to 34s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The demand for prompt and forward delivery has been very good, and a fair amount of business has been done for delivery to the end of the year. Prices have improved in nearly all quarters. Actual Beckton is quoted at £11 15s. to £11 17s. 6d.; outside London makes, at £11 8s. 9d. to £11 10s.; Hull, £11 17s. 6d. to £12; and Liverpool, £11 17s. 6d. to £12. Leith seems to be fairly well sold for prompt, but business is reported at £12 5s. In Middlesbrough, £11 17s. 6d. to £12 is the quotation.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a rather better demand for both steam and gas coal; but the supply is ample, and well meets the heavy shipments. Best Northumbrian steams are from 10s. per ton f.o.b., with an improving tendency, second-class steams are steady at 9s., and steam smalls are rather scarce at from 5s. 9d. to 7s., according to quality. There is a good output, except where local holidays temporarily intervene. In the gas-coal trade, the consumption grows steadily for home use, and the export inquiry is also full. Prices of Durham gas coals vary for the usual classes from 9s. to 9s. 10½d. per ton f.o.b., according to quality; while for "Wear" specials, up to 10s. 6d. per ton f.o.b. is the current quotation. The forward sales include some quantities for ports on the Mediterranean, at prices reported as from 15s. 6d. to 16s. per ton delivered at Genoa; but the current values of gas coal as stated above, and the current rates of freight to Genoa, seem to make such prices rather doubtful, more especially as at the present time the tendency appears to be to a fuller demand and firmer prices for gas coals locally. In coke, the market is steadier through large sales. Gas coke is a little more plentiful, and is quoted at from 15s. 6d. to 16s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade remains quiet; both the home and foreign demand being slack. Small sorts are in most request. The prices now quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 126,767 tons—an increase of 41,070 tons upon the preceding week, and of 245 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,582,738 tons—an increase of 901,838 tons upon the corresponding period.

Proposed Sale of the Amersham Gas-Works to the Uxbridge Gas Company.—At a special meeting of the Amersham Gas Company held last Tuesday, a resolution was passed to transfer the undertaking to the Uxbridge Gas Company as from the 30th of June last, subject to the sanction of the shareholders in the two Companies being obtained.

The Supply of Gas to Derbyshire Villages.—We understand that the preliminaries have been completed for the registration of a Company formed to acquire the Chapel-en-le-Frith Gas-Works from the present owner, and carry out an extension of plant and mains to provide a supply of gas to Chinley, Bugsworth, and other places in the district. Several gentlemen connected with the Matlock and Hathersage Gas Companies are interested in the new venture. It is understood that the scheme of establishing gas-works at Chinley, as proposed by a Company registered a good many months ago with a capital of £10,000, has been abandoned.

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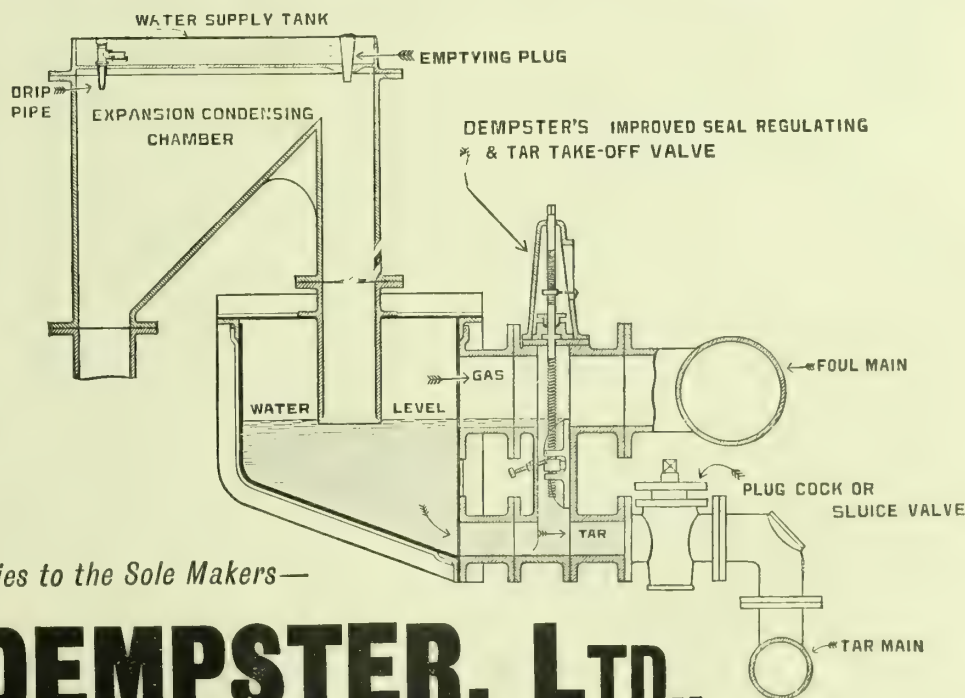
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GAS PLANT WORKS, MANCHESTER.



Voelker Lighting Corporation, Limited.

The Directors' report and audited statement of accounts for the year ending June 30—10 to be submitted to the shareholders at the annual meeting to be held on Friday—is a very satisfactory document. The profit is largely in excess of that of any previous year; and the balance-sheet figures show a sound and flourishing state of affairs, upon which the management are to be congratulated. The Directors recommend a dividend; and at the same time carry forward a very substantial amount. Notwithstanding the great competition, foreign and otherwise, the trade returns have gone up by leaps and bounds; and it is pleasant reading to realize that a concern "all British," employing nearly 500 hands, should have been able to achieve such good results—especially as (the report states) "they have been brought about by the maintenance of the high standard of quality for which Voelker mantles are now universally known."

Urban District Councils and Applications for Loans.

At Redruth, last Wednesday, Mr. F. H. Tulloch, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, into an application made by the Urban District Council for authority to borrow £400 for works of water supply. On asking if the Board had been furnished with full particulars as to the well from which the water was taken, he was informed that it was part of the original scheme, and was an auxiliary supply. The Inspector remarked that the Council wanted to borrow £400; while the estimated cost of the work was £450. The Surveyor (Mr. H. D. Strange) said that half the work had been done, and it would cost more than £400. The Council decided to apply for £400 before they received his estimate. The Inspector said this was a rather silly thing to do. A resolution should have been passed in an authoritative way, and application made in good time. His Board liked Councils to look forward a little, and not wait until they were compelled to do something in a hurry. It was not the right way to conduct local government. The proper thing was to take the Local Government Board into their confidence, and let them know that more machinery was required. They could always get at the Local Government Board. Mr. W. Williams explained that the Council were not satisfied with the existing plant, and were afraid to go through another summer with it. The Inspector: My Board wish to proceed in a more methodical way. They dislike the spending of money beforehand.

Hexham Water Supply.—Last Thursday, the members of the Hexham Urban District Council paid their yearly visit to the Ladle Wells in Hexhamshire, from which the town of Hexham gets its water supply. According to gaugings taken on the 2nd inst., the town was then receiving 226,000 gallons a day; the maximum quantity being 350,000 gallons. The storage reservoir contains 15,274,000 gallons.

Gas Schemes in Japan.—The annual report of the British Consul at Tokio, which has just been issued by the Foreign Office, shows that there has lately been a boom in electric tramways and gas undertakings, particularly for the district around Osaka and Kobe and for the south of Japan. Nearly every day notices have appeared in the papers of some new charter applied for.

Proposed Extension of the Walsall Gas Area.—A proposed extension of the area of supply of the Walsall Corporation gas undertaking was to come before yesterday's meeting of the Town Council. In a report which was to be submitted for consideration, the Corporation Gas Committee recommend that the Council purchase the undertaking of the Aldridge Gas Company, including the works, plant, mains, services, and fixed meters, for £1250; that the Walsall gas-mains be extended to Aldridge, at an estimated cost of £2750; and that an agreement be entered into with the Aldridge Parish Council to supply them with gas for public lighting purposes.

Quality of Holyhead Water.—Dr. Thresh, accompanied by Dr. Beal, of the London Hospital, recently visited Holyhead for the purpose of taking samples of the water supplied to the district, to be subjected to analysis. These gentlemen have made their report, which will shortly be laid before the Directors of the Water Company. The details have not yet been made known; but it is understood that the report indicates that the water taken from nine or ten different sources "is of good quality, and perfectly wholesome." The report further states that better water could not be wished for, and that it is even superior to that with which London is supplied.

Plymouth Water-Works Revenue.—A statement submitted to the Plymouth Corporation Water Committee by the Borough Treasurer shows that for the year ending March 31 last the income of the Department was £33,301, of which £19,042 was from water-rentals and £12,975 from supplies by meter. The expenditure was £11,412, of which £3163 was for salaries and wages, £1546 for works, £785 for maintenance of reservoirs, and £4683 for rates and taxes. Out of the balance of £21,889 gross profit, £9820 was paid for dividends and interest, and £6227 allowed for redemption of stock and repayment of loans; leaving £5842 as net profit for the year.

Northampton Gas Company.—At the annual meeting of this Company last Thursday, the Directors reported that the total profits available for distribution were £16,329, out of which an interim dividend at the rate of 5 per cent. per annum has been paid; leaving a balance of £10,345. The Directors recommended the payment of a dividend for the past half year at the same rate as before (being the maximum allowed); the two dividends amounting, less income-tax, to £11,968, and leaving a balance of £4361 to be carried forward. The Directors stated that the business of the Company continued satisfactory; and further extensions of mains had been made in various parts of the district. The report was adopted; and the remuneration of the Directors was increased by £400 per annum.

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Outer Casing is of Cast-Iron; Inner Oven Tinned Steel with Copper Water Container.

The latter is not fixed, but easily removable for Cleaning.

Steam is raised by a Gas Burner at bottom controlled by Gas and Air Adjuster. It may be connected at either side at will.

Steam-Tight Door with special facing and locking handle is fitted to front of door.

IT IS ECONOMICAL, EFFICIENT, SIMPLE, AND CHEAP.

PRICE, Small Size	.	.	£2	18s.
„ Large Size	.	.	£3	10s.



THE "PILGRIM" COOKER.

R. & A. MAIN, LTD.

ON VIEW AT OUR SHOW-ROOMS:

25, PRINCES STREET, OXFORD CIRCUS, LONDON, W.

GOthic IRON WORKS, FALKIRK, N.B.

GOthic WORKS, Angel Rd., Edmonton, London, N.

The Co-Partnership Movement.—The Labour Co-Partnership Association have published statistics as to the progress of co-partnership concerns during the past year in England. The capital involved is £722,000, and the turnover is £1,271,052; the number of societies being 108, compared with 106 in 1908. In Scotland, although there are only six societies, the capital involved is £1,300,000, and the trade done amounts to more than £3,000,000. This difference is accounted for by the fact that in Scotland consumers' societies are in the main run on co-partnership lines. As compared with six years ago, the co-partnership concerns in Great Britain have increased their capital by £300,000, and show a larger turnover by upwards of £1,250,000.

Beverley Gas and Water Supply.—At the meeting of the Beverley Town Council on Monday last week, Alderman L. Nutchey, in moving the adoption of the minutes of the Gas and Water Committee, said the gross profit on the gas-works had been £4557, against £4270 in 1908-9—an additional profit of about £300. They handed over to the general district rate last year a sum of £684; and now they had £1000 for the forthcoming year. The profits in the past financial year were the greatest there had been since the gas-works were established. The gross profit on the water-works had been £1587, against £1394 in 1908-9; being £193 more. Alderman Nutchey added that a letter had been received from the Local Government Board approving of the new site for the water-works, subject to the usual tests being made.

Bridport Gas Company, Limited.—At the meeting of the Company to-day, the Directors will report that the profit on the working for the year to June 30 has enabled them to place £250 to the reserve account. They have also decided to reduce the price of gas 2d. per 1000 cubic feet to all consumers, and to allow a discount of 2½ per cent. on all gas accounts paid within a month from the end of the quarter in which the gas was consumed. They recommend the payment of a dividend of 7½ per cent. on the ordinary shares, less income-tax, and of 5 per cent. on the preference shares, less income-tax, carrying forward a balance of £610. Under the supervision of Mr. W. H. Reed, the Engineer and Manager, there were carbonized during the year 2595 tons of coal; and the Company sold 25,428,800 cubic feet of gas, 1274 tons of coke, 25,613 gallons of tar, and 22 tons of sulphate of ammonia.

Howth Water Supply.—Last Tuesday, the new water-works at Howth (Dublin), which have been carried out to the designs of Messrs. Kaye, Parry, and Co., were formally taken over by the Urban District Council. Having inspected the catchment area, filter-beds, new reservoir, &c., the party assembled at the St. Lawrence Hotel, where luncheon was served. The toast of "Messrs. Kaye, Parry, and Co." having been honoured, Mr. Ross acknowledged the compliment on their behalf, and proposed the toast of "The Urban District Council." Mr. Butterley returned thanks, and expressed the hope that the work would prove of lasting advantage to the district. He said that in many respects it was unique, as, at the altitude above the sea at which they were placed, it was not generally possible to construct reservoirs; but after many difficulties the work had been completed.

Large Reservoirs for Hyderabad.—According to the "Pioneer Mail" of Allahabad, a scheme has been sanctioned by the Nizam of Hyderabad for the construction near the city, by the two branches of the Musi and Easi Rivers which join at Golconda, of two large water reservoirs, at a cost of 93 and 45 lakhs of rupees (£620,000 and £300,000) respectively. The works are to protect the city from floods.

Chester Water Company.—The half-yearly meeting of this Company was held on Thursday last—Mr. F. E. Roberts presiding. The Directors report for the six months ended June 30 showed a balance of £2787 on revenue account. Interest on preference capital required £450; leaving £2337. The usual statutory dividends absorbed £2078; leaving a balance of £259. The report was adopted, and dividends were declared at the rates of 7½ per cent. per annum (less income-tax) on the consolidated stock, 6 per cent. per annum (free of income-tax) on the perpetual 6 per cent. preference shares, and 7 per cent. (less income-tax) on the new ordinary stock, 1874.

Wrexham and East Denbighshire Water Company.—The fiftieth annual meeting of the Company was held last Tuesday—Mr. J. Allington Hughes in the chair. The report and statement of accounts, which were adopted, showed a net profit of £8435, which is £250 more than in 1909, and £450 more than the preceding year. The expenses amounted to £3530, against £3299 in 1909; and they represented 29·5 per cent. of the total receipts. The Directors reported that the construction of the additional filter-bed at Gronwen had been completed, and said this addition to the filtering capacity of the works would be of great service in maintaining the high quality of the supply. During the year ended the 30th of June last, water was laid on to 236 houses; making a total of 7071 houses now supplied. The Directors recommended the payment of the preference dividend, and also dividends at the rates of 6½ per cent. per annum upon the consolidated stock, and £4 11s. per cent. on the ordinary stock, free of income-tax. The report was adopted.

Proposed Extension of the Lostwithiel Water-Works.—An estimate and specification for the construction of a new reservoir and a supplementary estimate for the laying of new mains were submitted to the Lostwithiel Town Council by Messrs. S. W. Jenkins and Son, of Liskeard. The cost of the reservoir to hold 80,000 gallons was estimated at £960, to which was added £90 for contingencies; making a total of £1050. They recommended that the Council should obtain power to borrow £1500, which would cover the cost of the new mains if the Council should decide to have them. Mr. Reed opposed the scheme, and suggested that the Council might obtain an increased supply of water from the present source, and also increase the quantity available by having the mains scraped. Alderman Santo pointed out that many of the inhabitants of the town suffered inconvenience owing to the present shortness of water, and said they had been advised that it was not possible to scrape the mains. It was decided to seek power for borrowing the money. Mr. Green remarked that if they obtained the loan on the same terms as the last one, the rates would be increased by only 3d. in the pound.

The "SUN" Boiler.

The "SUN" is constructed on accurate scientific principles—all tending to ensure maximum effectiveness with a minimum gas consumption.

The "SUN" has a most important virtue—viz., a perfect working, non-capsule Thermostat—which prevents any delay and loss of efficiency in heating up the water.

And one more, hardly less in importance—Boiler and Tank in one, and right over the Burner—thus saving loss of heat in circulation, when hot water is not being drawn off.



JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

Reductions in Price.—The Directors of the Croydon Gas Company have announced their intention to reduce the price of gas by 1d. per 1000 cubic feet as from the 1st of October; making it 2s. 7d. in the Croydon and Carshalton districts, and 3s. 1d. in the Caterham district. The Downpatrick Gas Company have decided to reduce the price of gas by 2d. per 1000 cubic feet, bringing it down to 4s. 7d., with discount of 5 per cent. for prompt payment. The Leatherhead Gas Company have reduced their price 2d. per 1000 cubic feet to ordinary consumers, and granted a reduction to users of gas for power. The Bridport Gas Company, Limited, have reduced the price of gas 2d. per 1000 cubic feet, in addition to allowing 2½ per cent. discount for prompt payment; making the price 3s. 6d. for lighting and 3s. for power. Further discounts are to be granted to large consumers.

Automatic Public Lighting Adopted at Westhoughton.—At a recent meeting of the Streets Committee of the Westhoughton District Council, the Surveyor (Mr. George Hayes) submitted a special report on the cost of automatic public lighting. He calculated that instead of the five men employed at present for 40 weeks at 21s. a week each, two would be employed at 27s.—a saving of £104 14s.; and with other reductions in the time of lighting and mantles, there would be a gross saving of £177 7s. 6d. A sum of £87 12s. had to be taken off this for the gas consumed by bye-passes and the extra gas used after moons; making a net annual saving of £89 15s. 6d. The estimated expenditure in fixing the automatic controllers suitable to carry out this would be £449 2s. Controllers could be obtained which would extinguish the lamps at midnight, light again at three o'clock in dark weather, and again extinguish at daybreak; and the estimated gain if these were used would be £99 16s. 2d.—the capital expenditure being £531 6s. It was ordered that the surveyor should obtain quotations for the supply of 165 automatic lighting controllers.

The Leeds Fire-Clay (Construction) Company, Limited, has lately been registered with a capital of £40,000, in £10 shares, to adopt an agreement with the Leeds Fire-Clay Company, Limited.

The next Bill of the Manchester Corporation will, it is stated, contain a clause for the appropriation of certain land at the Bradford Road station for the purpose of treating ammoniacal liquor.

In the "JOURNAL" for the 2nd of November last, it was announced that a Company had been formed, with a capital of £860,000, in £1 shares, to manufacture and deal in "porhydrometers," weighing appliances, and other machinery, &c. The appliance named was described in the "JOURNAL" for Aug. 3, 1909. The statutory meeting of the shareholders of the Company was recently held, when the Chairman (Mr. Howard Houlder) stated that a series of tests of the porhydrometer had recently been made by the Board of Trade, and had been entirely successful. Tests to the number of twelve or thirteen, many of them of a very extreme and eccentric character, were carried out, and the result was that the difference between the weights registered by the porhydrometer on the average of all the tests, compared with those registered by a patent automatic checking machine looked upon as absolutely reliable by the Board of Trade, amounted to only 9-100ths of 1 per cent. This was exceedingly gratifying and proved conclusively the absolute accuracy of the appliance.

The Board of Trade have revoked the Strood and Dartford (Rural Districts) Electric Lighting Order, 1903, as confirmed by an Act passed in the same year. The revocation, which took effect from the 18th ult., applies to the whole of the proposed area of supply. The reason for the Board's action is that the promoters of the scheme have not exercised and carried out the powers with which they were entrusted seven years ago.

Messrs. Joseph Taylor and Co., of Bolton, have received orders for their latest makes of solid-plate lead saturators from the Ayr, East Hull, and Folkestone Gas Companies, the Atherton Urban District Council, and Messrs. Birkett and Co., of Retford; also for a saturator, acid-tanks, drainer, lining of sulphate stores, &c., as part of a new plant for the Weymouth Gas Company. They have likewise received several orders in connection with coke-oven plants.

The twenty-first annual report and balance-sheet of the Leeds Fire-Clay Company, Limited, show that the sales of the Company in the period covered exhibit a small increase over the figures of the previous year. The profit on working is £12,828. After providing for debenture interest (£12,000), and writing off a small adverse balance from last year, there remains £767 to carry forward. Mr. J. Armitage Drake, who retires from the Board, has, for reasons of health, determined not to offer himself for re-election.

APPLICATIONS FOR LETTERS PATENT.

18,222.—BRUCE, G. M., and VICTOR AIR-GAS MACHINES COMPANY, "Atomizer or mixing box for use with air-gas apparatus." Aug. 2.

18,234.—ALLDAY, E., and NICHOLSON, A., "Gas-burners for brazing, &c., and for gas-heated furnaces." Aug. 2.

18,267.—IONIDES, A. C., JUN., and SWAN, J. B., "Separately delivering at equal pressures two different gases or fluids received under unequal pressure." Aug. 2.

18,335.—M'DOUGALL, J. T., and MALYON, C., "Coin-free delivery machines." Aug. 3.

18,341.—THIBODEAU, P., "Pipe-jacks." Aug. 3.

18,370.—CREASEY, H. H., and ADAMS, S., "Gas-heating stoves." Aug. 3.

18,401.—BEDFORD, F., and WILLIAMS, C. E., "Catalytic synthesis of methane." Aug. 3.

18,406.—PHILLIPS, S., "Retorts to improve the quality of coke." Aug. 4.

18,417.—DUNCAN, W. L., "Gas generating fuel containers." Aug. 4.

18,428.—SCHMIDT, A., "Pipe-scraper." Aug. 4.

18,453.—YAPP, W. J., and WOODS, T. J., "Incandescent gas-burners." Aug. 4.

18,490.—ROBERT DEMPSTER AND SONS, LIMITED, and BROOKS, P. G., "Telphers." Aug. 5.

18,495.—BROWN, J., "Gas-retorts." Aug. 5.

18,514.—WOODALL, R., and HENRY SIMON, LIMITED, "Conveyors." Aug. 5.

18,594.—AUTOLOCK SAFETY COCK AND BOLT COMPANY, LIMITED, and BISHOP, A. P., "Gas-taps." Aug. 6.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 451.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr. 1	5	Alliance & Dublin Ord.	80-83	+½	6 0 0	4,940,000	Stk.	May 12	8	Imperial Continental	177-179	-2	4 9 5
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	52-94	..	3 14 5
200,000	5	May 12	7	Bombay, Ltd.	6½-6½	+1	5 7 7	195,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122-124	..	4 16 9
40,000	5	"	7	Do. New, £4 paid.	48-52	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	219-221	..	4 10 6
50,000	10	Feb. 25	15	Bourne- 10 p.c.	29-30	..	5 0 0	718,100	"	"	7	Do. B.	164-165	..	4 4 10
311,810	10	"	7	mouth Gas B 7 p.c.	162-163	..	4 3 7	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10	"	12½	and Water Pref. 6 p.c.	15-15½	..	3 17 5	75,000	5	June 29	6	Malta & Mediterranean.	41½-41½	..	6 4 8
380,000	Stk.	Aug. 12	6	Brentford Consolidated	246-249	..	5 0 5	560,000	100	Apr. 1	5	Met. of 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	184-186	+½	5 2 2	250,000	100	"	4½	Melbourne J 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	"	..	"	541,920	20	May 27	3½	Monte Video, Ltd.	123-123	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 28	3½	Newcastle & G'tesh'd Con.	101-102	..	4 5 9
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	83-91	..	3 16 11
246,320	"	"	10	Do. A Ord. Stk.	153-156	..	5 2 7	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	134-134	..	5 1 10
460,000	20	Apr. 1	10	British	44-45	..	4 14 8	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Aug. 12	6	Bromley, A 5 p.c.	117-119	..	5 0 10	60,000	5	Apr. 1	8	Ottoman, Ltd.	64-64	..	6 3 1
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
82,278	"	"	5½	Do. C 5 p.c.	106-108	+1½	5 1 10	60,000	50	"	12	Do. B.	126-128	..	5 1 7
55,000	"	June 29	3½	Do. 3½ p.c. Deb.	85-87	..	4 0 6	100,000	50	"	12	Do. C.	119-121	..	4 19 2
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	7-9	..	4 0 10	114,800	50	"	10	Do. D and E.	100-102	..	4 18 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	"	398,490	5	Apr. 29	7	Primitiva Ord.	51½-51½	-1	4 14 2
100,000	10	"	—	Do. 4½ p.c. Pref.	53-53	..	"	796,980	5	June 29	5	Do. 5 p.c. Pref.	52-52	..	4 13 0
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,903	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	111-113	..	4 8 6	62,500	10	Apr. 1	9	San Paulo, Ltd.	151-162	..	5 10 9
1,513,280	Stk.	Aug. 12	5½	Commercial 4 p.c. Stk.	105-107	..	4 17 2	125,000	50	July 1	6	Do. 6 p.c. Pref.	111-124	..	4 18 0
560,000	"	"	105	Do. 3½ p.c. do.	101-103	+1½	4 17 1	135,000	Stk.	Mar. 16	10	Do. 5 p.c. Deb.	492-502	+½	4 19 0
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	209,984	"	"	10	Sheffield A.	234-236	..	4 4 9
800,000	Stk.	June 10	5	Continental Union, Ltd.	90-92	..	5 8 8	523,500	"	"	10	Do. B.	234-236	..	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	70,000	10	May 27	7	Do. C.	235-235	..	4 5 4
492,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	6,429,895	Stk.	Aug. 12	5/9/4	South African	11-11½	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	1,895,445	Stk.	July 14	3	South Met., 4 p.c. Ord.	120-122	+½	4 9 7
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	209,820	Stk.	Mar. 16	8	Do. 3 p.c. Deb.	79-81	..	3 14 1
486,090	10	July 14	12	European, Ltd.	234-24	..	5 0 0	605,000	Stk.	Aug. 12	5½	South Shields Con. Stk.	157-158	..	5 1 3
354,060	"	"	12	Do. £7 10s. paid.	17½-18½	..	4 18 8	60,000	"	"	5	S'th Suburb'n Ord. 5 p.c.	119-121	+½	4 13 7
16,179,445	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	104-105	..	4 8 10	117,058	"	July 14	5	Do. 5 p.c. Pref.	119-121	+½	4 2 8
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	502,310	Stk.	May 12	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,062,235	"	"	4	and 4 p.c. Con. Pref.	102-104	..	3 16 11	120,000	Stk.	Aug. 12	7	Southampton Ord.	110-112	..	4 9 3
4,531,705	"	June 29	3	Coke J 3 p.c. Con. Deb.	80-82	..	3 13 2	136-138	Stk.	Aug. 12	7	Tottenham A 5 p.c.	136-138	+1½	5 1 5
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	..	5 5 3	483,940	"	"	5½	and B 3½ p.c.	111-113	..	4 17 4
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	149,470	"	June 29	4	Edmonton J 4 p.c. Deb.	57-59	..	4 0 10
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	17-17½	..	6 5 9	182,380	10	June 10	8	Tuscan, Ltd.	9-9½	..	8 8 6
131,000	Stk.	Mar. 16	7	Ilford A and C	145-147	..	4 15 3	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,780	"	"	5½	Do. B	111-113	+2	4 17 4	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,500	"	June 29	4	Do. 4 p.c. Deb.	88-100	..	4 0 0	255,636	Stk.	Feb. 25	6½	Wands J B 3 p.c.	139-141	..	4 15 9
								85,760	"	June 29	3	worth J 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

REPRESENTATIVE. "Gas-Works," c/o Streets, Cornhill.
DRAUGHTSMAN. No. 5272.
DRAUGHTSMEN. No. 5268.
COMMERCIAL OFFICER. "P.G.," c/o Streets, Cornhill, E.C.
LADY SHOW-ROOM ATTENDANT. No. 5278.
ASSISTANT-MANAGER. Coatbridge Gas Company Applications by Sept. 1.
ASSISTANT FOREMAN FITTER (SHANGHAI). No. 5274.
WATER SECRETARY AND MANAGER. Tynemouth Water Department. Applications by Aug. 31.
UNDER WORKS MANAGER. No. 5276.
WORKS MANAGER (GAS-MANTLE FACTORY). No. 5279.

Situations Wanted.

MANTLE MANUFACTURER (OWN FACTORY) OR CAPITAL WANTED. No. 5273.
GAS ENGINEER AND MANAGER. (Abroad). No. 5275.
ENGINEER, MANAGER, OR HEAD DRAUGHTSMAN. No. 5277.

Lectures, &c.

COAL GAS, FUEL, AND METALLURGY, &c. Leeds University.

Meetings.

CHICHESTER GAS COMPANY. Works, Aug. 30, One o'clock.
HARROW AND STANMORE GAS COMPANY. Holborn Restaurant, Sept. 5, Twelve o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices, Aug. 30, Three o'clock.

Patent Licences, &c.

"IMPROVEMENTS RELATING TO ACETYLENE LAMPS AND GENERATORS, &c." Haseltine, Lake, and Co., Southampton Buildings, W.C.
"INCANDESCENT GAS-BURNERS." Carpmal and Co., 24, Southampton Buildings, W.C.

Tank Waggon for Hire.

CLAYTON ANALINE COMPANY.

TENDERS FOR

Coal.

KILDWICK GAS COMPANY. Tenders by Aug. 31.

Compressors.

MANCHESTER MARKETS COMMITTEE. Tenders by Aug. 27

General Stores (Iron and Steel, Glass, Oxide Wiskets, Shovels, Waste, Oil, Gaskin, Brooms, Lime, Glass, &c.).

BRADFORD GAS DEPARTMENT. Tenders by Sept. 15.

Lamps, Cocks, &c.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 15.
MANCHESTER MARKETS COMMITTEE. Tenders by Aug. 27.

Meters.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 15.

Pipes, &c.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 15.

Tar.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 15.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on First White Page.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

READ HOLLIDAY AND SONS, LTD.,

HUDDERSFIELD,

Are prepared to Supply

BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.

ENQUIRIES SOLICITED.

SULPHURIC ACID for Sale, special y

suitable for making Sulphate of Ammonia.
BROTHERTON & CO., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKEFIELD.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
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Telegrams: "Doric," Newcastle-on-Tyne. National
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J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, Oldham, and
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WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.

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ANY QUANTITY. ANY PORT. ANY STATION.

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DUTCH OXIDE OF IRON.

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Apply, THOMAS HORROCKS,

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
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SULPHURIC ACID.

SPECIALLY prepared for the Manu-
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Results Guaranteed. No Working Costs.

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The Manufacture of

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THE very best Patent Grids for Holding

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SATURATORS and all LEAD and TIMBER
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We guarantee promptness, with efficiency for Re-
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Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**BRISTOL RECORDING GAUGES
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J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
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J. E. C. LORD, Ship Canal Tar Works,
Twelve, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
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GAS LIGHTING ENGINEERS AND
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JOHN RILEY & SONS, Chemical Manu-
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has now been used for upwards of 50 Years. References
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DIGGERS AND SUPPLIERS OF THE
FINEST DUTCH BOG-ORE.
(Natural Oxide of Iron.)
Best Percentages. For lowest Quotations to any Port,
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Consumers in any form are invited to correspond
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SULPHURIC ACID.

SPECIALLY prepared for Sulphate of
AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
WORCS.
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GAS-WORKS requiring Extensions
should Communicate with FIRTH BLAKELEY,
SONS, AND CO., LIMITED, Dewsbury, who make a
Specialty of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
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Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL.
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CORRESPONDENCE CLASSES.
GAS Engineering and Gas Supply.
City and Guilds of London Institute.
Teacher: HERBERT LEES (Silver Medallist),
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ham Gas Company, Lecturer at Rutherford College,
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For Terms, &c., address ELVASTON ROAD, HEXHAM.

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The RELIANCE LUBRICATING OIL COMPANY
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CANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20,
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THE UNIVERSITY OF LEEDS.

DEPARTMENTS OF COAL GAS, FUEL, AND
METALLURGY, AND ELECTRICAL, CIVIL,
MECHANICAL, AND MINING ENGINEERING.
THE Work of these Departments is
carried on in separate Blocks of Buildings
specially equipped for Systematic Instruction.
Prospectus may be had free on Application from the
Registrar.
The next Session begins on Oct. 4, 1910, on which day
the Entrance Examination will be held at Ten a.m.
and Two p.m.
W. F. HUSBAND,
Registrar.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
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GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
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SATURATORS, Tanks, &c., made or
Repaired by an Experienced Workman. First-
Class References for Sulphate Plant.
Address DAVIES, Leadburner, 21, Pier Road, Graves-
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GAS Engineer and Manager (Age 32),
Experience over 17 Years in Erecting and
Managing Gas-Works, desires APPOINTMENT
Abroad. Would go out Erecting or Managing.
First-Class References, and any further Particulars
from No. 5275, care of Mr. King, 11, Bolt Court, FLEET
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WANTED, a Position as Engineer,
MANAGER, or HEAD DRAUGHTSMAN to Gas
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Competent. Energetic. Good References. Age 35
Years. Moderate Salary. No objection to going Abroad.
Address No. 5277, care of Mr. King, 11, Bolt Court,
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INCANDESCENT Gas Mantle Manu-
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date, for want of Capital would Join Corporation, Gas
Company, Financier, or act as Working Manager.
Address No. 5273, care of Mr. King, 11, Bolt Court,
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WANTED, immediately, Two or Three
DRAUGHTSMEN, fully Experienced in the
Design of Modern Gas Plant.
Apply, by letter, Stating Age, Qualifications, and
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Court, FLEET STREET, E.C.

UNDER WORKS MANAGER.
WANTED, a Man Experienced in the
Management of Men to TAKE CHARGE of
Works.
Apply, by letter, stating Experience, Age, and Salary
required, to No. 5276, care of Mr. King, 11, Bolt Court,
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REPRESENTATIVE required to intro-
duce and push important article used in all Gas-
Works. Must have Good Connections and be good
Salesman.
Please write, stating Qualifications, District, and
References, to: "GAS-WORKS," care of STREETS, 30,
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WANTED by a Firm of Ironfounders
and Chemical Engineers, with Established Trade
among Chemical Manufacturers, to undertake the Sole
Rights of Making and Selling Chemical Specialities in
Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court,
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WANTED, a Works Manager for
Medium-Sized Incandescent Mantle Factory.
One who is fully capable of Supervising the work in
the Various Departments.
Apply, by letter, stating Salary expected, previous
Occupation, and References, to No. 5279, care of Mr.
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WANTED by a Suburban Gas Company,
a LADY SHOW-ROOM ATTENDANT, who
has occupied a similar Position and has a thorough
knowledge of Gas Cookers and Appliances. No others
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SHANGHAI GAS COMPANY, LIMITED.
WANTED, immediately, an experienced
Man as ASSISTANT FOREMAN FITTER.
Applicants must be accustomed to work in Iron and
Compo. and be fully Experienced in the Fixing and
Maintenance of all usual Gas Appliances, including
High Pressure Lighting. Three Years engagement,
with free Passage Out and Home. Salary, Taels 120
(about £14) per Month, with Unfurnished Quarters.
Apply, by letter, with full Particulars, to No. 5274,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Coatbridge Gas Company require
an ASSISTANT-MANAGER.
Applications, stating Experience, References, and
Salary expected, to be in the hands of the Secretary not
later than the 1st of September current.

DRAUGHTSMAN Wanted, by a Firm
of Gas Engineers and Contractors. Must be
well up in Modern Plant and Competent to Take Out
Quantities for Estimating.
Apply, by letter, stating Age, Experience, and Salary
required, to No. 5272, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, by an important Provincial
Gas Company, as Head of a Department for the
Sale of Gas and Gas Appliances, a thoroughly Com-
petent and Experienced COMMERCIAL OFFICER,
with Initiative, Energy, and a Sound Knowledge of all
forms of effective Advertisement. Technical know-
ledge a secondary consideration to the above require-
ments. Salary, £300 to £400 per Annum, according to
qualifications.
Address "P.G.," care of STREETS, 30, Cornhill,
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COUNTY BOROUGH OF TYNEMOUTH. (WATER DEPARTMENT.)

THE Corporation require a Water
SECRETARY and MANAGER possessing Ex-
perience in the Office of a Water Department and
having Engineering Qualifications as well as a Com-
mercial Training.
Salary, £250 per Annum, for Two Years, rising there-
after by Two Annual Increments of £25 to a maximum
of £300 per Annum.
Canvassing prohibited.
Applications, stating Age, Experience, and Qualifica-
tions, to be delivered to the undersigned before noon
on the 31st of August, 1910.
A List of Duties may be obtained from the under-
signed.
E. B. SHARPLEY,
Town Clerk.

Town Hall Tynemouth,
August, 1910.
FOR HIRE—Two Tank Waggons suit-
able for carrying Crude Naphtha.
Apply to the CLAYTON ANALINE COMPANY, LIMITED,
Clayton, MANCHESTER.

GASHOLDERS—16 ft., 24 ft., 26 ft., and
45 ft. Diameter GASHOLDERS, Cheap for im-
mediate Sale. Re-erected in either Brick or New Steel
Tanks Complete to Plan and Specification. Can be
seen Temporarily Erected at our Works.
FIRTH BLAKELEY, Thornhill, DEWSBURY.

FOR DISPOSAL—Brick Plant com-
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BRICKS, 15s. to 25s. per Thousand f.o.r. Maidstone,
12-H.P. Portable STEAM-ENGINE by Marshall, of
Gainsborough, insured 90 lbs. Steam by National,
nearly as good as when delivered from Workshops, £140.
High-Pressure BOILER, new, insured 200 lbs. Steam.
Suitable for 2-Ton Lorry, £20. 4-H.P. Horizontal
STEAM-ENGINE, £5. 5-H.P. ditto, £6. Cheap 8-H.P.
Portable STEAM-ENGINE £25. Offers solicited.
Full Particulars on Application to Wm. JOHNSON,
JUNR., New Hythe, Larkfield, KENT.

THE Directors of the Kildwick Parish
Gas Company invite TENDERS for the Supply
of the whole or part of 4000 Tons of Screened or Un-
screened GAS COAL, to be delivered free into the
Company's Siding at Kildwick during the ensuing
Twelve Months.
No Form of Tender supplied.
Tenders to be sent in not later than the 31st inst. to
FRED. H. PICKLES,
Manager and Secretary.

Gas-Works, Kildwick,
Aug. 12, 1910.

CITY OF BRADFORD.

TENDERS FOR STORES.

THE Gas Committee of the Bradford
Corporation are prepared to receive TENDERS
for the Supply of the following STORES required in
their several Departments during a period of One Year
ending Sept. 30, 1911:—

	PROBABLE QUANTITY REQUIRED.
Wet and Dry Gas Meters.	
Pipes and Castings.	
Wrought-Iron Steam Tubing.	
Best Merchant Iron and Steel	30 tons.
Charging Shovels	70 doz.
Oxide Wickets	25 doz.
Cotton Waste	60 cwt.
Best Engine Oil	1500 gallons.
Common do.	1800 gallons.
Cylinder Oil	1000 gallons.
Tarred Gaskin	90 cwt.
Brass Main Gas-Cocks	160 doz.
Weed Brooms	72 doz.
Best Lime	120 tons.
Copper Lamps	500
Lamp Irons	300
Sheet Glass (English) for Street-Lamps, 21 oz., 9000 sq. feet.	
Opal Glass for Street-Lamps, 21 oz., 3500 sq. feet.	

Form of Tender, with any further Information re-
quired, may be had on Application to Mr. Chas. Wood,
Gas Engineer, Town Hall, and Samples may be seen at
Mill Street Gas-Works.
The Contracts will be let subject to the Fair Contracts
Clauses of the Corporation, which may be seen at the
Town Clerk's Office, and which the accepted Con-
tractors will be required to sign.
Tenders, endorsed "Tender for Stores," to be sent to
me not later than Thursday, Sept. 15, 1910.
The lowest or any Tender will not necessarily be
accepted.
FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 12, 1910.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Purchase of their Surplus TAR for One Year. Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Tar," to be sent to me on or before Thursday, Sept. 15, 1910.

The highest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 12, 1910.

CITY OF MANCHESTER.

THE Markets Committee invite Tenders for the Supply and Fixing of a GAS COMPRESSOR or DUPLICATE COMPRESSORS; also for the Supply of LAMPS of various Candle Power. Full Particulars may be obtained on Application to the Superintendent, Markets Department, Town Hall, Manchester.

Tenders, with full Specification, must be addressed to the Chairman of the Markets Committee, Town Hall, Manchester, endorsed "Compressors," and be delivered not later than Saturday, the 27th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester,
Aug. 8, 1910.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Holborn Restaurant, 218, High Holborn, London, on Monday, the 5th day of September, 1910, at Twelve o'clock precisely, to receive the Directors' and Auditors' Reports; to declare a Dividend; and to transact any Ordinary Business of the Company.

The REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Aug. 29 until Sept. 5, both inclusive. By order of the Board,

J. L. CHAPMAN,
Secretary.

Gas Office, Roxeth, Harrow,
Aug. 16, 1910.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of the above Company will be held at the Offices of the Company, at the Gas-Works, Chichester, on Tuesday, the 30th day of August, 1910, at One o'clock in the Afternoon precisely, to receive the report of the Directors and the Accounts for the Half Year ended the 30th of June, 1910; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 17th to the 30th inst., inclusive. By order of the Board,

VICTOR V. VICK,
Secretary.

Offices: Gas-Works, Chichester,
July 22, 1910.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

(INCORPORATED BY ACTS OF PARLIAMENT, 1867 AND 1907.)

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Western Road, Mitcham, in the County of Surrey, on Tuesday, the 30th day of August, 1910, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and for General Business.

The REGISTER OF TRANSFERS OF THE CONSOLIDATED ORDINARY STOCK WILL BE CLOSED from the 15th inst. until after the Meeting. By order of the Directors,

BENJAMIN GREEN,
Secretary.

Offices and Works:
Western Road, Mitcham,
Aug. 9, 1910.

THE Proprietors of the Patent No. 2980, of 1906, relating to "IMPROVEMENTS IN INCANDESCENT GAS-BURNERS," desire to enter into Negotiations with One or more Firms in Great Britain for the GRANT OF LICENSES to Manufacture under Royalty.

Inquiries to be addressed to Messrs. CARPMAEL AND Co., 24, SOUTHAMPTON BUILDINGS, W.C.

THE Proprietor of the Patent No. 19,799, of 1907, for "IMPROVEMENTS RELATING TO GENERATORS FOR ACETYLENE GAS OR THE LIKE," is desirous of entering into Arrangements, by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, AND Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Proprietors of the Patents Nos.

7188, of 1901, for "IMPROVEMENTS IN, OR RELATING TO, ACETYLENE GAS-LAMPS, OR GENERATORS;" 11,612, of 1902, for "ACETYLENE GAS-LAMPS FOR TABLE USE;" 23,629, of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" 10,186, of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER

Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER,"
Telephones 1806.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 87'85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: **BIRTLEY, CO. DURHAM.**

Newcastle-on-Tyne Offices: **MILBURN HOUSE.**

**KOPPERS' PATENT
CHAMBER OVENS.**

Results obtained which have never been Surpassed by any other System of Carbonization.

Plants at Work and under Construction for the production of **18,000,000** cubic feet of Gas per Day.

See our large Advertisement appearing in alternate issues of the "JOURNAL."

The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

**ALL the
BOYS CALORIMETERS**

which have been in daily use in all the Official Testing-Stations in London for the last Three Years

**WERE MADE BY
JOHN J. GRIFFIN & SONS,**
— LIMITED —
KINGSWAY, LONDON, W.C.

Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the Original makers.

Descriptive Catalogue on Application.

**THOMAS TURTON
AND SONS, LIMITED,**

SHEAF WORKS, SHEFFIELD,
**MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.**

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

London Office:

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
R. LAIDLAW & SON, LTD.,
ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

GAS-WORKS can Sell

ALL their **COKE**

in their own District

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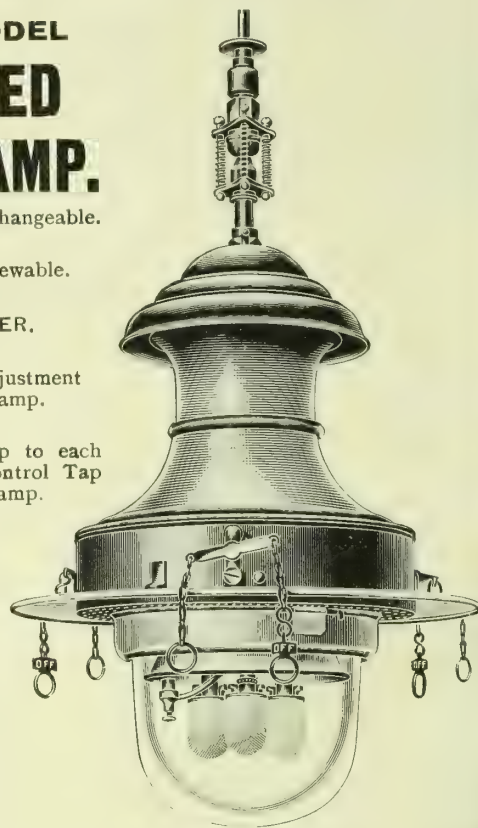
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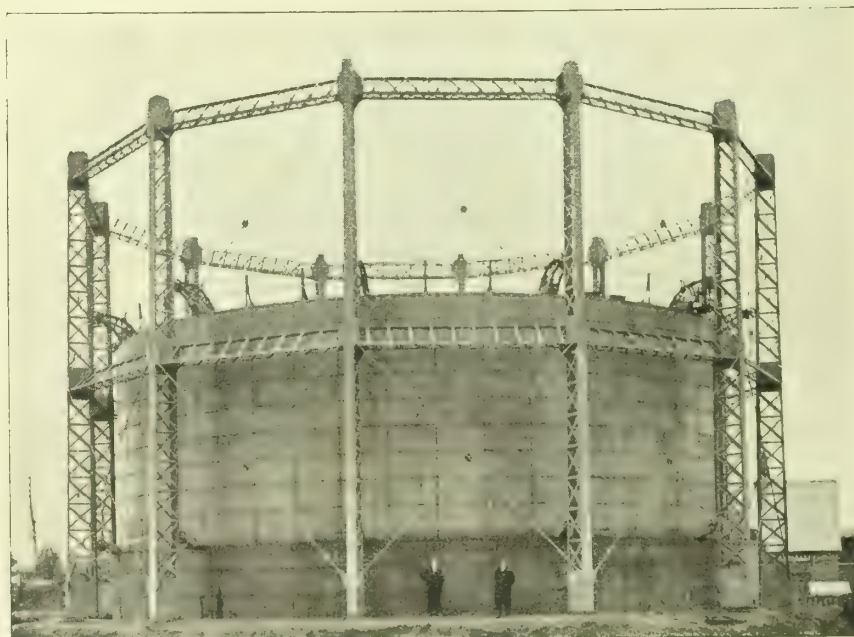
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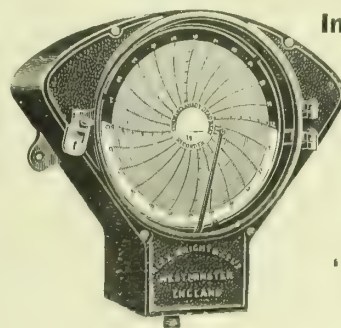
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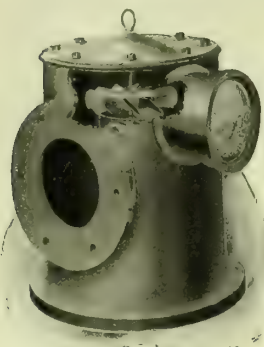
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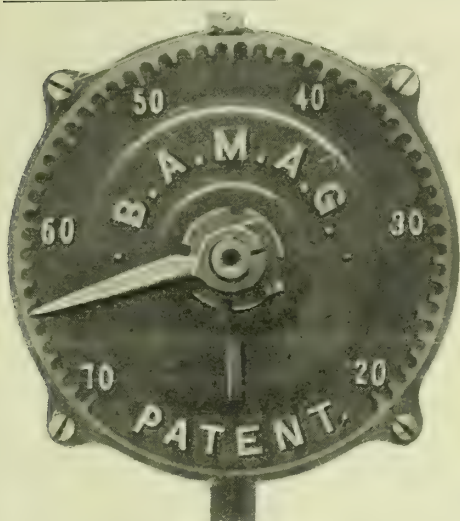
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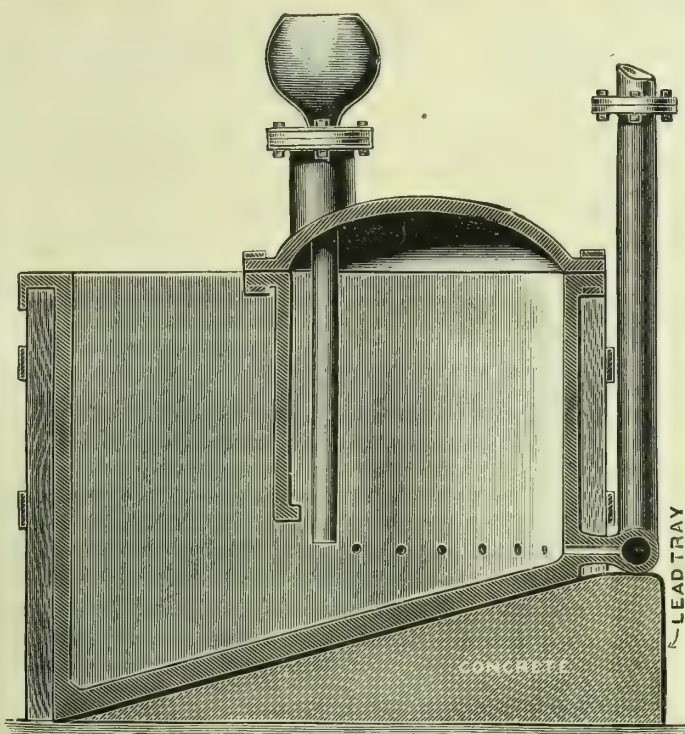
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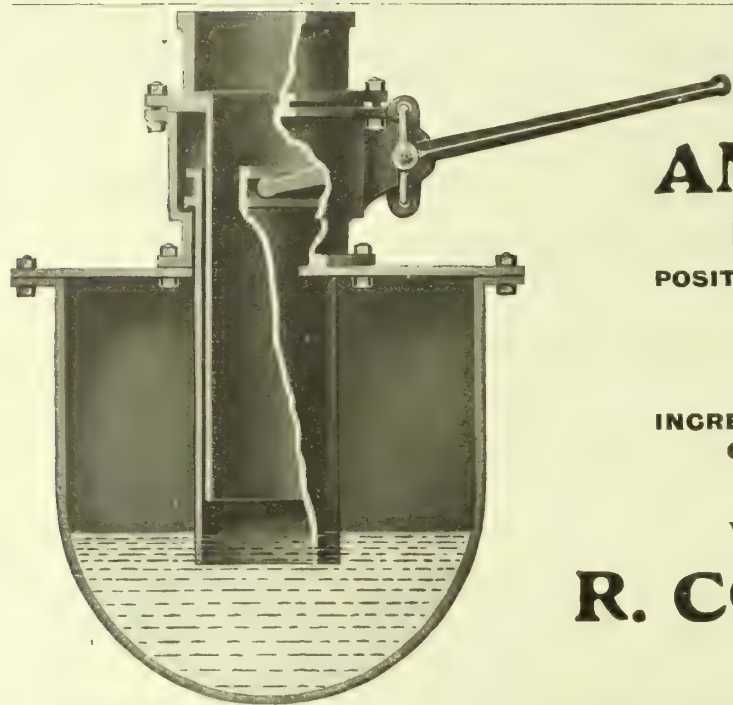
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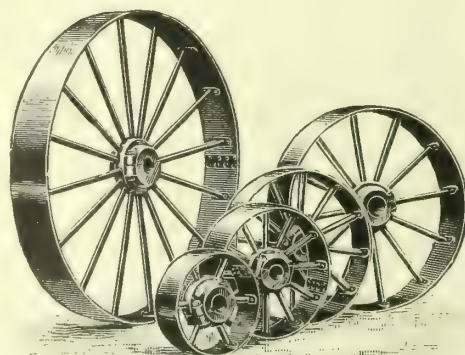
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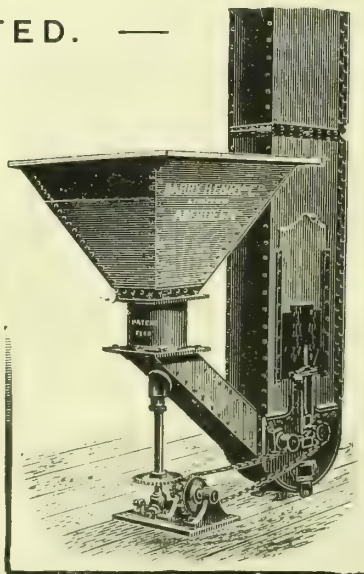
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Inverted Arc Lamp, Fig. 623.

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1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

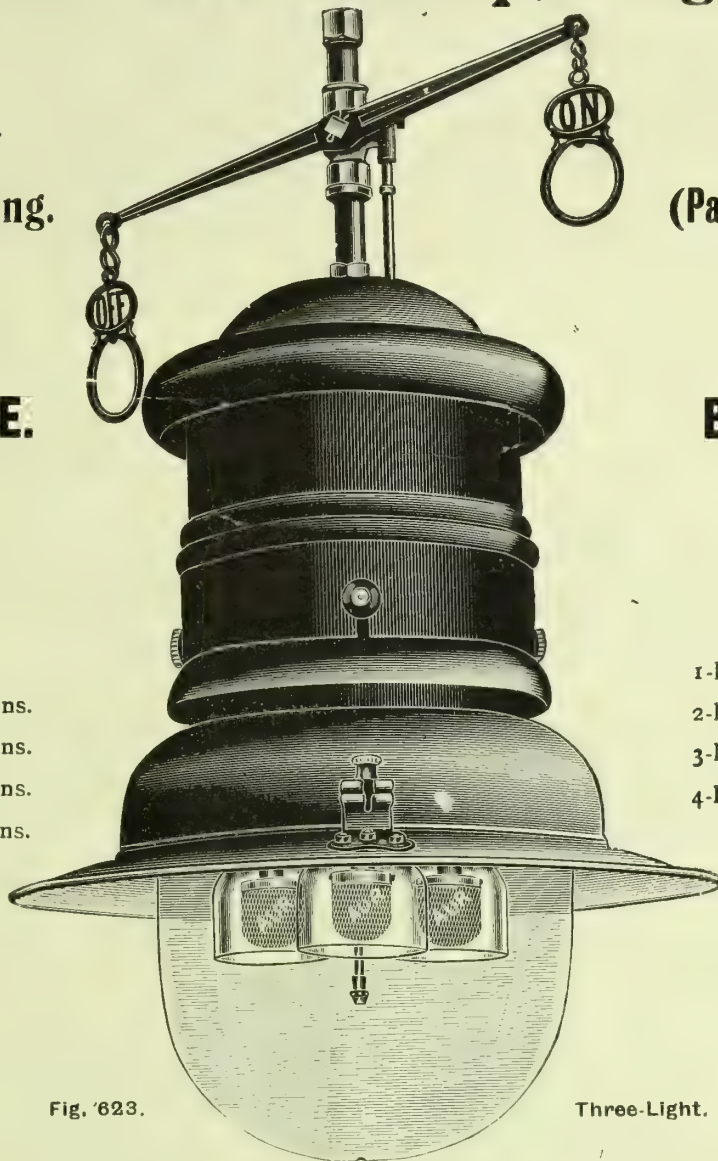


Fig. 623.

Three-Light.

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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

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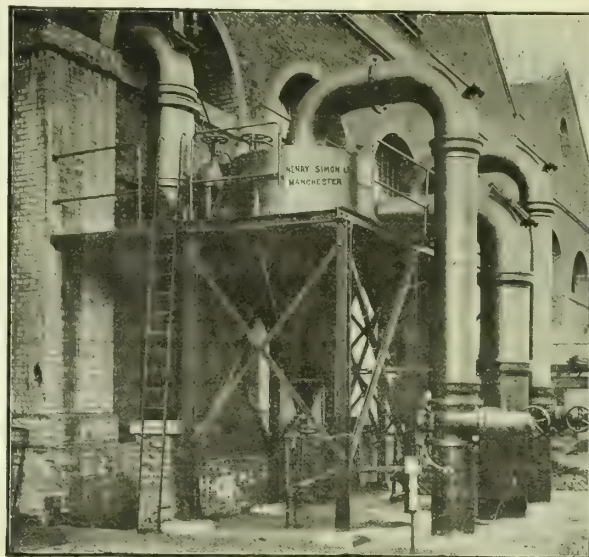
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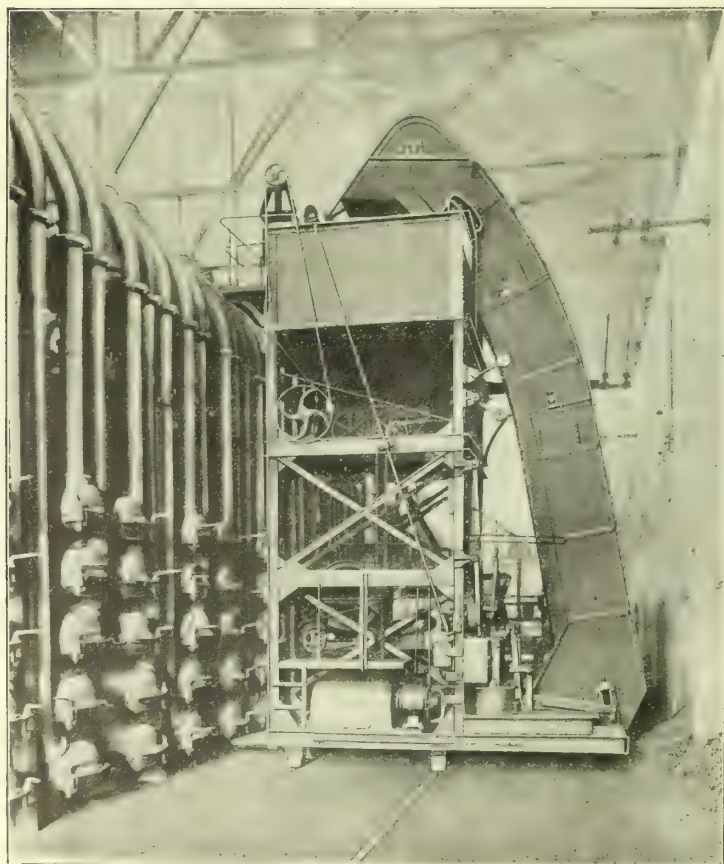
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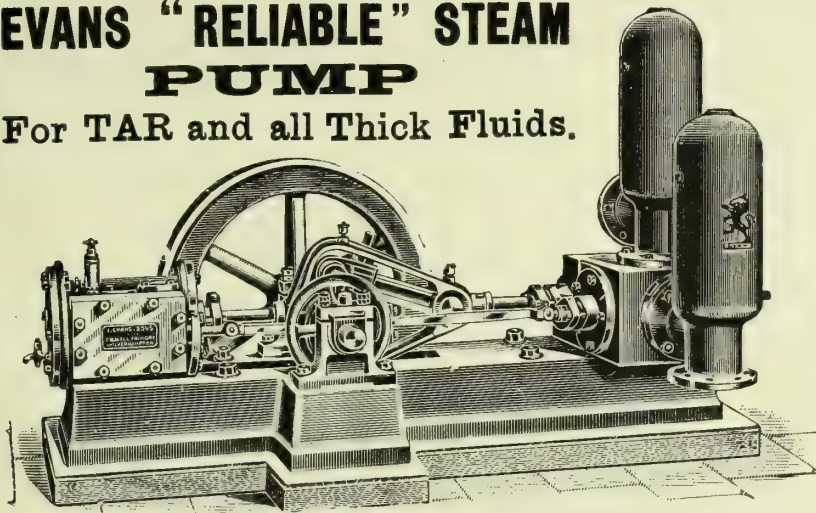
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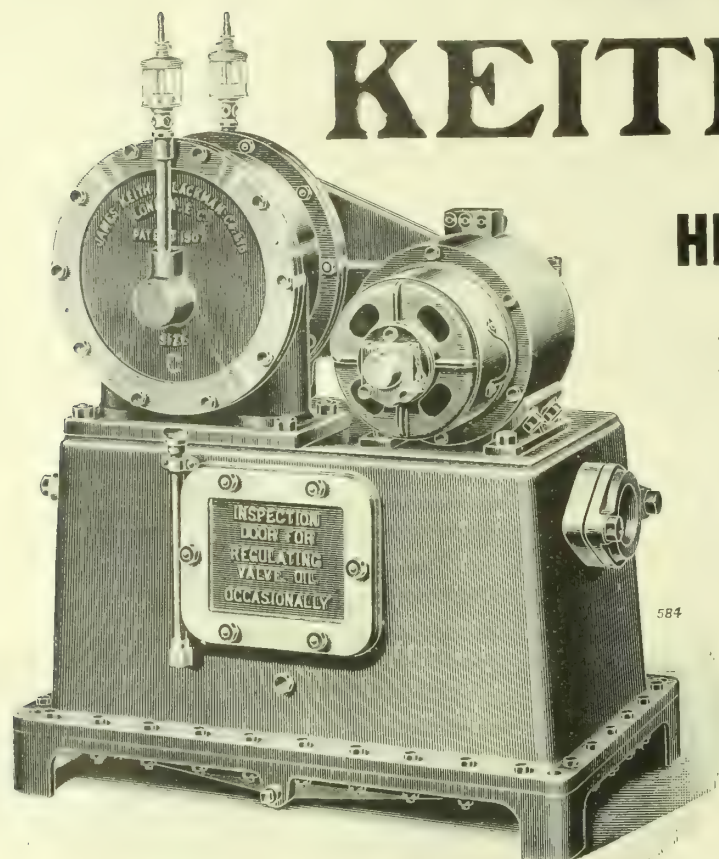
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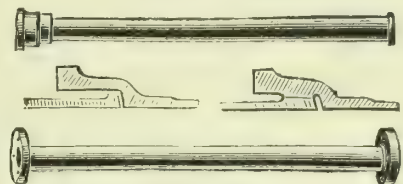
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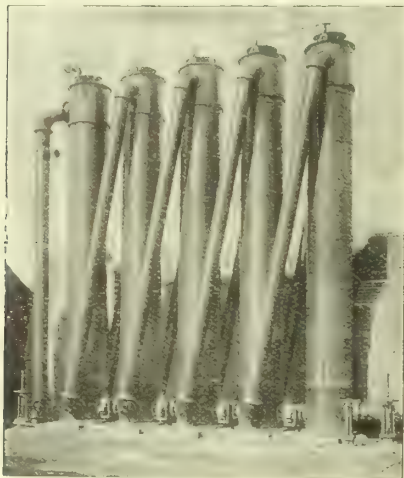
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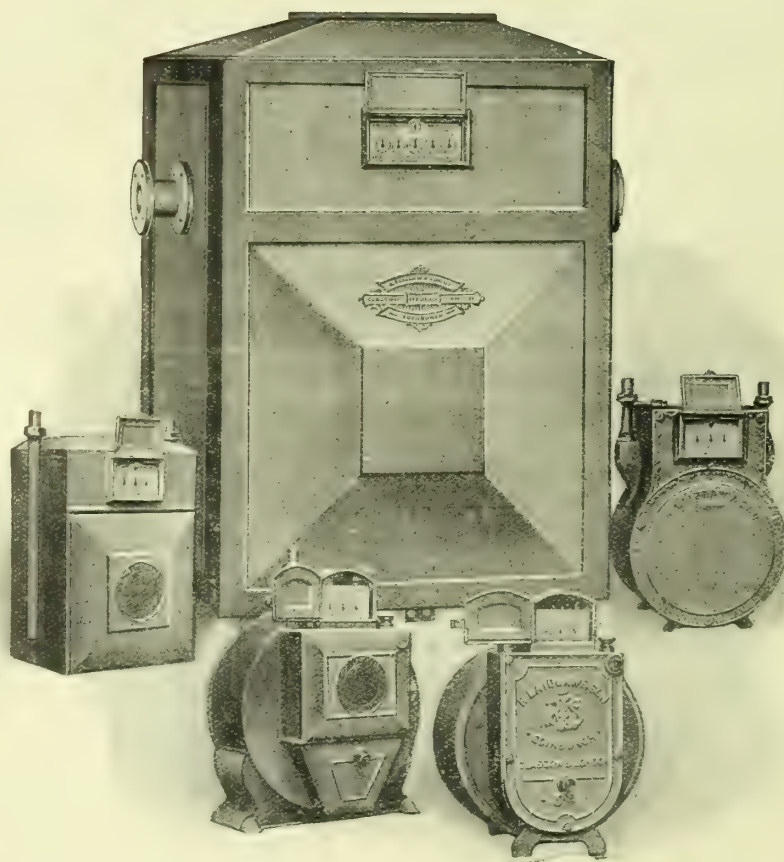
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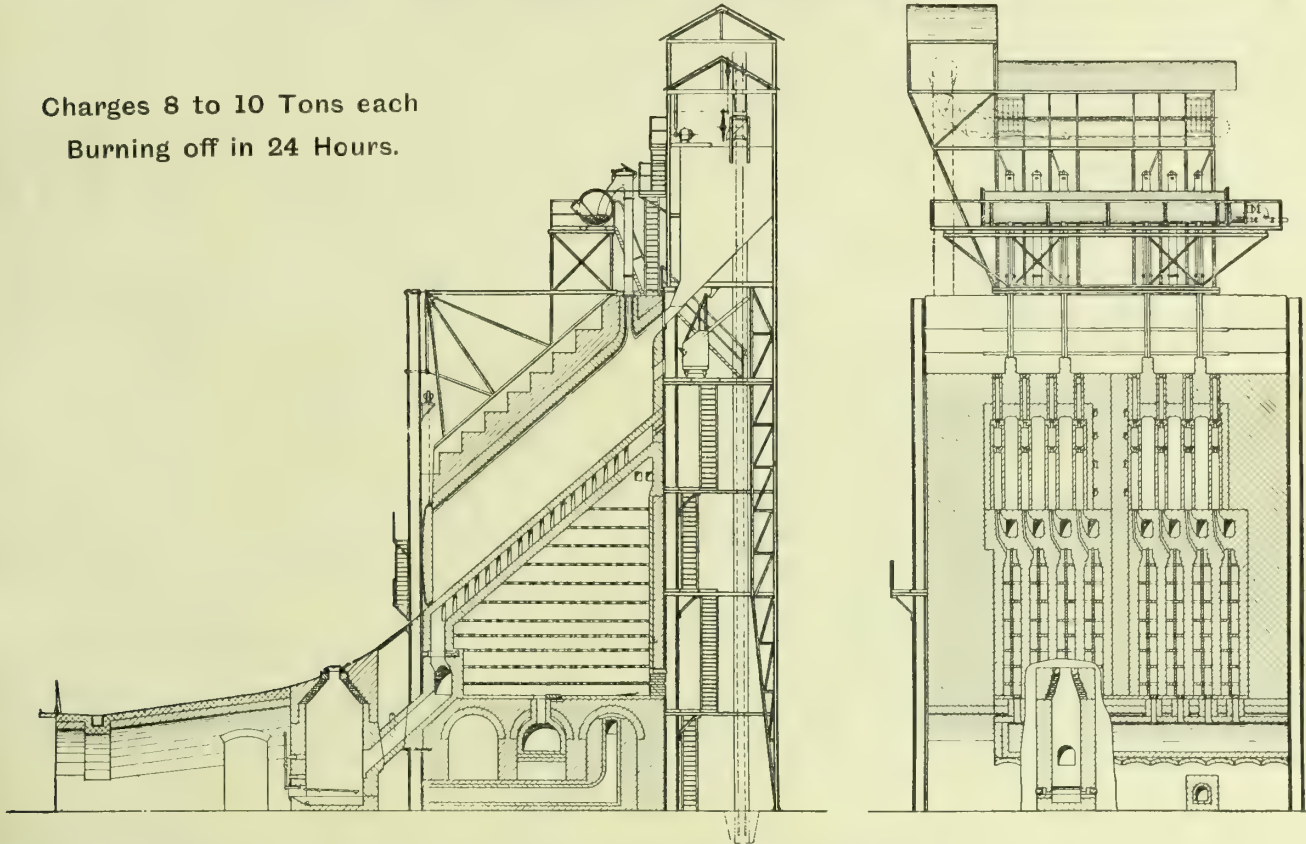
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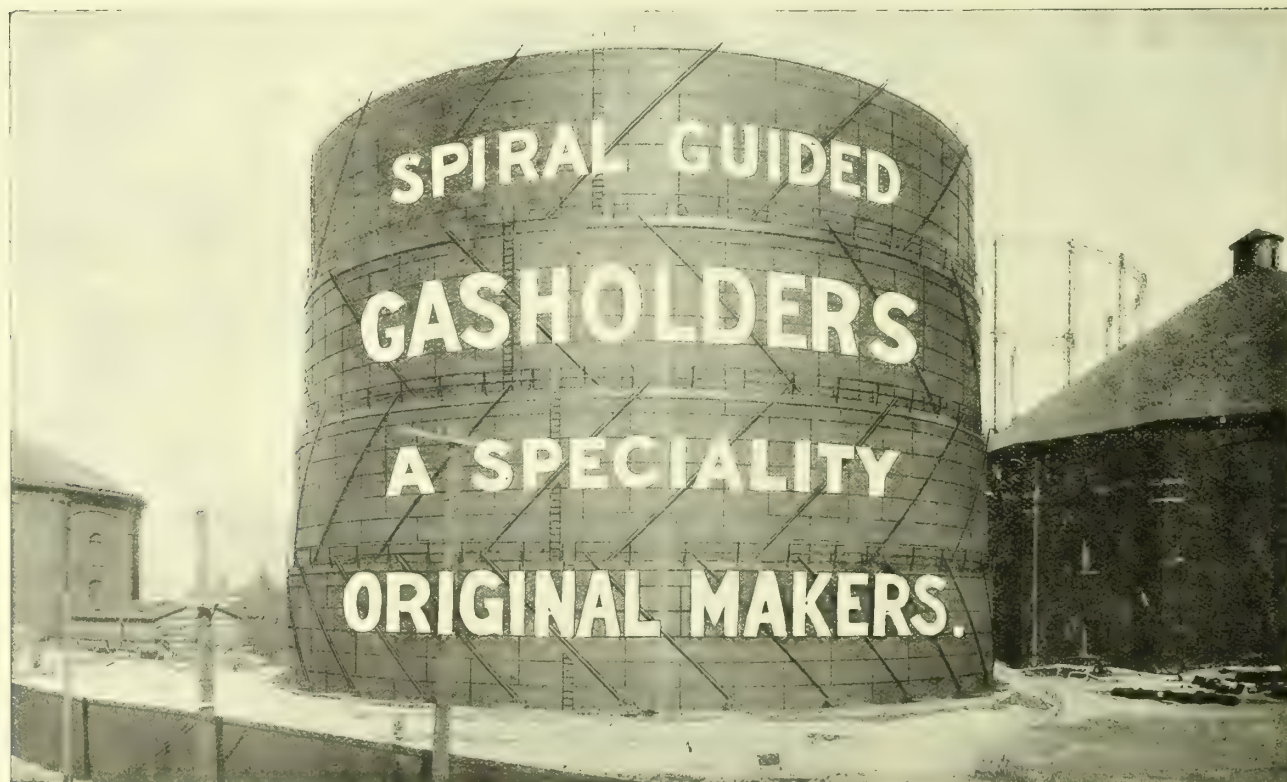
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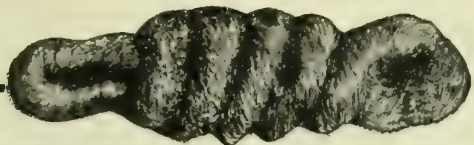
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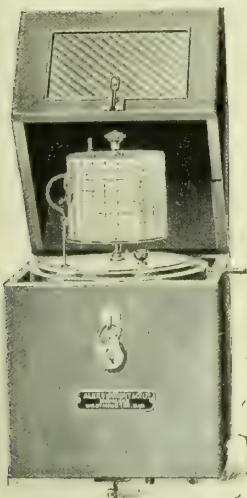
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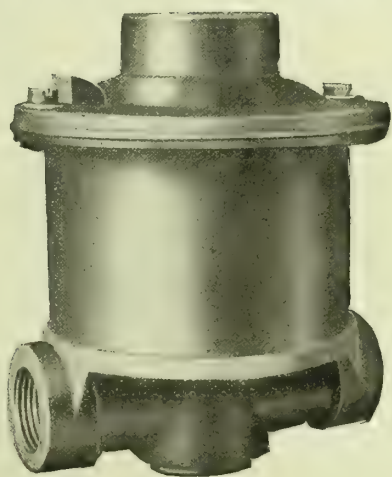
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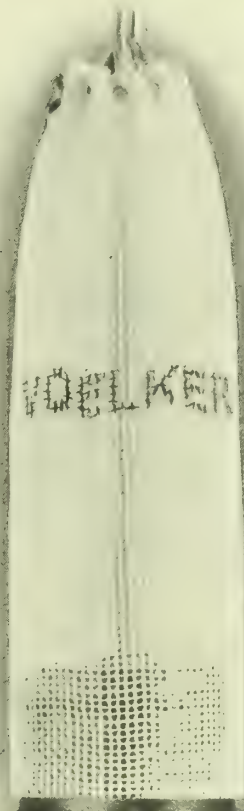
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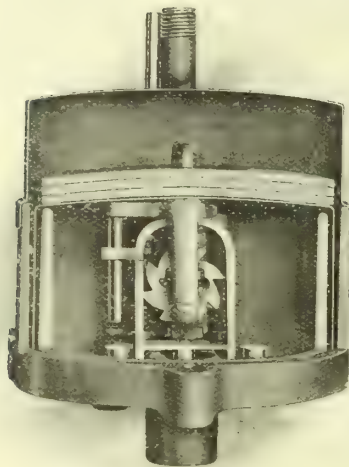
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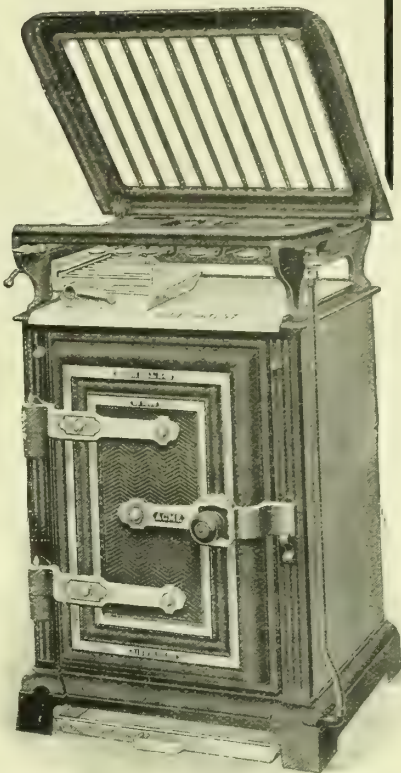
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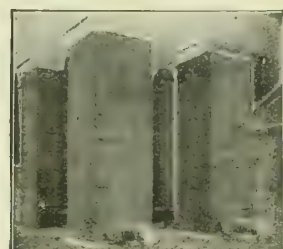
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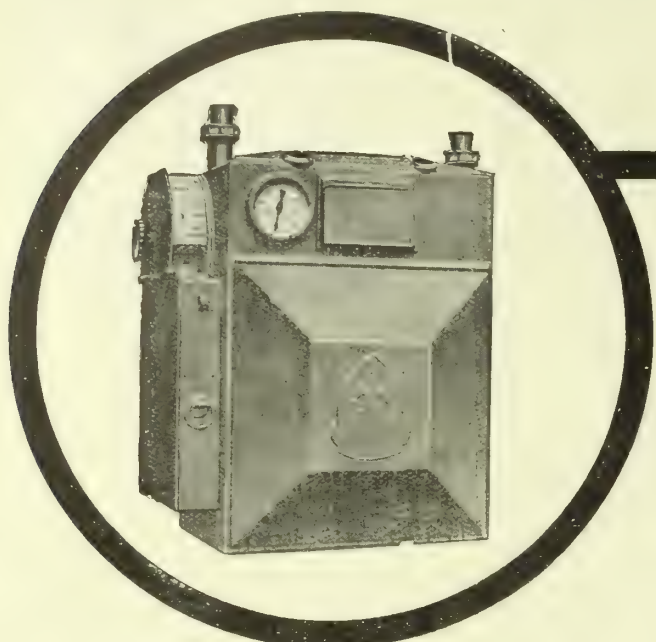
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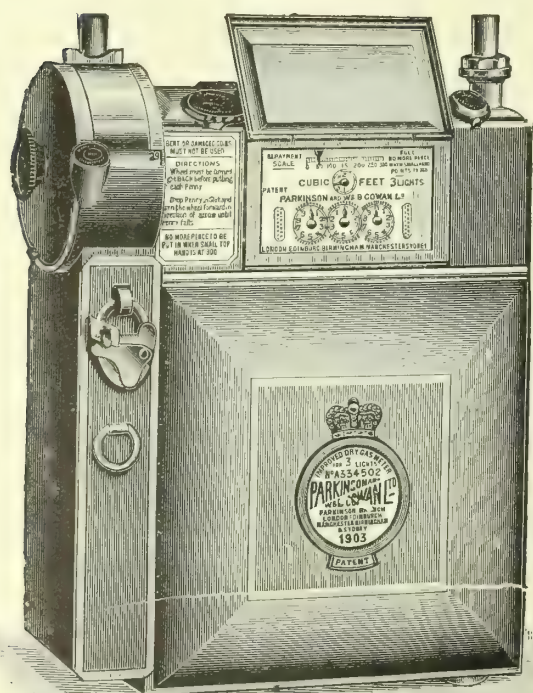
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VOL. CXI., No. 2467.—TUESDAY, AUGUST 23, 1910.

EDITORIAL NOTES—GAS, &c.

Separate Interests.

IN our "Correspondence" columns there is a letter from Mr. R. H. Smith, the General Secretary of the Ironmongers' Federated Association, in which he suggests that the gas industry should join forces with the Electrical Contractors' Association and the Ironmongers' Federated Association in organizing opposition to the projected Bill for conferring upon the promoting municipal bodies powers for entering into trading in electric wiring and fittings. Some municipal bodies have been trading in this way without parliamentary authority; and through the recent Leicester case, they have been told that they are acting *ultra vires*. Thus they want to put themselves in proper legal order. Others who have not traded in wiring and fittings are anxious to procure the powers, though there is ample experience showing that the speculation in this direction has not been remunerative, but on the contrary has resulted in dead-loss. In Mr. Smith's letter, there is also a modest rebuke to the gas industry for not having supported the two organizations named, when they resisted—and successfully, too—the insertion of these powers in the Electric Lighting Acts (Amendment) Bill last year. When the gas industry originally appeared before the Committee, by Counsel, in opposition to the Bill, through the Gas Companies' Protection Association and certain of the large Gas Companies, the clause referred to (if we remember rightly) had not been introduced; and when it was, the Gas Companies, as ratepayers, had not any substantial ground for opposition so long as the stipulation was made that the electrical undertakings should keep separate accounts for this business, and that the income from it should be at least equal to the outgoings, though, truth to tell, we fail to see how this could be assured.

But the projected joint promotion started and agitated by the Incorporated Municipal Electrical Association, has not by any means been overlooked. The Gas Companies' Protection Association are keeping a watchful eye upon the movement; and, when the time comes, the Electrical Contractors' Association and the Ironmongers' Federated Association will, we think we may promise them, see that they have allies in the gas industry. But they must also see that their interests in the matter and the interests of the gas industry are essentially different, and that a joint case would not meet the attitude of the gas industry in the matter. We can quite imagine a condition of things in which a compromise might be effected, whereby the electrical contractors and the ironmongers would be satisfied; and then where would the gas industry be in a joint opposition? At the bottom of the hostility of the two bodies is the interference contemplated by the Bill (in empowering an extension of municipal trading) with the interests of their members as private contractors and traders in electrical fitting work and goods. The gas industry as represented by gas companies cannot claim this position, or put forward the same objection. Gas companies are large ratepayers; and their objection to the proposed measure is that, as such, they have already seriously suffered from the municipal administration of electricity supply undertakings, and as gas suppliers they have already suffered from having to compulsorily contribute to the support, through deficits and otherwise, of a competition with their own interests. They are therefore antagonistic to any extension of electrical trading powers. We can defy anyone to show where Parliament has created a more ludicrous and a more inequitable position than the one now occupied by gas companies in this respect. Fancy Parliament compelling (say) a local butcher to contribute to the support of the business, or to the making good of the financial deficits, of a competitor! If such a thing happened, it would be pretty safe to predict that we should not then be far from intestine war.

A curious thing is that these municipal authorities should

be agitating for a united attempt to obtain their investment with electric wiring and fitting powers. We cannot understand why they covet them, seeing that so many authorities have burnt their fingers over them, through financial failure. The gas industry looks on this experience as offering substantial support to an opposing case from large ratepayers. However, it is pretty clear that the interests of the gas industry are not quite identical with those of the Electrical Contractors' Association and the Ironmongers' Federated Association; and that gas companies, if the Bill is persevered with, will have to stand separately, and present their case in their own way—at least, so we imagine. Though this be so, the two organizations named will find the gas industry shoulder to shoulder with them; and it may well be that the presentation of two cases will, in the circumstances, turn out to be better than one.

Changes at Liverpool.

IN engineering and works management, the Liverpool Gas Company have been displaying much enterprise; and the results are showing themselves, in a very gratifying and substantial manner, in the accounts of the Company. Manufacturing and carbonizing costs have, in the last accounts, decreased by several thousand pounds, and distribution expenses, contrary to the usual experience in these times, have also receded. Yet the sale of gas has, in volume, represented a large increase. The Chairman (Mr. H. Wade Deacon), at the meeting of the shareholders last Tuesday, spoke of these, among many other, matters of interest, and said "the endeavour of the Directors had been to do everything in their power to cheapen the cost of production, and so lower the price at which they could afford to sell gas." That the cheapening of the carbonizing costs has been one of the aims of the Company has been particularly obvious during the past few years; and one of the best ways in which the "endeavour" of the Directors can be exercised in this connection is by continuing to endorse, and to give every possible encouragement to, the efforts of the Engineer and his staff in cheapening production and lowering prices. These are progressive times in which gas companies cannot afford to stand still; and it is largely due to what has been done on the works that the Company are able to announce a recession of 1d. from the 2s. 6d. per 1000 cubic feet at which the price of gas in the city has so long stood, and 2d. from the charge made to slot-meter consumers. And we see no reason whatever why the Liverpool Gas Company should not take a place in time among the few concerns standing at the very head and front in lowness of price.

The Company were united recently with others as promoters of the Standard Burner Bills. Participation in such a matter is a very proper action on their part, as there is in it evidence of a desire to break from the old conservatism that dominated the Company so completely for many years, and which conservatism, unfortunately for the Bill and for the co-promoters, was really at the bottom of a considerable part of the opposition produced, and consequently of the expense incurred. But the Company in the joint promotion were then ranked alongside Companies who, though far removed from the coal-fields, with heavy carriage to pay on the transit of their coals, and doing a very much smaller business, are supplying a lower illuminating power gas at the same price, and lower than that now charged in Liverpool, and—this is the main point—are giving complete satisfaction to their customers. With the success of the Standard Burner Bills, and the Liverpool Company still occupying their place among the promoters without the imposition of any condition as desired by their opponents, their future policy is clear; and we can foresee them in time supplying a gas of a calorific power ample for all purposes at a price that will be the envy of many other undertakings. And why not? Here is the Company with gas at 2s. 5d. of a grade in illuminating power that is perfectly useless for the purposes for which the bulk of the gas is consumed; and freedom from the fetish would mean a gradual

decline in price that would—big as the business in gas now is in the city—extend its service to the community in a marked manner. At present, money is being wasted there; and such waste is not good for the Company nor the community. However, we see the thin end of the wedge inserted in the old conditions and traditions. Another change is produced by the retirement of two officers whose names have been long and honourably associated with the Company. They are Mr. P. F. Garnett, the Secretary, and Colonel J. F. Robinson, the Treasurer. We wish both of them health and happiness to enjoy the leisure merited and earned by their extended years of activity and fealty.

The "Apotheosis" of the Horizontal Retort.

FROM most quarters, the intelligence comes that new coal contracts have been entered into at higher prices than last year, that oil contract prices are about the same or even a fraction lower, and that the prices of residuals are about being maintained, but, though new consumers and additional cooking-stoves and fires have been fixed, the level of gas consumption has not of late been raised (as much owing to economical gas-burners as to anything else) by such percentage increases as a few years ago. Despite these conditions, there are announcements from near and far of reductions in the price of gas having taken place from Midsummer, or—this in not a few instances—of definite promises of reductions at Christmas time. Looking into the cause for this, it is found that the financial positions of undertakings have been so considerably enhanced of late, that the reductions in price can be made without the slightest hesitation. Examining account after account, there is only one part in them to which credit can be given for an improvement which is nothing short of extraordinary; and that part is the one headed manufacture. "Extraordinary" is not too extravagant a term under the circumstances; it is indeed so extraordinary that one can hardly help feeling a constant current interest in it. Lessened coal consumption, lower totals for carbonizing wages, and higher makes per ton are all attributable to heavier charges and longer duration carbonization. And if the practice in this respect continues to spread as it is doing in the gas industry at the present time, we shall in all likelihood find, in the Board of Trade returns for these times, that the total annual coal consumption of the industry is possibly standing still—perhaps even receding—while the total gas consumption is still on the upward move. Economy of the kind is not only of industrial, but of national importance; and we hope when Professor H. E. Armstrong comes to contribute his paper to the proceedings of the British Association on "The Provident Use of Coal," he will make due note of what the gas industry is doing in this direction in these times.

And all this is being done with the horizontal retort. It was at one time thought the horizontal retort had come to the end of its possibilities in the matter of economy; but it is a case of the unexpected that has happened. While conditions existed that prevented the filling, or practically the filling, of the horizontal retort, while engineers refused to depart from custom to see whether anything of value lay beyond, the additional wealth to be derived from a horizontally equipped retort-house was completely hidden from sight. The many new types of machines for charging and discharging have been largely instrumental, through their capacity for placing heavier charges in the horizontal retorts, in producing the profitable revelation; and it is now interesting to hear of the instances in which the published records have hastened decision as to the scrapping of old plant and the putting in of new plant suitable for dealing with heavier charges, and through them deriving the largest possible profit from every ton of coal carbonized. It seems ages ago since we first heard Mr. H. E. Jones making his merited boast of the economical working of the retort-house machines devised by the late Engineer (now a Director) of the Wandsworth and Putney Gas Company, Mr. Henry S. Freeman. They were all that was claimed for them. But from the exceptionally interesting speech that Mr. Jones made at the meeting of the Company last week, we learn that at length these machines, applauded so highly in the past, are now giving way to newer invention, in order to secure the valuable gains (to which they were not equal) of modern carbonizing method. Progress means supersession in some form or other. Mr. Jones was never particularly enamoured of retorts inclined or retorts vertical; and with coal and labour economies and enhanced results from coal

carbonized in horizontal retorts, he is now talking of their "apotheosis." It is rather a mouth-filling word; perhaps this makes it appropriate to the subject. However, there is no question that, if we do not exactly worship or deify the horizontal retort, it is far from disestablishment yet, and farther than it would have been had retort-house costs and gas production remained as but a few years since. We have said, and we repeat, that the revelations of gas companies' accounts under the head of manufacture have been extraordinary.

There are the effects. Reduction of price to consumers means, for sliding-scale companies, the right to higher dividends. These are also creeping up. The London and the Suburban Gas Companies (several of whom are working under the co-partnership system) are paying higher dividends to proprietors and higher bonuses to the worker co-partners—all through their ability to reduce the price due to the new experiences within the retort-house; and the advantages do not end there. Higher dividends have a marked stimulating effect upon the market values of gas stocks; and appreciation of the quoted values of British gas stocks in which there are open dealings has been a noteworthy feature of our Stock and Share List. The higher the dividend the lower the price of gas in the case of sliding-scale companies; and the lower the price of gas, the greater the assurance of decent dividends being maintained in the future. As Mr. Jones admirably puts it in the speech to which allusion has already been made, so long as proper attention is given to upkeep, there is nothing to be ashamed of in a high dividend—and the higher the better, because it reflects low price, a low capital, and good engineering and administration. The Wandsworth Company have a low capital; the ordinary price of gas is at 1s. 10d. (and lower for power) per 1000 cubic feet; dividends are on the three classes of consolidated stock respectively at the rates of £8 5s., £6 15s., and £5 15s. 6d. per cent. per annum; and last half year no less than 9.4d. per 1000 cubic feet was spent on upkeep. There is nothing to be ashamed of in high dividends when the world can be shown such a state of affairs. And there is fair promise that next year the price of gas will be lower still, and consequently the dividends will be higher. The Wandsworth Company deserve all praise for what they have done in making a record among the London and Suburban Companies; but the tendency in other quarters is in the direction of narrowing existing differences between themselves and the Company in the south-western corner of the Metropolis. There is one more point affecting the appreciation of the market value of gas stocks; and it is that it carries with it an increased premium on new issues of capital. This again is capital economy springing from the work that is now being done in the retort-house in adding to stability and value, and in helping to bring us nearer the period when gas will be as common as coal as a fuel on the domestic hearths of the country, and on account of its cheapness a still larger factor in artificial illumination than it is to-day, though now the largest. The position is as cheering and inspiring as anyone could look for or desire.

Reconstruction of the Hamburg Holders.

WE do not know whether to congratulate the Hamburg authorities on their decision to reconstruct the 7 million cubic feet gasholder that was the centre of the catastrophe last December, on the same lines as the one that was then wrecked—that is to say, with raised tank and a chamber or store beneath, through which goods trains can pass. Though the site is congested, it would have been fair expectation that, after the terrible and costly experience, there would have been a leaning, and an ultimate determination, to come down at any rate to ground-level for the bottom of the tank. That there has been a definite resolve to rebuild on the same lines seems clear from the papers of which translations are given elsewhere this week. But, as yet, it is uncertain whether the resolution has been arrived at prior to, or after, the report of the independent Committee of Experts who were deputed to inquire into the causes of the disaster. We can hardly think determination preceded report, though the document, to the best of our belief, has not yet been published. In the interests of gasholder engineering, and of future protection, it is to be hoped the report will not be relegated to the impenetrable archives of the Hamburg authorities and of the builders of the holder. But from the paper of Herr Scheuss, which was read as recently as last month, it is seen that the work of reconstructing this holder has

not yet commenced, and that the preliminary preparations for so doing will occupy some time. He also remarks that, naturally, in its reconstruction great attention will be paid to the arrangements, and a specially high factor of safety will be adopted in the structure. This is where the report of the Committee of Experts would be highly interesting and edifying, to ascertain whether or not, in their collective wisdom and expert knowledge, there was any deficiency in the "factor of safety" that was formerly deemed to be sufficient. However, on the measures now to be taken with the object of securing a specially high factor of safety, Herr Scheuss cannot speak until later; and this indicates that details will be published that will be comparable with those for the wrecked holder as given in the contribution that is published to-day.

The Fire at the Brussels Exhibition.

A CONSIDERABLE amount of intelligence was published during last week concerning the great fire at the Brussels Exhibition; but it was mainly directed to the devastating character of the conflagration, and to the immensity of the loss occasioned thereby. From it all, however, we have not got any nearer to a solution of the origin of the fire than we were when the paragraph was penned that appeared in our "Electricity Supply Memoranda" a week ago. The Belgian papers were at one in attributing it to a short-circuit, and so were the correspondents of the papers published in this country. It was not a case of a solitary newspaper man jumping to any conclusion in the matter; but practically there was unanimity. One correspondent did suggest that responsibility might rest with the firework display; but, no doubt for excellent reasons, the firework theory seems now to have been entirely abandoned. An attendant has since stated that the first thing he saw was a curtain in flames; but how the curtain became ignited is as complete a mystery as a good many other instances of spontaneous combustion of goods in places that—of course, there is no significance in the detail—are electrically lighted. But it is suggested that if the curtain incident is true it disposes of the short-circuit theory, although there is nothing to show why the curtain should not have been set alight by a fused wire as well as by any other means. There has been an almost general demand in the Press for a searching inquiry into the origin of the fire; and we hope there will be, though there seems to be, *prima facie*, little chance of any positive result. However, as to that, we can only watch events, and trust that, both in the interests of at present criminated electricity and the safety of life and property, there will be some satisfactory disclosure.

There has also been much writing of a non-technical character touching the danger of constructing exhibition buildings, containing exhibits of such immense value—some almost priceless—and in which people congregate in crowds, in the gossamer vogue of the present day. These buildings are costly enough for their temporary purpose; but, though only for temporary use, they certainly seem far too fragile and combustible for the responsibility imposed upon them. At the same time, it must not be forgotten that it is not the buildings so much as the inflammable character of the goods housed in them that causes fire to rapidly spread, and supply fuel to, and thus vitalize more and more the consuming flames. Messrs. Arding and Hobbs establishment at Clapham was not a flimsily constructed place; nor were the premises in which the Accrington and the Brixton fires recently occurred. The only thing to be said in favour of more substantial exhibition buildings is that they might have some effect in confining fire. But even in such a case, with buildings stocked with inflammable goods, and intercommunication existing between the buildings, there would be no great assurance against fires swiftly reaching enormous proportions.

High Pressure Gas for Railway Lighting.

One of the—perhaps it is the—largest private installations of high-pressure gas lighting in this country at present is to be seen at the Brighton Central Station and Locomotive Works of the London, Brighton, and South-Coast Railway; and this week it is our pleasure to publish an extended illustrated description of the work. The system adopted is the Keith, with inverted lamps; and that it is there in this extensive form is due to the enterprise of the Brighton and Hove Gas Company and to the

business attitude that the Brighton Railway Company adopt in connection with their lighting arrangements. Electric light was formerly the means of inefficiently lighting the large station, goods yards, sidings, and workshops; and when the Brighton Company considered that the electric lighting was not altogether satisfactory, and that improvement was required, municipal electricity—and municipal electricity is keen in Brighton—made a brave struggle to obtain the business. The fact of the extensive installation of high-pressure gas lighting is proof of non-success. It was a bitter pill for the local purveyors of electricity to swallow; but swallow it they had to, inasmuch as the Brighton Railway Company were fully persuaded, and the opinion is confirmed in the result, that in both economy and efficiency, though an inviting price was quoted for electricity, high-pressure gas lighting stood pre-eminent. It was a big win for gas, and a win that will carry influence in the future. An illustrated description of the installation ought to be introduced to the notice of every railway authority in the United Kingdom; and to carry the education of railway officials as far as possible, the gas engineer in every town should see to it that the chief representatives of the Railway Company or Companies there should be supplied with an account of what has been done at Brighton. It is a subject that should be talked about among railway men. Such an example of good work is an aid to gas in its strenuous contest with electricity for extensive lighting custom; it is also one of many proofs that gas is beyond all question, in the open field, the superior illuminant in regard to the two most powerful considerations of economy and efficiency. Details are set out fully in the special article in other columns; and the contrasts afforded by the photographs of the lighting by electricity before the change and the lighting now, will not be the least instructive parts of our pages this week.

Points from Croydon.

This year will stand out as an interesting one in the history of the Croydon Gas Company—it being the one in which the Institution of Gas Engineers paid the well-equipped works at Waddon a visit during the crowning week of the presidency of Mr. J. W. Helps, the Engineer and General Manager of the Company, and the one in which the members of the German Association who will be visiting this country in October will also be received by the Chairman (Mr. Charles Hussey) and the Directors—the Company's works being one of the few selected for a visit. Mr. Hussey, at the meeting of the proprietors (and the proprietors endorsed his remarks) rightly appreciated the honour that such visits confer, just as the visitors appreciate the honour conferred upon them in being permitted to visit works of such advanced technical interest as those at Croydon, all parts of which works breathe of the professional spirit and ability of their author. The encomiums of a competent body of judges stand for much in the justification of policy and selection; and the Croydon Directors, specially qualified in gas matters though the majority are, are not above feeling gratified at the endorsement of their and their Engineer's work from those capable of making the attestation. We will not say anything about the commercial affairs of the Company, except that reductions of price are in the immediate future to be enjoyed by the consumers. But we should like to direct the attention of all gas-works administrations to the broad-minded policy of the Board in regard to the co-operative work of the industry, as reflected in the Chairman's remarks upon extended support to the Sulphate of Ammonia Committee and joint advertising effort. There is one thing in Mr. William Cash's remarks that is also striking, and that is the rapid effect co-partnership has in promoting thrift among gas-works employees. The experience of Croydon is the experience of other places—that, when the spirit of saving gets hold of the men through the influence of co-partnership, they are not long in putting something by to add to their accumulating bonus and dividend. Sir George Livesey used to say co-partnership improved men. It does. The thrift of the man must have a bearing not only on his own interests, but on the affairs of his employers. No employer given the choice between a thrifty and a thriftless man, would select the latter.

Proposed Change in Decimal Punctuation.

At the time of the International Exhibition at St. Louis in 1904, an Electrical Congress was held, over which Professor Elihu Thomson presided. In the course of the proceedings, a resolution was passed, as the outcome of a paper submitted by

Col. Crompton, to the effect that steps should be taken to secure the co-operation of the technical societies of the world by the appointment of a representative Commission to "consider the question of the standardization of the nomenclature and ratings of electrical apparatus and machinery." The result was the formation of the International Electrotechnical Commission, which held a preliminary meeting in London in 1906, and its first formal meeting in the same city in 1908. Among other conclusions come to was one that the Commission should endeavour to arrive at a universal system of symbols. After the meeting in 1908, the Electrotechnical Committees of various countries proceeded with the work entrusted to them; and a formal meeting of the Commission is to be held next year, at which the work of the Committees will, it is arranged, be considered. On the invitation of the Belgian Committee, a conference has just been held in Brussels to compare the work done, and decide whether or not it is being carried out on suitable lines. A very interesting article on the subject, from an electrical correspondent, appeared in the Engineering Supplement to "The Times" last Wednesday, in which it was stated that the "practical value of the congress was apparent as soon as the proceedings began." We are not in a position to controvert the statement, but only wish to direct attention to one proposal which does not seem to us to be called for. Among the suggestions placed upon the agenda by the French representatives was one that a comma should be used "to separate the units from the decimals, to the exclusion of the full stop;" that is to say, that we should write 7,125 for 7·125. We fail to see any advantage to be gained by the proposed change. On the contrary, it would, in our opinion, lead to confusion; and we are pleased to find that the proposal was not pressed. If change is necessary, let it be by the abolition of the comma, and the universal adoption of the inverted full stop. It has been questioned whether anyone has ever been so stupid as not to recognize a decimal point because a comma was used for it. We venture to reply in the affirmative; for it was once stated, in a technical publication, that two towns were some thousands, instead of only a few, miles apart, because a translator had regarded the comma used as a decimal point as one employed in the ordinary way to mark off the thousands.

Glover-West Vertical Retorts for Australia.

The Australian Gaslight Company, Sydney, have placed a contract with West's Gas Improvement Company, Limited, for a complete installation of Glover-West vertical retorts. The contract comprises a retort-house building suitable for accommodating fourteen benches of retorts, eight retorts in each bench. The carbonizing capacity of the retort-house will be approximately $3\frac{1}{2}$ to 4 million cubic feet of gas per day. Half of the retorts—namely, 56—are to be erected at once; and the contract comprises the whole of the necessary fittings and equipment for this number. This is the first installation of vertical retorts to be introduced into Australia.

Sulphate of Ammonia in Germany.—The United States Consul at Frankfurt has forwarded a brief report on the use of sulphate of ammonia by German farmers. He says the consumption has increased from 284,000 metric tons in 1908 to 330,000 tons in 1909. He adds: "The consumption of Chile saltpetre was about 450,000 metric tons; so that, as far as the percentage of nitrogen is concerned, ammonia is already a trifle ahead of saltpetre." The "Journal of the Association of German Engineers" states that the developments in the last ten years point to the fact that in the near future ammonia will chiefly be used as an artificial fertilizer. Statistics show that Germany consumes its entire yearly production of 322,700 tons at home.

Protection of Water Supplies.—In the "JOURNAL" last week, we gave the conclusion of our report of the proceedings of the Joint Committee of both Houses of Parliament to whom was referred the Water Supplies (Protection) Bill. The report of the Committee, which was given in a previous number [see ante, p. 280], has now been issued, with the evidence of the witnesses examined, as a Blue-Book. It may be remembered that the Bill proposes to restrict the powers of authorized water undertakers in the following ways: (1) By preventing the acquisition of fresh supplies without specific parliamentary authority; (2) by rendering the undertakers liable to give compensation for injury to private supplies caused by their works; and (3) where water is taken from one district to supply another, by conferring on the local authorities of the districts from and through which the water is taken the right to demand a supply from the works of the undertakers on terms to be agreed or fixed by the Local Government Board. The Committee unanimously resolved to report the Bill without amendment.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 535.)

THE Stock Exchange had an unusually dull and uninteresting week. The long nineteen-day account was decidedly unpopular; and members seemed pretty well tired of it before it was half-way through. There were many absentees on the opening day. Some markets were almost deserted; but the Consols Market showed signs of life. Starting weaker than it had closed the Saturday before, prices fell to $80\frac{1}{8}\%$. But a sharp recovery set in, and 81 was marked before the finish, the quotation showing an advance. Most others were uneven, and the speculative lines were easier generally. Tuesday was an idle day; but the tone was better. Consols rose another $\frac{1}{8}$; but Rails lacked support. Americans were firmer. Business was as quiet on Wednesday; but some prices advanced a little. Government issues were hardly so firm, and Rails languished under neglect. Americans and Foreign were firm. On Thursday, the continued absence of business became almost oppressive, and there was hardly enough to move prices at all. Friday was as bad; and many members went away, as the Exchange was to be closed the next day. The Consols and Railway Markets were practically unchanged, but Americans showed weakness. In the Money Market, there was a fair demand; and rates both for short loans and for discount hardened and closed at an advance. Business in the Gas Market was about what might be expected at this time of the year—the aggregate being only moderate. But everything was very firm, and a fair number of quotations improved. In Gaslight and Coke issues, the ordinary was strong and advancing. On the opening day, $104\frac{1}{4}$ was marked; but this was soon left behind, and $105\frac{1}{2}$ was the price before the close—a rise of $\frac{1}{2}$. In the secured issues, the preference realized $102\frac{1}{2}$ and $103\frac{1}{2}$, and the debenture $81\frac{1}{2}$ and $81\frac{3}{4}$. In South Metropolitan, there was one bargain at $120\frac{1}{2}$; while the debenture changed hands at $79\frac{1}{2}$ and $80\frac{1}{4}$. In Commercial, there was only one transaction—viz., $106\frac{1}{2}$ for the 4 per cent. Among the Suburban and Provincial group, Alliance and Dublin was done at from 81 to 82, ditto debenture at 97, British at $44\frac{1}{2}$ (a rise of $\frac{1}{2}$), Brighton original at $215\frac{1}{2}$, ditto ordinary at 155, Bromley "B" at $88\frac{1}{2}$ and $89\frac{1}{2}$, Hastings $3\frac{1}{2}$ per cent. at 94, Ilford "B" at $115\frac{1}{2}$ (a rise of 3), and Southampton at $110\frac{1}{2}$. On the local Exchange, Liverpool "A" marked 219. In the Continental companies, Imperial changed hands at 177 and $177\frac{1}{2}$, Union at $91\frac{1}{2}$ (a rise of 3), and European fully-paid at $23\frac{1}{2}$ and $23\frac{3}{4}$. Among the undertakings of the remotest world, Bombay was done at $6\frac{3}{4}$, Buenos Ayres at $97\frac{1}{2}$, Monte Video at $12\frac{1}{2}$, Primitiva at $7\frac{1}{4}$ and $7\frac{3}{8}$, and ditto preference at from $5\frac{1}{8}$ to $5\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Electrical Cooking and Heating—Experience and Time Publish the Truth—"Meteor" Staggers under a Load of Hard Words—Manglebone Hawkers—Effect of High-Efficiency Lamps on Output—Power Companies as Non-Dividend Paying Concerns.

WHAT has become of domestic electrification? We have heard precious little about it lately; and in all our travels, we have not yet gone into a single house—except an electricity show-house—where electric cooking stoves are in use. It must have been an ugly blow to electricians to have read the statement of the Right Hon. John Burns—a name that suggests heat by combustion rather than by electrical means—when the smoke abaters were before him, that the two largest Gas Companies in London had between them no less than 1,300,000 gas-heating appliances of which they had cognizance in use in their areas; while the electricians had only—well, Mr. John Burns was kindly considerate, and omitted to mention the number of cooking, water-heating, and other similar appliances that the electrical suppliers in the same area have in use, and from which use the householders suffer. But it passes strange there should be this silence, and this want of popularity in regard to electrical appliances; inasmuch as the electrical press and central station advertising literature have times out of number given their word of honour that all such appliances have been brought to a pitch of perfection that has made them the equal of gas appliances in economy and cleanliness, and that this is due to the complete utilization of the heat generated. Especially is this the reputed case in electric cooking-stoves containing ovens, because there is no radiation from them. There has been a great deal of contradictory assertion on this point through some electrical writers being dishonest and a few honest. Among the honest writers is Mr. M. Farrer; and he has had a turn at telling the truth in the "Electrical Review." He treats very brusquely the mythical claims as to the superior economy of electricity over gas, and that miraculous construction of electrical goods that causes all the heat to be usefully employed without loss. Says Mr. Farrer: "We cannot at present compete against gas as regards cost alone. Therefore, the only way to make electrical cooking popular is to make it, as it can be made, far more convenient and cleanly than gas cooking." We do not see where the extra convenience and cleanliness in cooking is to come in. But there must be a little charity; and our electrical friends ought to be allowed the modicum of comfort

to be derived from thoughts of a possible—not accomplished—excellence in the matters of convenience and cleanliness.

It is not only that the claims to a supereminence in economy and efficiency have been proved to have been ill-founded, but, in the matter of detail, the designers of electrical appliances seem to have an entire misconception as to requirement. Mr. Farrer does not say a "misconception;" he is a little more caustic, and describes it as a "want of common sense." A few examples will not be amiss. He knows of one electric kettle so designed that, as soon as it begins to boil, water is blown violently out of the spout, soaking everything in its immediate vicinity. This kettle which shows such ebullition of feelings over its performances is also so designed that it scorches anything upon which it is stood. Then, again, there is the switch difficulty; and every utensil, it is advised, should be fitted with a substantial switch of ample carrying capacity. Breaking the current by pulling the sockets off the terminals is a very crude method; but it is the only safe one under existing conditions, although liable to burn the fingers. Flexibles, too, should be covered with fireproof material. Heat regulation seems to be a matter entirely ignored by a large number of makers; and this results in wasteful consumption. All these points, says Mr. Farrer, tell against electricity in competition with the "well-known" convenience of a gas-stove. We are obliged to him for the "well-known."

Passing on, Mr. Farrer states that he has in use a Phoenix grill, which, in its way, is a practical article. A controlling switch would be an improvement; the plug tops soon getting too hot to touch. An early pattern Wilkinson cooking-stove was made for 700 watts; but this did not give sufficient heat. It was, in fact, more useful as a radiator than as a cooking-stove. But recently a new 1000-watt stove has been put into use; and excellent results have been obtained from it. Most of us have different notions as to what constitutes "excellence." It is a much abused term; and the performance of a heating appliance that a gas man might turn up his nose at, an electrician might describe as "excellent." We see, however, that with this Wilkinson cooker, it is most important that the top of the stove should be completely covered with whatever utensil is in use, as otherwise so much heat is radiated away. A word of caution is necessary with this stove when it is completely covered, because the whole body becomes extremely hot; and unless it is stood on a stout metal tray, it burns anything under it. Mr. Farrer finds the G. E. C. oven a success; but considerable trouble has been experienced with the two hot-plates on the top—due to the fact that they are not sufficiently protected from water, &c., that boils over, and they consequently break-down to earth after about three months' use. With the oven, it is necessary to have the current full on (1000 watts) for a quarter of an hour before, to half an hour after, commencing cooking, when it can be reduced to 700 watts. With reference to the boiling of water, Mr. Farrer says the Phoenix grill took 18 minutes to boil 1½ pints in an aluminium kettle with a consumption of 0·3 unit; the Wilkinson stove boiled the 1½ pints in 14 minutes; and three pints in a patent "Kwik" kettle in 23 minutes. We have all heard of the patience of Job. As we write recollections come of the rubbish that has appeared in print as to the perfection in economy and utility of electrical appliances for cooking and heating. With time truth prevails.

After writing the above, the pages of the "Electrical Times" were turned to; and we found a correspondent, covering his identity under the *nom de plume* "Iconoclast," saying nice things about domestic gas cooking apparatus, and very nasty things about domestic electrical apparatus—"abortions" he calls them. This writer owns up to being an electrical canvasser; and so—travelling daily the rugged ways along which he gathers experience, which causes him to speak out plainly—he ought to know of what he is talking. "Meteor" comments half-heartedly on "Iconoclast's" letter. He has not the courage to say there is no truth in this man; and yet he cannot (with the ghost of a Domestic Electrification Number bidding him refrain) acknowledge that all his correspondent says is true. "Meteor" takes the middle course by saying that he does not believe the charges levelled against such apparatus will apply to all. Then how is it the perfect apparatus does not "take on," push the imperfect goods out of the market, and create a big business other than for lighting for the central stations? Less than twelve months ago "Meteor" was talking windily of domestic electrification producing a state of positive blessedness throughout the land, of milk-and-honey, of Promised Lands, and so on. Now "Iconoclast"—the canvasser, the man with practical knowledge, the man who has come into contact with those who have tried these things and will not have them at any price—comes along and shows up the cobwebs behind the pretty gossamer covering produced by the penman of the "Electrical Times." "The electric oven," we read, "is a rough, ugly, gimcrack box of sheet iron, or tin, and would pass as the offspring of a sanitary dustbin, crossed with an old biscuit tin." Servants, too, have to keep their mouths closed, lest they blow the switches off. He is certain it would be good business for the gas companies to subsidize the makers of this rubbish. Electric grills and flat-irons come under his cutting censure. His last sentence has a thoroughly comprehensive appearance. Here it is: "What is being produced at present is the most expensive, inefficient, thoroughfaced hopeless rubbish that any industry has ever had tacked on to it." We had better turn from the subject.

"No hawkers or circulars" is a legend that is seen neatly printed on an equally neat plate affixed to the gates of many

suburban residences just now. The plates (which, neat though they be, strike us as being a bit incongruous) are said to be effective; but the hawker and the tradesman who have to cultivate their businesses by being a nuisance, have been meditating with full souls over the degenerating benevolence of the British householder and the general inclination to crustiness of the human race. A letter by "Householder" in "The Times" brings those plates to mind; and we are wondering whether they would be effective against the Marylebone Electricity Department whose "enterprise" has now stepped beyond the bounds of decency, and whose business getting work is a nuisance to the householders in the district. A start has been made by the department in hawking electric flat-irons; but we have not yet seen that the Borough Council have taken out a hawkers' licence for Mr. Seabrook, Mr. Holmes, or any other members of the staff. The *modus operandi* in the new work is thus described by "Householder":

A parcel and letter were this morning handed to my servant, and, of course, taken in. The messenger vanished without waiting for a reply. The parcel, judging by the several addresses erased from the cardboard box, had been already left at other houses; it contained an electric iron. The letter was full of printed matter pointing out the advantages of this machine, and the use of electricity. The iron was to be left at my house for a month, and then I should have either to pay the price set upon it, or hand it back to the messenger, who would call. I was not given the option of otherwise refusing these "advantages."

The prospect of what this sort of thing might lead to if encouraged by householders seems to scare the correspondent of "The Times." If private traders follow this example of the municipal traders, our houses may become warehouses for unsolicited goods, and our servants be occupied resisting demands for money or for a return of the parcels left. There is no end to the vista of "advantages" and of demands that may be made on our house room and patience. Old clothes dealers might favour us with the loan, on trial, of their stocks; and even fishmongers, fruiterers, butchers, and greengrocers might have on Saturday nights a chance market for perishable goods that they had been unable to sell. A question will no doubt be raised in the Borough Council regarding this prominent complaint as to a fresh ill that the householders of Marylebone have been called upon to bear in the interests of municipal trading.

That new conditions are coming over electrical undertakings is apparent on every hand; and unless the latter are specially favoured, those conditions will make a vast difference in the relation of financial result to the business done. The "Electrician" has given prominence to some rather remarkable statistics respecting Leeds. New consumers, it is stated, continue to be connected with the mains at a very satisfactory rate; but nevertheless the output of energy remains almost stationary—there being practically no difference between the number of units sold during last financial year and two years previously, although the sales (at lower prices than the lighting units) of current for power and heating have in the period increased by upwards of 1 million units. This causes one to turn to the revenue from private lighting, as it is obvious that, with this increase in one department, if the total output is only now what it was two years since, there must have been a big leakage somewhere. It is found that private lighting income is no less than £16,410 below what it was two years ago—£64,518, compared with £80,928. That is a substantial difference. New consumers are being constantly obtained; but they do not afford compensation for the factors that have contributed to the reduction of the consumption of lighting units. There is a proneness to give the metallic filament lamp the credit for all the saving; but, at any rate at Leeds, there is another movement operating, and that is lessened consumption of electricity proportionately to the number of lamps fixed. There appears to have been a careful inquiry into this matter. In 1907-8, the number of units sold for private lighting per 35-watt lamp installed was 21½; last year the figure had declined to 17½ units. There are a not inconsiderable number of electricity consumers in areas with which we are more especially acquainted who, on adopting electricity, retain their gas-fittings, and use them alternately according to the season—the gaslights in the colder weather. With the big improvement there has been in gas lighting through the inverted gas-burners, there is a strong temptation on the part of such consumers to patronize to a larger extent the system of lighting that they find the more economical and efficient. Perhaps this experience is not unknown in Leeds. At any rate, the figures quoted are not only interesting, but most significant.

It is commonly said to-day, as it has commonly been said by a long line of ancestors, that it is never safe to prophesy. But there is one thing over which one does not hesitate much in indulging a little in this direction; and that is that it will be a long time before another electrical power company can get capital from the public with which to start operations. The wreck of the South Wales Company is fresh in memory. Occupying the choicest of districts, the Lancashire Electric Power Company is not yet in a dividend-paying way, and not likely to be for a very long time. The business has more than doubled during the past four years; but even in 1909 the units generated only amount to 9,251,831, while the receipts and expenditure show merely a difference of £130 in favour of the former—£15,294, against £15,164. Economies at the generating station, including a favourable coal contract (favourable coal contracts cannot be relied upon just now), helped last year in causing the expenditure to keep within the line

of receipts. The cotton trade was not in favour of the Company in 1909; but there is a hopeful eye cast in the direction of the collieries within the area of supply. The Company have taken over quite a number of Orders from local authorities; but there was not a cheerful ring in the voice of the Chairman (Mr. H. F. Parshall) in referring to these the other day at the meeting of the shareholders. He looks for a certain amount of growth from the Orders; but the business is not large in volume. On the other hand, the amount of capital required is not considerable; and the return per unit is higher than in most classes of industrial supply. The year's netting of Provisional Orders from local authorities include Abram, Aspull, Burton (Rural), Bury (Rural), Kearsley, Little Hulton, Little Lever, Ramsbottom, Tyldesley, Westhoughton, Whitefield, and Worsley. We think the Chairman is about right in considering that the business will not be large in volume. Certain it is these authorities would not have parted with their rights if they could have strained themselves into the belief that there was money in the supply of electricity in their districts.

THE VISIT OF THE GERMAN ASSOCIATION.

Programme of Arrangements.

IN previous issues of the "JOURNAL," reference has been made to the visit to be paid to Great Britain by members of the German Association of Gas and Water Engineers early in October next. The current number of the "Journal für Gasbeleuchtung" contains the programme drawn up for the occasion, which furnishes the following particulars. On Monday, Oct. 3, the party will leave the Westminster Palace Hotel at 9.30 a.m. by motor for the Beckton Gas-Works, where they will be received by the Governor (Mr. Corbet Woodall) and Directors of the Gaslight and Coke Company, and the most interesting parts of the works will be inspected. They will return to London by motor, and visit the works of the Company at Kensal Green and Fulham. At the former, the Fiddes-Aldridge charger-discharger machine will be on view; and at the latter, the Woodall-Duckham vertical retort for continuous gas production. In the evening there will be a reception and banquet by the Institution of Gas Engineers, probably in the Hotel Cecil. Next morning, a visit will be paid to the works of the South Metropolitan Gas Company at East Greenwich, where the Arrol-Foulis hydraulic charging machine and the Company's special types of charging and discharging machines will be inspected. There will afterwards be a reception by the Chairman (Mr. Charles Carpenter) and the Directors. The party will then motor to the Croydon Gas-Works, where they will see West's charging-machine, with apparatus lately invented for charging and discharging; also special arrangements for handling coke with Marcus coke-conveyors. The evening will be left free; but special arrangements may possibly be made. On the 5th, the party will leave by the 11.50 p.m. train for Edinburgh, where they will arrive about 8 a.m. next morning. Between 9 and 10 o'clock they will leave to visit the works of the Edinburgh and Leith Corporations Gas Commissioners at Granton. After luncheon, at which the Lord Provost of Edinburgh will be present, there will be a short visit by motor to the Forth Bridge, returning direct to Edinburgh in order to leave for Glasgow about 5 p.m. In the evening, a dinner in honour of the visitors will be given by the Corporation of Glasgow—the Lord Provost presiding. On Friday, visits will be paid to the Tradeston and Provan Gas-Works of the Corporation; and the party will leave Glasgow by the afternoon train, arriving in London at 10.45 p.m. It is proposed next day to invite the visitors' English hosts to luncheon, at which there will be an opportunity of thanking and taking leave of them. The return journey will be commenced on Sunday, Oct. 9; the departure from London being at 9 a.m., and the route being *via* Dover, Ostend, Brussels or Lüttich, to Cologne. The programme leaves the visitors Wednesday and part of Saturday entirely free, so that they can see anything of interest to them in London. An offer has been made to arrange for a visit to the Japan-British Exhibition, if a large number of the party so desire.

Lighting the Public Streets on the Slot-Payment System.

Noticing the arrangement referred to in last week's "JOURNAL," p. 463, the "Evening Standard" a few days since remarked: Local authorities may take a hint offered by those in charge of the village of Jocketa, in Saxony. In this village, as in many another in England, the folk retire early, leaving their hamlet almost deserted. Not quite, however. There are business men of the neighbouring town of Plauen who have villas at Jocketa; and, when trade is good, they may be late in returning home. There is also, of course, the occasional but inevitable passage of vehicles; and we may hazard the guess, though we do not know Jocketa, that the reveller, albeit unusual, is not an unknown apparition. In short, the authorities were confronted by the usual problem of little towns; they were compelled to put themselves to the expense of keeping the streets lighted for the convenience of a handful of residents. They have now found an ingenious way out of the expense. Slot machines have been attached to certain lamp-posts. After eleven o'clock, the lights are turned off; but the insertion of a coin in one of the boxes relights half the town, and the insertion of two fills every lamp with glory. The system sounds simple, efficient, and eminently just; the light is paid for by those who need it.

COMPREHENSIVE GERMAN TEXT-BOOK ON GAS.

LESS than three years have elapsed since we had the pleasure of reviewing the second edition of Herr A. Schäfer's text-book on the "Equipment and Operating of a Gas-Works," which forms one of the series of technical hand-books published by the house of R. Oldenbourg, of Munich and Berlin. The fact that a new edition has been called for within so short a space of time indicates that Herr Schäfer's efforts to provide a compendium of the plant and processes adopted in gas manufacture have been well appreciated. The name of Dr. Witzcek, a chemist whose assistance had been acknowledged in the preface of previous editions, now appears on the title-page as collaborateur with Herr Schäfer. The new edition is considerably larger than the last, which again constituted a very marked enlargement on the first edition. The present volume comprises 923 pages, as compared with 751 pages in the second edition; while the number of illustrations also has been correspondingly increased.*

The first chapter relates to coal. The origin and classification of coal are referred to, and then follow descriptions of methods for the analysis and the valuation of coals for gas making. The analytical methods recommended do not generally follow those of the Committee of the American Chemical Society, which are now pretty widely accepted as standard, except perhaps in Germany, where we think they have failed to receive the recognition they deserve. The results of the investigations made at the Karlsruhe Instructional and Experimental Works on the principal varieties of German gas coals are reported fully; and no doubt in his next edition Herr Schäfer will include also the results of the investigations on typical English coals which are being carried out at the same institution, and on which a preliminary report has recently been issued. ["JOURNAL," Vol. CX., p. 961.] At present, the book does not contain much about English gas coals, probably because the author appears to have gleaned his information almost wholly from German authorities and journals.

The second chapter treats of retort-settings. The subject of furnaces and producer firing is, on the whole, very well dealt with by reference mainly to the researches and lectures of Bunte and Geipert. A diagram (fig. 44) for calculating the efficiency of furnaces from the proportion of carbonic acid in, and the outlet temperature of, the flue gases, to which reference is made in the text, has been omitted from the copy of the book which is in our hands. Similarly, we have been unable to find three diagrams for computing the volumes of gas which will pass through mains of various sizes and of various lengths with different falls of pressure, as referred to on p. 851 of the book. The subject of vertical retort-settings is naturally much more fully handled than in the previous edition. We notice that the statement is made that the make of gas with these settings does not exceed that obtainable with horizontal or inclined retort-settings well operated.

The only type of vertical retort-setting spoken of is the Dessau; and, somewhat curiously in the light of the recent development of this type, by which 18 retorts are included in one setting, it is strange to find the author saying that ten is the most suitable number of vertical retorts for a setting. There is a new section on large chamber carbonizers, of which the Munich type of inclined chambers receives exhaustive treatment; and the Koppers' horizontal chambers are briefly described. The Klönne and other types are passed over. But perhaps the most serious defect of this chapter is the omission to refer to the Woodall-Duckham and Glover-West systems of vertical retorts. Methods of gas analysis and pyrometry for the control of the working of retort-settings are fully and fairly satisfactorily described. Several important and valuable types of charging and discharging machines for horizontal retorts have escaped notice.

The third chapter is on coal and coke conveying plant, and storage arrangements. Though comparatively brief, it is well worth perusal by English gas engineers, because it will help to show the differences between the types of conveying plant which are in vogue in German and English gas-works, and to indicate the great extent to which relatively costly equipment has of late years been adopted in the former. The fourth, fifth, and sixth chapters treat respectively of condensers, exhausters, and tar-separators, and will not prove specially instructive to the English gas man, except in so far as they indicate the departure which has been made by German makers of gas plant from English patterns. The seventh chapter relates to naphthalene extraction; and we notice that the author speaks most favourably of a crude carbolic tar oil as an agent for use in naphthalene washers. He disparages petroleum oil for the same purpose; but we think unjustly. Both the solar oils commonly used in this country in the manufacture of carburetted water gas and distillates from water-gas tar are superior to almost all coal-tar oils as solvents for naphthalene; but they are less well known in Germany than here, and probably have not been fairly tried there in naphthalene washers.

The eighth chapter deals with washers and scrubbers for the extraction of ammonia from coal gas, and the ninth chapter with the composition, analysis, and working-up of gas liquor. Then

* "Einrichtung und Betrieb eines Gaswerkes." Ein Leitfaden für Betriebsleiter und Konstrukteure bearbeitet von A. Schäfer, Direktor des Städt. Gas- und Wasserwerks zu Ingolstadt. Unter Mitwirkung von Dr.-Ing. R. Witzcek, Chemiker. Dritte vermehrte und verbesserte Auflage. Mit 413 Abbildungen und 8 Tafeln. Munich and Berlin: R. Oldenbourg; 1910.

follows an important chapter on purification. Oxide of iron, either in the form of bog ore, or of an artificial preparation such as Lux material, is used in Germany as a purifying agent to the almost absolute exclusion of lime and Weldon Mud. Chapter eleven treats of station meters. At the close, the rotary type of meter is described. Its advantages and limitations are fairly set forth; but we do not see that the author has mentioned the name of the inventor in connection with it—an omission which is scarcely fair to the latter. The twelfth chapter refers to gas-holders, of which types of construction protected by comparatively recent German patents are described somewhat fully. Particulars are given of the 7 million cubic feet holder erected in 1908 and 1909 at the Grasbrook works at Hamburg; but there is no mention of the catastrophe which occurred to this holder on Dec. 7 last. [The preface to the book is dated December, 1909; but it did not leave the publishers' hands until last June.] The next chapter is a short one on station governors. The fourteenth chapter deals with water-gas manufacture. Four types of plant are here described—viz., the Humphreys and Glasgow, the Strache, the Dellwik-Fleischer, and the Kramers-Aarts—and the information given is, generally speaking, quite satisfactory. The next chapter—on gas supply to distant places—should be interesting to English readers, because there has been a greater development in this direction in Germany than in this country in recent years. The sixteenth chapter is a very comprehensive one, referring to the physical and chemical

methods of control of the working of a gas-works. It includes gas analysis, calorimetry, and photometry, and, from the German standpoint, may be considered adequate and good. Naturally, much that is said is not directly applicable in English gas-works' laboratories, because of the differences in standards, weights and measures, and forms of apparatus. The seventeenth chapter is on distribution, and gives the usual formulæ for calculating the sizes of mains required. But, as already mentioned, some diagrams appear to have been inadvertently omitted in connection therewith. The eighteenth (and last) chapter is a short one on the size of works and plant required for the supply of gas to a district having a certain population. Appendices give the atomic weights of the elements and some other useful data; and the book concludes with a rather inadequate index. We have endeavoured in the foregoing to give an impression of the scope of Herr Schäfer's work. It appears to us to be almost solely a compilation from published particulars, nearly wholly of German origin, to which the author has added little from his own experiences. The latter, in a small works such as that of Ingolstadt, are likely to have been somewhat limited. But, on the other hand, the author has probably been free to devote to compilation more time than the manager of a large gas-works. Hence the result is, on the whole, satisfactory; and we can heartily commend the book to English gas men who wish to learn what are the present methods of equipping and operating gas-works in Germany.

BLUE WATER GAS v. CARBURETTED WATER GAS.

Experience in Amsterdam.

By J. VAN ROSSUM DU CHATTEL, Chief Engineer and Manager of the Amsterdam Municipal Gas-Works.

THERE are still some questions connected with the gas industry which have not been completely cleared up—not so much for want of information, but because the information has reached us from so many sides. A fair comparison between the figures has been somewhat difficult; for the circumstances under which they were secured were so different. This refers in especial measure to the old question of which is the cheaper—blue or carburetted water gas.

Now, the Amsterdam Gas-Works are possessed of both types of water-gas plant—one at the Western works (blue water gas, made under the system of Kramers and Aarts) and one of carburetted water gas (Samuel Cutler and Sons' arrangement) at the Eastern works; and so we are well in the way to give some useful information. Both works are under the same general direction; both were built in the same style; both are of the same size; and the quantity of gas they have made is (if not equal) at any rate practically equal—the difference being too small to exercise any influence on the cost price of the gas. Both plants were really erected under the impression that for both systems of making water gas much was to be said; and that after a sufficient period of time we would be able to decide upon their relative merits. No trouble was therefore spared to put

the two works in the same condition, so that a fair comparison might be possible.

It may therefore be interesting to give the figures which we have found over the last four full years of working; both plants being erected and started to work in 1905. I may premise that the percentage of water gas (blue or carburetted) mixed with the ordinary coal gas is from 25 to 30 per cent. at the utmost.

The figures, of course, have the same basis of cost prices—viz., the cost of coke for both plants is the price at which it has been sold every year under large contracts, but lessened by all the extra labour, cartage, &c.—thus leaving a "net profit price." Wages for labourers are, of course, the same in both works. The mixed gas is carburetted with benzine in "Bamag" evaporators at the Western works; while at the Eastern works Solar oil is used from different places of origin—Texas, Roumania, &c. The price of the oil has lately gone down very much; but this has also been the case with the benzine used at the Western works.

Formerly there was still a certain quantity of benzol used at the Eastern works for carburetting the mixed gas. This, however, is not done any more; the Solar oil being used to correct any want of illuminating or heating power of the mixture, as its cheapness renders it preferable for this purpose to any other means.

The figures below leave no doubt whatever that, under the

Cost Prices of Water Gas per 100,000 Cubic Feet.

	WESTERN WORKS (BLUE WATER GAS).				EASTERN WORKS (CARBURETTED WATER GAS).			
	1906.	1907.	1908.	1909.	1906.	1907.	1908.	1909.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Coke for generators	1 10 11	1 15 11	1 13 4	1 11 10	1 13 9	1 16 4	1 16 1	1 10 3
Fuel for boilers	0 3 11	0 3 9	0 5 3	0 6 2	0 7 4	0 8 8	0 8 5	0 6 9
Wages for gas makers, engineers, and firemen	0 11 5	0 11 4	0 10 5	0 10 9	0 10 3	0 10 7	0 10 9	0 10 1
Purification (including wages)	..	..	..	..	0 1 10	0 0 11	0 0 11	0 1 3
Carburation	2 18 2	3 5 3	3 5 1	2 19 6	2 15 5	2 5 11	2 8 5	2 17 3
Repairs	0 6 4	0 8 11	0 7 1	0 6 6	0 7 1	0 5 8	0 5 7	0 5 7
Oil, lubrication, &c.	0 0 4	0 0 4	0 0 4	0 0 5	0 0 5	0 0 3	0 0 4	0 0 3
Gas	0 0 9	0 0 8	0 0 7	0 0 9	0 0 5	0 0 5	0 0 4	0 0 5
Sundries for manufacture	0 1 4	0 1 4	0 1 6	0 1 3	0 1 4	0 1 2	0 1 3	0 1 1
Written off, 4 per cent.	0 7 0	0 7 3	0 6 10	0 7 1	0 6 3	0 5 8	0 5 8	0 5 10
Interest, 4 per cent.	0 7 1	0 6 8	0 6 1	0 5 11	0 6 5	0 5 6	0 5 5	0 5 5
	6 7 3	7 1 5	6 16 6	6 10 2	6 7 1	6 1 1	6 3 2	6 4 2
Less water-gas tar.	..	..	..	..	0 3 5	0 5 6	0 9 10	0 12 1
					6 3 8	5 15 7	5 13 4	5 12 1
Average price of coke per ton	1 0 6	1 1 2 5	1 0 2	0 18 6	1 0 3	1 1 3	1 0 2	0 18 6 5

Amsterdam circumstances (and, as I believe, under nearly most others), the blue water gas comes dearer than the carburetted water gas. The difference between the cost price of the two gases was small in 1906—due to different circumstances, such as our using a cheap coke dust in the Western works, which afterwards was not further available on the same scale, and using less benzine. The gas had not then completely reached the desired calorific power, and we were obtaining a less perfect tar-extraction at the Eastern works. After this period the conditions became more accentuated; so much so that no doubt now remains on the question as to which of the two systems is preferable. Another question which has presented itself and has been dis-

cussed already many times before, is whether with cold weather in winter the benzine does not deposit. In the first year, our experience was really not unfavourable; but in 1907 (as I had always anticipated and expected) condensation occurred in the mains in rather considerable quantities. It was not only in the mains, but also in both the dry and wet gas-meters. We use, of course, for our production of gas large quantities of benzine at the Western works—a total quantity of 1,767,482 kg., of a specific gravity of 0.740, being used in 1909. Stranger still, we do not find condensed benzine vapours only in the cold season, but even in summer; and no doubt is any longer possible on the question as to whether or not the benzine falls out. The emphatical answer is that it does fall out, not in small, but in rather large quantities.

SPECIAL COAL GAS FOR INFLATING BALLOONS.

It was reported in the "JOURNAL" last year (Vol. CVII., p. 311, Vol. CVIII., p. 180, Vol. CVIII., p. 533) that some experiments had been made at the Dessau works of the German Continental Gas Company on the production of a special gas for inflating balloons; and a report on the same was submitted to the Aeronautical Congress at Frankfort-on-the-Maine in September last. Since that time, investigations have been continued with a view to the regular employment of such gas for charging balloons; and Dr. W. von Oechelhaeuser, the General Manager of the German Continental Gas Company described the progress in a communication to the "Journal für Gasbeleuchtung" for July 23.

The raw material for the production of the special gas is ordinary purified coal gas; and further experiments have disclosed the interesting fact that its decomposition takes place quite as well, or rather better, in horizontal retorts than in the vertical retorts which were first used for the purpose. This fact is explicable through the greater ease with which a uniformly high heat may be maintained throughout the whole length of the retort when it is set horizontally. The gas produced must be collected in a gasholder, in order that the balloons may be filled rapidly. A single setting of horizontal retorts serves to produce 42,380 cubic feet of balloon gas in twenty-four hours; and a setting of ten vertical retorts will produce three times this quantity in the same time. It will thus be seen that the make of gas per hour is comparatively low, and falls off at times through the loss of time in renewing the coke in the retorts and raising the new charge to incandescence. Scarcely any gas-works would be prepared to keep a special holder for balloon gas, having regard to its relatively small use; and, consequently, the process is only readily applicable in works which have several gasholders, one of which can be relegated in the summer months to the purpose of storing a special gas. At Dessau, a holder of 120,000 cubic feet capacity is used for the purpose. It is necessary that the water in the tank of the holder should not give up heavy hydrocarbons to the prepared gas; and therefore a thin layer of oil has been spread on the surface of the water in the holder at Dessau. Clean water in the tank would, however, not require this.

The laboratory experiments last summer showed that the rate and completeness of the decomposition of coal gas depended not only on the temperature, but also on the amount of heated surface to which it was exposed. Increased pressure was of no advantage. It was found best to pass the gas through a highly-heated retort, packed with coke or charcoal, at a pressure of 0 to 2.10ths of water. A higher pressure caused loss of gas; while a lower pressure caused the gas to become contaminated with flue gases. Charcoal was at first used as the filling material, but afterwards small coke was found quite satisfactory. With horizontal retorts it was sufficient to leave the coke from the previous charge in the manufacture of ordinary gas in the retort. The carbon which is deposited when purified coal gas is thus decomposed ranges in character in the direction of the current of gas through the retort from the finest flaky soot to the most beautiful silver-grey crystalline needles. The increase in volume which, according to theory, would be expected on the decomposition of purified coal gas is not actually quite attained, owing to the difficulty of maintaining the retorts quite gas-tight. An increase of 20 per cent. in volume is about realized.

The fitting up of retort-settings for producing balloon gas is a simple and not costly matter. A $1\frac{1}{2}$ -inch pipe is laid from the gasholders to the bottom of vertical or the back of horizontal retorts, and a similar pipe from the ordinary ascension pipes to the gasholder reserved for the balloon gas. A small purifying plant, consisting of a simple atmospheric condenser, a dust filter, and an oxide purifier, is interposed in the exit pipe for the gas, in order to cool it and remove fine particles of carbon and small quantities of sulphuretted hydrogen which are formed from the traces of carbon bisulphide in the purified coal gas. The purifier requires to have an area of 0.09 square foot per 1000 cubic feet of gas made per diem. The material used for filtering the fine carbon dust from the gas is fine wood shavings. As the carbonic acid in the gas is decomposed on its passage through the incandescent coke, apparatus for abstracting traces of carbonic acid from the balloon gas can generally be dispensed with. The gas is sucked from the purifying plant and pumped into the special gasholder by an exhauster. A single vertical retort produces 706 cubic feet of the gas per hour; but as six hours out of twenty-four are required for recharging and heating up the fresh charge of coke, only eighteen hours are practically available for the manufacture of the gas. Hence the productive capacity of one vertical retort is 12,714 cubic feet per twenty-four hours. Thus the productive capacity of a setting of ten vertical retorts is about three times as much as that of a special hydrogen plant.

With settings of horizontal retorts, only those retorts which can be raised to a temperature of about 1200° C. (2192° Fahr.) can be employed; and this is generally the case with only the upper four to six retorts of a setting of eight. The rest of the retorts are charged with coal at the same time, and produce ordinary coal gas. A 10-foot retort raised to the proper temperature produces 350 cubic feet of gas per hour, and it is available for gas making for twenty hours out of the twenty four. Consequently, it yields

about 7000 cubic feet per twenty-four hours. If four retorts are used, the productive capacity of the setting is 28,250 cubic feet, or if six retorts are employed, 42,380 cubic feet, per twenty-four hours. The latter is the greatest productive capacity of the special hydrogen plant ordinarily used for charging balloons.

The additional cost of preparing the special balloon gas from ordinary coal gas is computed as follows, per 1000 cubic feet of balloon gas made: Fuel for heating four to six retorts, 5.3d.; wages, 1.5d.; maintenance and repairs of setting, 0.9d.; general working expenses, 1.3d.—making a total of 9d. The cost of adapting a horizontal or vertical setting for the manufacture of balloon gas, including condensing and purifying plant, and an exhauster, is about £150 to £200; and the interest and depreciation charges on this expenditure may be reckoned at about 10d. per 1000 cubic feet of balloon gas made. In order to arrive at the total cost of the balloon gas, the holder cost of the coal gas must be added. This is usually about half the cost of coal gas into the consumers' meters. The distributing charges on coal gas therefore about balance the extra cost of producing balloon gas. Hence the total cost of the balloon gas should not be higher than that of ordinary gas as sold for industrial purposes.

The specific gravity of coal gas in Germany varies between 0.36 and 0.53, and the specific gravity of the balloon gas varies more or less according to that of the coal gas from which it is produced. At Dessau, the fluctuations in the specific gravity of the balloon gas have ranged from 0.225 to 0.3; and an average specific gravity of 0.27 may be assumed, which corresponds with a lifting power of 59½ lbs. per 1000 cubic feet. It is noteworthy that coal gas, which is regarded as bad or poor for use in airships, is better for ordinary heating purposes than the light coal gas which would be specially suitable for balloons. Hence if a gas manager prepared for general supply a specially light gas on any occasion on which balloons were to be charged, he would be producing a gas which, from the point of view of his ordinary consumers, would be inferior. It is therefore impracticable to change the procedure of gas manufacture for the sake of filling one or two balloons.

Description of Gas.	Specific Gravity Air = 1.	Volumes per Cent.	
		Dessau Coal Gas.	Dessau Balloon Gas.
Heavy hydrocarbons	0.97-2.7	2.6	—
Carbonic acid	1.52	1.3	—
Oxygen	1.105	0.2	—
Nitrogen	0.97	6.3	5.1
Carbonic oxide	0.967	5.3	7.3
Methane	0.553	24.7	6.9
Hydrogen	0.069	59.6	80.7
Specific Gravity		0.41	0.225-0.3
Lifting power per 1000 cubic feet	pounds	47.6	62.4-56.2

The difference in composition of the ordinary Dessau coal gas and of the balloon gas made from it is shown in the annexed table, in which the average lifting power of the two gases is also stated. The freedom of the special gas from benzol and other heavy hydrocarbons and impurities capable of acting on the envelope of the balloon is a great advantage. The new gas has a feebler smell than ordinary coal gas, and is less sensitive to variations of temperature. On storage for fourteen days in a gasholder at Dessau, no change in specific gravity could be detected. This is a great advantage, both from the point of view of the gas-works and the aeronauts, since it indicates that the gas may be prepared and stored for a long time in advance. A balloon of 44,500 cubic feet capacity was filled at Dessau in 45 minutes.

It is worth while recalling that in the year 1869 a druggist—M. E. Vial, of Paris—published an article suggesting the production by the decomposition of coal gas of hydrogen for heating and power purposes and for lighting by raising platinum to incandescence. C. Schinz, in a subsequent article, pointed out that though the volume of hydrogen obtained might be about double that of the coal gas decomposed, the fuel consumption would also be about doubled; and hence the process would scarcely be economical. In regard to these early suggestions, the author points out that the production of hydrogen in this manner on a large scale would be considerably affected by the unsoundness of the retorts. It is worth recalling the suggestion, however, in view of the fact that a procedure which would be economically impracticable for a gas for lighting and for heating purposes becomes practicable for a gas for filling balloons, because the high distributing charges are saved with the latter.

The paper concludes with appendices, giving the details of the equipment of the retorts and the procedure to be followed in the manufacture of a special balloon gas from coal gas.

The foregoing particulars in regard to the method adopted by the German Continental Gas Company for the production of a balloon gas from coal gas are of special significance at the present time, having regard to the publication in a recent "JOURNAL" (p. 269), of an abstract of the specification of a patent dated June 28, 1909, granted to Dr. R. Lessing for a special process following the same general lines for producing such gas.

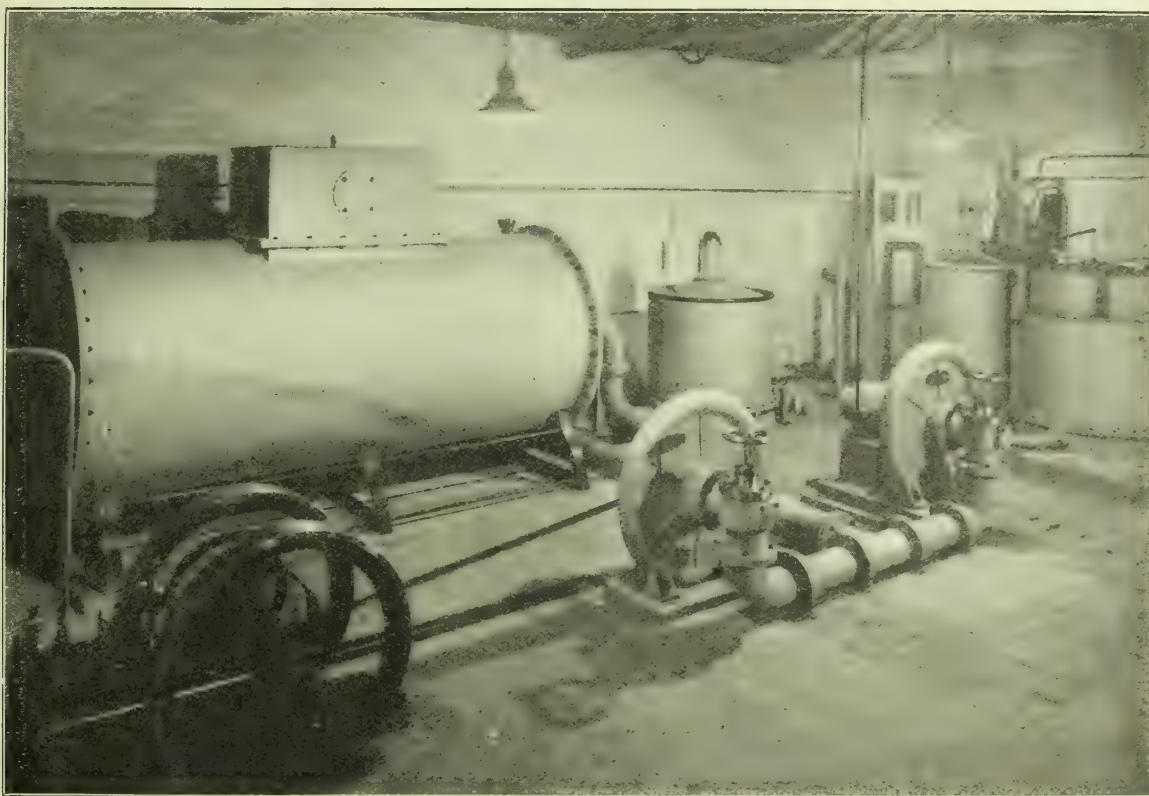
HIGH-PRESSURE GAS FOR RAILWAY PURPOSES.

Lighting of the Brighton Railway Station, Workshops, Goods Yards, and Sidings.

STARTING after dusk from the Victoria Station of the London, Brighton, and South Coast Railway for the Queen of southern seaside resorts, one begins the journey from the magnificent and extensive station, under the light of high-pressure gas-lamps (which illuminate the whole place in a manner that has caused no little admiration on the part of the public, and has produced a by no means small economy for the Railway Company), and ends the journey at Brighton to find the extensive terminus there also lighted by high-pressure gas, in a fashion that induces the expert in artificial lighting to express his opinion that it is well and not over done. The light is so excellently diffused all over the place that, from whatever point one takes up for making survey, uniform illumination is found; shadows are suppressed by judicious placing of the lamps; platforms, lines, and standing trains are covered by the effulgence; reading can be enjoyed in every part; there is no glare, on the contrary the light is soft; there is no flickering, the light being as steady as a light should be. Moreover, it is not prone to failure. Such are the impressions of the illumination of the Brighton Railway Station, and it is the sort of lighting that, for public convenience and railway working economy, should be the vogue at every station of importance, and for

that matter would be preferable at every station, though of minor degree. The system used at Brighton is the Keith, with the new inverted types of lamps. But the lamps and the effects that one sees on the main station and platforms constitute part only of the high-pressure gas lighting, which extends to goods yards, sidings, through some 60 acres of locomotive and other workshops, with lamps running almost up to Preston Park. This is an extensive piece of lighting; and it is made of greater technical interest by the facts that the installation is complete in itself from the compressing-house throughout, that the ignition and extinction of the lamps is by electrical means, and that it incorporates several features showing that every precaution has been taken in connection with it to ensure against interruption of the lighting.

Before we go farther, let us congratulate the Railway Company on the practical demonstration they have made of the economy and efficiency of high-pressure gas lighting; and the Brighton and Hove Gas Company (and particularly their Chief Engineer, Mr. Joseph Cash) and the Contractors (Messrs. James Keith and Blackman Company, Limited), on the good account they have, through the installation, silently but brilliantly given of themselves and of the high-pressure system of the latter, and on the excellent service again rendered to the gas industry in proving that,



The Gas and Air Mixing and Compressing Plant at the Brighton Railway Station.

in a fair field, gas is capable of rendering more effective and more economical service than its strongest and keenest rival—electricity, and at its very best.

The station and its precincts were formerly electrically lighted. This fact and the change speak louder than words. The electric light has been evicted on the ground of economy alone, but not until there had been competition. The eviction and the new installation have proved, by the contrast of past and present, the superiority in the matter of efficiency of the scheme upon which the choice of the Railway Company eventually fell. The change in lighting forms part of a big scheme of workshop reconstruction and reorganization which has been proceeding for some time. The Railway Company themselves prepared a plan for electric lighting. The Brighton and Hove Gas Company, not to be behind, submitted two schemes for gas lighting—one of which comprehended the complete Keith system from the mixing and compressing plant to some 2000 lamps, including electrical ignition and extinction devices; thus giving addition to economy and superior efficiency, and incorporating the boasted convenience of electric lighting of immediate ignition and extinction.

There was, last Thursday evening, an inspection of the new lighting and lamps and plant under all the circumstances of lamp use in the station proper, goods yards, over sidings, and in workshops, at which inspection were present the Chief Engineer of the Railway Company (Mr. C. L. Morgan), Mr. Joseph Cash, Mr. J. Petrie (Engineer of the Southern Division of the railway), Mr. A. Stanley Cooke (the Gas Company's Chief Inspector), Mr. A. Collinson (Manager of the James Keith and Blackman Company), and local and other gentlemen. But before giving a sketch of the

visit and what was seen, there are a few points of general and technical interest that should be presented to put readers at once into possession of the extent of the installation and of the special features of the plant.

EXTENT OF THE INSTALLATION.

There is no precise knowledge as to what will be the ultimate extent of this installation, as the new lights are so much appreciated that the borders of the scheme are being frequently pushed out by a request for one of the new lamps here and a new lamp there; and these are not denied if utility and convenience are served. But at the present time there are fixed about 2000 lamps in all; the greater portion being of 100 and 60 candle power. The smallest units are used chiefly in the workshops for bench lighting; one lamp being allowed for each vice. The vices are, on the average, 7 feet centres; and with the 60-candle unit of lighting, the consumption being only $1\frac{1}{2}$ cubic feet per hour, the effect is perfect. Other lamps of 100, 150, 300, 360, 500, and 1000 candle power, are used for general lighting; the area to be lighted, and the height at which they are fixed, determining the candle power. The station lights throughout are of 500-candle power, and situated at about 40 feet centres, 12 ft. 6 in. from the platform level. In addition to the forecourt and circulating space, there are seven rows of lamps; making in all 75 500-candle power, or a total of 37,500-candle power. This is secured at the modest cost of 1s. 3d. per hour. The lamps on the sidings and in the goods yards are 1000-candle power, fixed on steel columns; the light being 25 feet from rail-level. The old electric light standards, it is understood, have been utilized; and we are inclined to think

HIGH-PRESSURE GAS LIGHTING BY INVERTED LAMPS

At the Brighton Station of the L.B. & S.C.R.



IN THE DAYS OF ELECTRIC LIGHTING

At the Brighton Station of the L.B. & S.C.R.



the height is unnecessarily great for such a candle power. But in the goods yards, where the lamps are a reasonable distance apart, the effect is all that could be desired.

THE KEITH MIXING AND COMPRESSING PLANT.

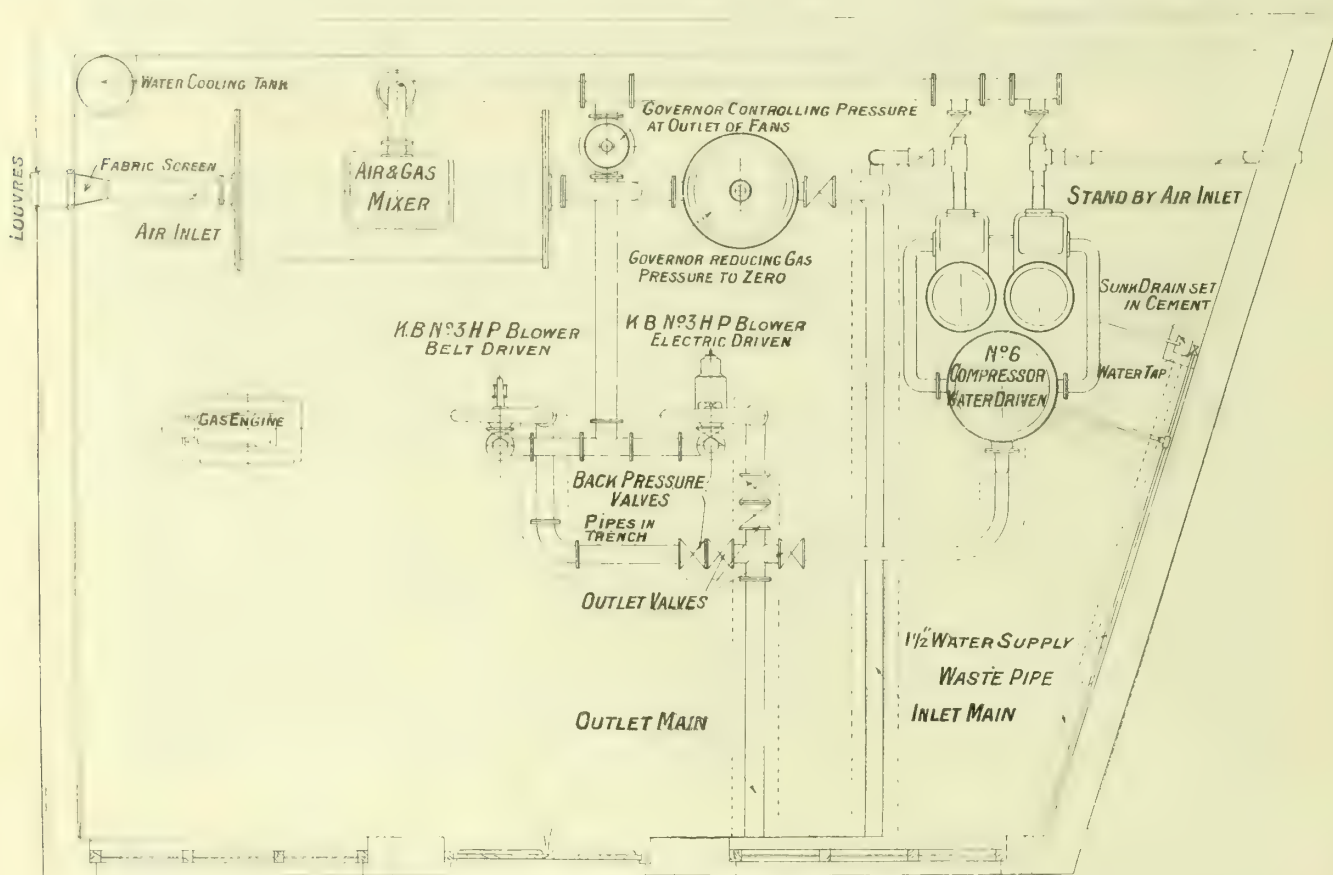
Novel ideas have been introduced into the mixing and compressing plant used in this installation to meet special requirements. In the first place, the lamps have been modified to work with a mixture of gas and air at 10 inches pressure, instead of the usual 54 inches pressure; the chief object of the modification being to enable the pressure to be kept on night and day automatically, by means of the Keith automatic water-driven compressor. While the capacity of this is quite sufficient for all likely requirements after midnight and during the day, the main compressing is performed by means of two high-pressure fans of the Keith-Blackman narrow pattern—one driven by a gas-engine (used normally), and one by an electric motor, which is used as a stand-by, and is also arranged to come in automatically in case of the failure of either the water supply for driving the automatic compressor, or collapse of the gas-engine.

In this installation, the mixture used is composed of equal parts of gas and air; and the apparatus for producing it consists of a large double wet meter, having two drums keyed to one spindle—one drum being connected to the gas supply, and the other drum being connected to an air-inlet pipe. The drums both discharge into a common chamber; the outlet from which is

coupled up to the three compressors. The air (drawn from the outside of the compressor house) is filtered before passing into the mixer by flowing through a fabric screen. The gas pressure is reduced to zero by a Keith governor. This arrangement allows an absolutely invariable proportion of gas to air, irrespective of the rate of consumption. The pressure given by the automatic water-driven compressor is regulated by the weight of the compressor holder, in the standard method, which is doubtless familiar to most readers.

The pressure given by the fans is arranged to be slightly higher than that thrown by the water-driven compressor; so that, when either of them comes into action, the holder of the water-driven compressor is raised, and this machine is put out of action. The pressure produced by the fans is regulated automatically by a governor fixed on the common inlet to the fans. This governor consists of a holder bell arranged to float at the required pressure, which bell is connected by means of a chain to a throttle valve, operated by a quadrant. When the governor holder rises, the throttle valve is arranged to close; and, by doing so, it at once reduces the pressure on the inlets of the fans. This, of course, has a corresponding effect in reducing the outlet pressure. If the pressure tends to fall, the opposite result takes place. The controlling pressure is brought to the governor holder by a 1-inch pipe connected with the delivery-pipe from the fans.

The automatic device for throwing in the electrically driven fan in case of emergency, is extremely simple. It will be readily



Arrangement of Compressing Plant for the Keith Light Installation at the Brighton Railway Station.

understood that, in the event of the water-pressure failing, or the gas-engine driven fan failing to keep up the pressure, the regulating holder of the water-driven compressor would begin to fall. When this passes a pre-determined point, a small switch is thrown in. This switch controls an automatic electric starting switch, which gradually turns on the current to the electrically driven fan. The same action will take place should the water-driven compressor be overtaxed at any time, by sudden demand, before there is time to start up the gas-engine driven fan.

The capacity of the water-driven compressor is approximately 6000 cubic feet per hour; and that of each of the fans is 25,000 cubic feet per hour. The present demand upon the plant being about 12,000 cubic feet, the fans would be able to comfortably deal with twice this volume of mixture; so that there is a large margin of safety, and for future possible extensions. It will be understood, of course, that the power taken by this type of fan is somewhat proportional to the output; about 1 1/2-horse power being required to deal with the maximum demand. The small power taken by this class of apparatus was a further inducement to employ the mixture method in such a large plant; for had the same quantity of gas been required to be compressed to 54 inches by positive rotary blowers, at least twice the power would have been necessary.

ELECTRICALLY IGNITING AND EXTINGUISHING THE LAMPS.

There is one other feature of particular technical interest, and that is the method of lighting and extinguishing the lamps readily

and with the certainty of electricity, and with the added certainty that when once lighted they will remain so. This is carried out by a new system of control and ignition introduced by the James Keith and Blackman Company, and specially adapted for use with high-pressure gas lighting. There have been in the past, many attempts made, with more or less success, to control and ignite gas-lamps by electric means; but none of the systems could be satisfactorily applied for use with high-pressure gas. Two reasons accounted for this. There was the difficulty in operating a valve, which would be tight at high pressure; and the further difficulty of the igniter being apt to be destroyed by the great heat, when placed close enough to the burner to effectually ignite it. Both of these difficulties have been successfully overcome in this new system.

The valve consists of a drop valve with the pressure on the top, so that the pressure tends to keep the valve closed. Attached to the stem of the valve is an iron rod, which forms the core of an electro-magnet, and works in the gas-way. A short distance above the top of the rod is fixed a permanent magnet. The valve operates in this way: When the current is passed through the coil in a direction which magnetizes the core, so that the adjacent ends of the permanent magnet and electro-magnet are of opposite polarity, the combined effect of the two magnets is sufficient to lift the core and the valve up to the permanent magnet. When the operating current is stopped, the core is held up by the permanent magnet. In order to close the valve, the direction of the current through the coil is reversed; so that the adjacent ends

of the electro-magnet core and the permanent magnet become of the same polarity, and thus repel each other, and allow the valve to drop on to its seat. A simple mechanical arrangement is provided for opening and shutting this valve independently of the electric action, should it be required.

The arrangement for lighting the lamp is also on novel lines. A small chamber is attached to the heater in the lamp; and this chamber is adapted to be supplied with a very small portion of the mixture which is passing to the burner nozzle, when the lamp is turned on. Into one end of this chamber is fixed the igniter, which consists of a platinum filament mounted in a porcelain plug, one terminal of which is connected to the coil, and the other to the gas-pipe; the filament forming part of the electric circuit in which the coil is fixed. On the current being allowed to flow through the coil and filament, the valve is opened, and a portion of the explosive mixture in the heater of the burner finds its way into the small chamber, which, coming in contact with the filament, causes a small explosion, the resultant flame from which is blown out through an opening in the chamber, and is directed towards the lower portion of the mantle. This flame ignites the mixture, which is at the same time passing into the mantle. It will be seen that this method gives a certain ignition without requiring to bring the filament close to the mantle.

Each burner is controlled by its own switch, which is fitted with a white and black button. On pushing the white button, the lamp is turned on and the lamp lit; and on pushing the black button, the lamp is extinguished. At a height commanding the whole station, a switch-board is fixed; and from there the whole of the lighting can be viewed and controlled.

The current for operating the lamps is supplied by sets of accumulators situated in various centres about the installation. Each set of accumulators is in duplicate, and is charged from the electric power main used for operating the machinery in various parts of the works. The arrangement ensures that there is always one set of batteries completely charged in case of failure of the other set.

Incidentally it was heard from Mr. Collinson that, in the installation of this system of ignition and extinction, no less than 60 miles of wire were used; and, speaking of miles, reminds us that a distinct system of Mannesmann steel mains (with services) have been laid—comprising in all about 2½ miles—in connection with this installation. These were specially laid by the Gas Company, under the superintendence of Mr. Cooke. Owing to ashes forming such a large part of the subsoil, it was considered necessary to protect the steel tubes by laying them in troughs and covered with pitch.

THE INSPECTION.

Before starting on the inspection on Thursday evening, the little company dined together; and there was a limited amount of informal speech-making afterwards. Mr. Joseph Cash performed the part of host on behalf of his Company. In a few remarks, he touched upon the object of the visit, and spoke of his gratification at the successful issue of this large installation of high-pressure lighting. It must indeed be gratifying to him, seeing the vast amount of responsibility that attaches to its successful running. But the confidence of the technical chiefs of the Gas Company, of the Railway Company, and of the contractors was complete before the work was entered upon; and the confidence of the tripartite interests has been confirmed to the full. Mr. Cash acknowledged his indebtedness to the contractors, to the engineering staff of the Railway Company, and to his own staff, in bringing the work to a happy issue. Then there was a speech from Mr. Collinson, in the course of which he intimated that this is one of the largest contracts for private high-pressure lighting there has been in his experience. To the contractors, it had been a pleasure to see the scheme through; and the conditions under which they have had to work were made most pleasant by the assistance rendered by both the Railway and the Gas Companies' staff. With an expression of the view that high-pressure lighting is going to have a big effect on the future of the gas industry, he spoke of what had been done by its aid to secure London lighting contracts. The sustained efficiency of the lamps as demonstrated at Aldwych was also mentioned. As he pointed out, too, the Gaslight and Coke Company would not go to the capital expenditure that they are incurring, nor would the Brighton Railway Company have gone to the expense that they have done, had they not been abundantly satisfied that what the contractors for the Keith system claim is demonstrably true. "The light is second to none," he said, "in penetrating power, in brilliance, in its softness upon the eye, and in cheapness." That is an all-round good character. Then he proceeded to describe (in language as devoid of technicalities as possible) the ingenious system his firm have devised for the electric ignition and extinction of the high-pressure lamps, as practised in this installation, and as already described.

After hearing more about the lights, we went to see the actual thing. Starting at the lower railway goods yard, quite luxuriant lighting was found; the men carrying on their work under artificial light that was almost as good for their purpose as daylight. This is where the 1000-candle power lights are fixed; and as the visitors, mostly strangers, wandered along—all pronounced in their encomiums as to the lighting—there was no falling over lines, points, or shunting rods or levers, and no robbing the truck-wheels of their lubrication. The pitfalls were many; but thanks to the adequate lighting, we all proceeded safely and

without damage with the inspection. There are all-told something like sixty 1000-candle power lamps in the goods yard and along the sidings towards Preston Park; and each one is under separate control by means of push buttons within reach of the hand on the columns. Mr. Morgan, the Railway Company's Chief Engineer, mentioned that the difference between the lighting when electric lamps were used and now was something remarkable; and whereas formerly the men were constantly complaining of the poor lighting, now they work under comfortable conditions in this respect. It is indeed a triumph of lighting under difficult conditions.

Some little distance from all this activity is the power house. To this we were taken, and there is in it a feast for the mechanical engineer who can admire both ingenuity and good work and give due credit for it. The plant has been described; and Mr. Collinson demonstrated how there is an automatic "ringing of the changes" on it in the event of emergency, or when greater power is required, and generally for protection. We fail to see how any accident could possibly occur that would interrupt the supply of high-pressure gas. The actions and devices that produce this automatic control and assurance are all very simple, but efficient and positive.

Back again to the sidings, and then some of the workshops were visited; the aggregate area of these shops being, as previously stated, about 60 acres. We went into the wheel-shop, and saw the big wheels of locomotives stacked up in long rows as though they were matters of small moment. They partly constitute the affairs of everyday life here. This huge shop, we were informed, is lighted for 1d. an hour by fourteen lamps of 150-candle power and three of 360-candle power. Then the visitors were taken to see the bench lighting in one of the shops, where men were on vice work. This was the one-lamp-per-man lighting; each light being of 60 candle power, and consuming 1½ cubic feet of gas an hour. There are about eighty hours' lighting per man to be obtained by these means for 2½d. The men testified to the great improvement of the illumination; and one thing they specially like about it is the steadiness of the light. In the frame-fitting shop, the place was lighted almost as brightly as one would expect to find it in the daytime. Here one could see to work at any machine; and it was extraordinary how clearly could be seen the delicate markings on the work in progress. Passing through to the boiler-shop, several mammoth boiler shells upon which work is proceeding were examined. All the machinery here is driven by electric motors, as well as the powerful traversers which run lengthwise and transversely of the house. If the lighting has gone over to gas, the Corporation of Brighton cannot complain of a customer who takes—what shall we say?—one-tenth of the total output of their electricity generating-station for power purposes. There are 45 lamps in this shop—mostly 500-candle power, with two of 2000-candle power; and the cost of lighting the place is only 9d. an hour. Some of the lights are fixed rather high, on account of the traversers. If it were not for these, they could with advantage have been dropped 10 feet. Apart from the lighting, the visit to these shops was an intellectual treat, although only some of them were inspected.

Time, however, was passing; and there could only be a hurried inspection of the station before visitors from London had to leave. Then were gained the impressions to which expression is given in the opening paragraph of this article. In few words again, the lighting is rational and magnificent; and everything is under perfect control.

The plant has now been running some few months; and the Railway Company have expressed their approval in about the most practical manner possible, by placing with the contractors an order for two additional plants; one being for their new works at Lancing, with compressing plant practically of the same capacity as that at Brighton. Once, again, we take the opportunity of heartily congratulating all concerned in this notable piece of high-pressure incandescent gas lighting. What has been done here in producing economy and efficiency, and excellent working conditions, can be done equally well elsewhere.

We have received from Mr. George Helps, of Nuneaton, a copy of the first number of a new fortnightly publication entitled "Gas." It consists of eight quarto pages; and its contents will be devoted mainly to the subjects of "Light," "Distribution," and "Maintenance," which words form a kind of sub-title. The object of the publication, as set forth in the "Editorial" Notes, is "to deal particularly with all matters that concern the requirements of the consumer of gas for public as well as private lighting;" and the endeavour of its conductors will, it is stated, be "to promote the welfare of the consumer jointly with that of the supplier of gas."

The Board of Agriculture and Fisheries have published a memoir of the Geological Survey on the "Water Supply of Oxfordshire," and a copy has been sent to us. It is the ninth of a county series dealing with the water supply derived from underground sources. The introduction contains particulars of the geological formations of the county, with special reference to the water-bearing strata. Accounts are given of wells, borings, and springs, with supplies therefrom, and analyses. The memoir is accompanied by a rainfall map of the county, with explanatory report and statistics; and a bibliography of published works relating to the water supply of the county is included.

ANOTHER HIGH-POWER INVERTED LAMP.

Milne's (1910) "Viaduct" Lamp.

CHEAPNESS, strength, accessibility of parts, and efficiency are the four characteristics that are looked for nowadays in high-power lamps for low-pressure service; for, as a rule, such lamps are fixed in positions that especially demand from them the four qualities named. Due recognition of the essentials to a successful lamp has been made by Messrs. James Milne and Son, Limited, in the new type, for outdoor and indoor purposes, that they have introduced under the title of Milne's, 1910, "Viaduct" lamp. The question of cheapness can be passed by, with the intimation that, we are convinced, every customer will be satisfied on that score. As to strength, we have heard complaints from several users as to certain types of high-power lamps having a comparatively short life. In this lamp, Messrs. Milne have adopted a stronger case than they have done before, so as to make the exterior less susceptible to the ravages of the extreme climatic conditions to which, at any rate, the exterior forms of lamps are exposed in this country. The casings are made with welded joints, and of double-enamelled steel—the outdoor patterns, by the way, being finished in green and gold, and the indoor ones in white and gold.

But a most important feature of the lamp is the accessibility of all the parts vital to the maintenance of efficiency. This is accomplished by making the lower part of the cylindrical body

just like a shutter, which simply slides up into the head of the lamp, and is self-supporting. In the outdoor form of lamp, the means for gas and air regulation are immediately at hand, and when the shutter is closed they are completely protected. As to the lower part of the lamp, the glass bowl is supported by the hinged shade, which, when closed, is held rigidly in position by a weighted catch.

The interior construction of the lamp makes it self-intensifying. The lamps are constructed with two, three, or four burners; and each burner has on opposite sides two flues, which conduct the products of combustion away to the head of the lamp for dispersion, thus keeping pure the air supply which finds entrance into the cylindrical body. At the same time, the double flues to each burner represent a large heating surface, which keeps the chamber formed by the cylindrical body well

heated. Consequently, no cold air is supplied for admixture with the gas or for supporting combustion. The central gas-supply tube also passes through this heated chamber; so that gas, as well as air, becomes heated before reaching the point at which they intermingle. The gas supply is regulated by a screw, with lock-nut, at the top of the burner, and the air supply by a sliding collar—the air-holes themselves being covered by gauze to keep out any extraneous matter. The simplicity of the burner is an advantage in its maintenance. By the removal of the gas-regulating screw, a rod or small brush can be passed right up through the bunsen tube, and out at the top of the burner. The nozzles are made so as to take mantles of universal size; and the fittings for the inside glass chimneys and the globes are such that ordinary stock patterns can be used. This is an advantage, as lamps requiring special mantles and glassware do not tend to economy in maintenance.

The efficiency of each burner is placed at about 120 candles with a consumption of 4 cubic feet of gas. Among miscellaneous points, it may be of interest to mention that the overall length of the two-light lamp is 25 inches, of the three-light one 28 inches, and of the four-light one 33 inches. Each burner is fitted with a flashing-jet supplied from a common bye-pass tube. The lamps are ordinarily made with a lever-cock and chains; but any other form of tap can be supplied. Already, several gas authorities have taken up the lamp; and many others will no doubt do so when they have had an opportunity of testing it, or making inspection of it at one of the Company's show-rooms.

MODERN PYROMETERS.

WE have received from Mr. Robert S. Whipple, of the Cambridge Scientific Instrument Company, Limited, a copy of a paper on recent advances in pyrometry, which he read a short time ago before the Birmingham Metallurgical Society. It constitutes a useful summary of work lately done in this direction; and a few particulars of the ground covered by it may be given.

The author refers first to the gas thermometer which is the final reference in all thermometry. The temperature measurements with gas thermometers have now been extended to 1550° C. (2822° Fahr.) and 1600° C. (2912° Fahr.) by Day and Holborn respectively, by the use of, in the one case, a platinum rhodium bulb surrounded by nitrogen at the same pressure as that inside the bulb, and, in the other case, of a bulb of pure iridium. The probable error in measurements between 300° and 1150° C. (572° and 2102° Fahr.) is believed by Day to be not greater than 0.5° and by Holborn between 2° and 3°. The next section of the author's paper is on resistance thermometry, in which he does not find any striking advance to report. For temperatures up to about 1000° C. (1832° Fahr.) a useful improvement has been introduced in constructing a thermometer in quartz. The resistance wire is wound on a rod of quartz, and protected by a very thin tube of quartz fused over it, by which arrangement the wire is protected from the injurious effects of gases and mechanical strain. The third section of the paper refers to thermo-electric pyrometry. For standard thermo-couples, platinum and certain platinum alloys have been produced in a purer and more homogeneous state than hitherto, so that it is now possible to obtain a second thermo-couple similar to one previously obtained, which may be used without introducing any serious error on the same galvanometer or recorder. Owing to the rapid destruction of platinum and platinum alloy thermo-couples in certain not well-defined conditions, many attempts have been made to produce cheaper thermo-elements, of which the most satisfactory for temperatures not exceeding 700° C. (1292° Fahr.) is copper-constantan. Constantan consists of 60 per cent. of copper and 40 per cent. of nickel. According to Pécheux, a copper-nickel couple may be employed satisfactorily for temperatures up to 900° C. (1652° Fahr.). The author's experience is that, for accurate results, it is necessary to calibrate every individual couple, and that if the couple is overheated or perhaps over-annealed the calibration may become seriously altered. Various potentiometers have been designed in recent years specially for accurate work with thermo-electric couples; and recorders of various types have also been introduced.

The next section of the paper refers to radiation pyrometry, in which great progress has taken place in recent years. Depending on the fact that as the temperature of a hot body is changed the wave length of the radiation having the maximum energy will be changed so that the product of the wave length and the corresponding absolute temperature is a constant, a great many instruments have been designed for measuring radiation. The first satisfactory radiation pyrometers were photometric. The monochromatic light is matched against that obtained from a lamp, which in the Féry photometric pyrometer is the Hefner amyl-acetate lamp, and in the case of the Wanner pyrometer is an electric incandescent lamp. The author states that the Wanner pyrometer is not applicable to temperature measurements below 900° C. (1652° Fahr.) owing to a considerable amount of light being lost in its optical system. The range of the Féry pyrometer has recently been largely extended by the addition of extra neutral tinted glasses. The Féry and Thwing pyrometers use the total radiation from a hot body. The first forms of these pyrometers required the use of a galvanometer; and for works where it is desirable to dispense with the latter, Féry has introduced another form, in which the radiation is concentrated on a small bi-metallic spiral carrying an aluminium pointer. As the temperature of the spiral increases, it unwraps, and so moves the pointer over the scale. Optical pyrometers are calibrated in terms of the radiation emitted by a black body; and the temperature measured by them will depend on the nature of the black body under observation. The difference between the black body temperature and the real temperature has only been determined for platinum and a few other bodies; and the author points out that it is much to be regretted that no authoritative work has yet been carried out on the black body temperatures of molten iron and steel, since these values would be extremely useful industrially.

The last section of the paper refers to the standardization of pyrometers. The tendency of recent workers has been to adopt the melting-points of pure metals as standards of reference, as several of these melting-points are known to a high degree of accuracy. There is, however, difficulty in obtaining the metals sufficiently pure to ensure an accuracy of 1° C. at the higher temperatures. But the "commercially pure" metals will afford an accuracy of 1° to 3° C., which is amply adequate for most technical purposes. A table of the solidifying points of a number of metals from recent determinations concludes the author's paper, which will be found very useful to those who have occasion to make accurate pyrometrical measurements.

We learn that the Jurors at the Brussels Exhibition have decided to award a Grand Prize for the Humphrey pump in two classes—as a gas-engine and as a pump. It was described and illustrated in the "JOURNAL" for the 26th of October last, and it is on view in the Machinery Section of the Exhibition, which, fortunately, was not damaged by the recent disastrous fire.

The vacancy in the secretaryship of the Northampton Gas Company caused by the death of Dr. Faulkner, has been filled by the appointment of Mr. C. H. Batten.

THE STORAGE OF GAS AND THE HAMBURG GASHOLDER CATASTROPHE.

THE disaster at the Grasbrook Gas-Works of the Hamburg Corporation on the 7th of December last—by which twenty lives were lost and about seventy workmen and others were injured, is recalled by papers which have been read before meetings of the Aix-la-Chapelle district branch of the German Association of Engineers.

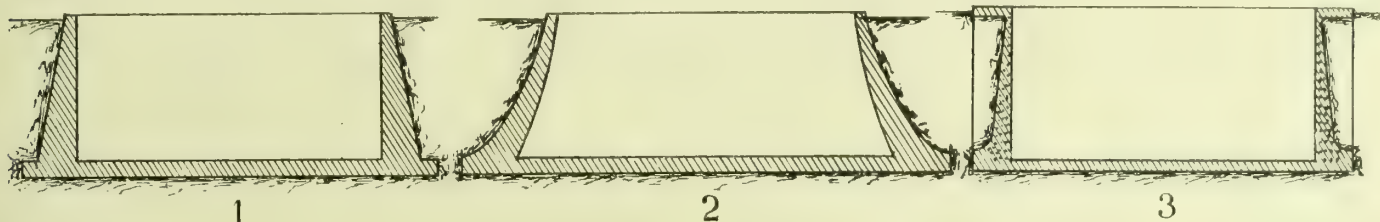
One read at the meeting of the branch on Feb. 2 last, by Herr Scholz, the Manager of the Hamburg Fire Brigade, added little to the information which had already been published in the "JOURNAL." The author refused to express an opinion as to the cause of the catastrophe, since a committee of experts had been entrusted with the investigation of the roof-construction, and had not so far issued their report. This Committee consisted of Herr Müller, of Breslau, Herr Boost, of Berlin, and Mr. E. Körting, the Manager of the Berlin Works of the Imperial Continental Gas Association. In regard to the prevention of similar accidents, the author, however, stated that the peculiar conditions of the Hamburg site must be taken into consideration; and that such a catastrophe need not be feared with gasholders in general. The Hamburg authorities, indeed, contemplated re-constructing the two gasholders on the same lines; but it had not been made known to what extent the details would be modified. Special precautions, however, were desirable, in view of the peculiar constructional conditions; and he suggested that there should be provided automatic indicators of accumulations of gas in the chamber of the tank, and that no gas services at all should be allowed in the substructure.

The second paper, which was read on the 9th ult., was by Herr Scheuss, the Engineer of the firm of F. A. Neuman, of Eschweiler. This firm was, jointly with the Berlin-Anhalt Engineering Company ("Bamag"), responsible for the structural work of the gasholder of 200,000 cubic metres (about 7,060,000 cubic feet) capacity at Hamburg. It was in this holder that the disaster on Dec. 7 last originated, though a second smaller gasholder—of older and different construction standing alongside it—became involved and was burnt out. Herr Scheuss' paper, which has been printed in the August part of the "Mitteilungen des Aachener Bezirksvereins Deutscher Ingenieure," is entitled "Gas Storage," and deals first with gasholder construction in general, and lastly with the large Hamburg holder. The following is an epitome of its contents.

The increased application of gas necessitates more storage capacity on gas-works. Gas from recovery coke-ovens is about

to be used for the public supply of the towns of Barmen, Mülheim, and Bochum. The gas evolved from coke-ovens from the second to the tenth hours of carbonization is of uniform calorific power; and if it were collected from all the coke-ovens in the Rhenish-Westphalian district and half of the total were employed on the works, there would be a surplus of 180 million cubic feet of gas available per diem for the supply of towns. This surplus would in three months amount to the present supply of gas for a whole year to all the towns in the Rhine district. Storage accommodation for coke-oven gas would be required to an increasing extent, and perhaps also for blast-furnace gas. Attempts have been made from the earliest days of gas supply to dispense with the liquid seal in gasholders; and there has lately been a revival in the evolution of schemes for the construction of tankless gasholders. Most of these have involved the employment of some elastic medium. The author, however, in the year 1907 elaborated a method of storing gas under pressure in a closed vessel. The sphere was the form which was most economical of material for the storage vessel; and for the storage at a maximum pressure of two atmospheres of $3\frac{1}{2}$ million cubic feet of available gas, the author computes that there would be a saving in weight of steel, as compared with an ordinary gasholder of that capacity, of 400 tons—value (say) £6000. There would be a further saving of about £2000 in respect of foundations, tank, painting, &c. Against this, however, must be set the cost of compressing plant for $3\frac{1}{2}$ million cubic feet of gas to two atmospheres in 24 hours, which he gives at £1250, and the working charges of the plant, which he estimates at £1500 a year. From the figures, he concludes that such a spherical holder worked in this manner would not be economical in comparison with the ordinary type of gasholder.

Passing on to the latter, the author remarks that the bell itself has been altered since the early days of gasholder construction only in the directions of increase in size and of division into a number of lifts. The guiding of the bell by rollers has undergone no change in recent years. Generally speaking, small holders are guided simply by radial rollers; larger holders of from 700,000 cubic feet capacity upwards, by tangential rollers; and holders of $1\frac{1}{2}$ million cubic feet and upwards, by a combination of tangential and radial rollers. Spiral and rope-guided holders have not been introduced in Germany. The guide-framing must correspond with the system of rollers adopted on the bell, and must be sufficiently stiff to withstand deflection and to prevent deformation of the cups and curbs of the bell. After referring to two German patents relating to guide-framing, the author says that

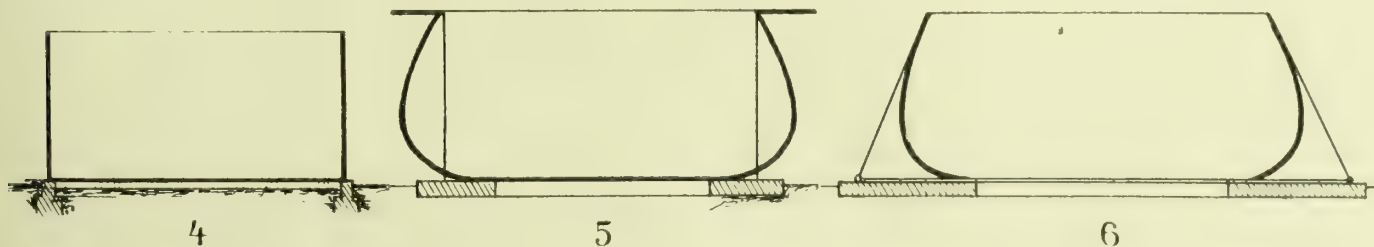


the chief differences between gasholders are found in the method of constructing the tanks.

Masonry or concrete without iron is, he says, generally not suitable for the outer wall of a tank, and will only be chosen when the wall can be supported by loads which will take up the whole or part of the water pressure. This occurs when the tank is sunk below ground (fig. 1), and the support is rendered more effective if the tank wall is sloped inwards (fig. 2). The tensional strains in the wall may, however, be reduced by putting heavy vertical loads upon it, and so providing moments or forces which counteract the water pressure. This result is attained by gasholder houses, where the heavy load due to the building and the load of

the water unite, in the portion of the wall lying between any two adjacent vertical sections, to give a resultant of the forces which falls in the inner third of the wall. Reinforced concrete is a material for constructing the wall which is capable of taking up all tensional strains. Ordinarily, however, when it is used, either the iron is not fully utilized or the concrete is overstrained. In the first case, the construction is comparatively costly; in the second case, the structure may warp or fail owing to the inserted iron becoming imperilled through cracks developing in the overstrained concrete. The type of tank shown in fig. 3 is analogous to a type of steel tank described later.

The simplest type of iron tank is the basin shown in fig. 4, which



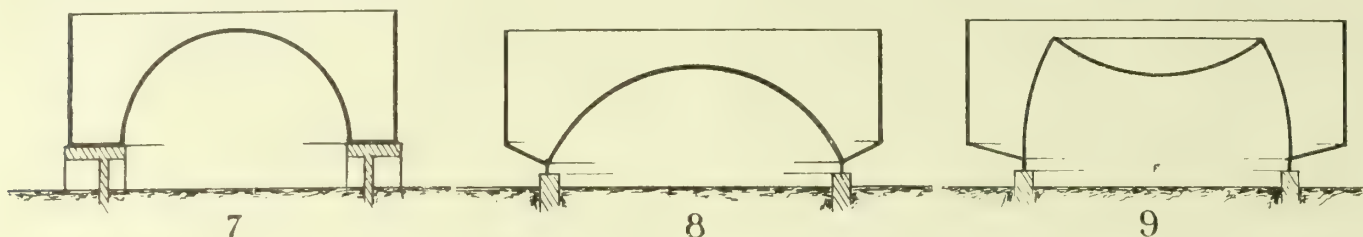
rests everywhere on a level base, and has a cylindrical iron shell. The thickness of the shell or sides is most usually determined in Germany according to the standard formula adopted by the Association of Gas and Water Engineers and the gasholder makers, which formula does not allow for the sides being fixed to the base. Owing to the connection with the base, however, there occur in the lower portions of the sides deflections in the generating lines. Assuming that the sides are set perpendicular to the base, Professor Müller, of Breslau, has calculated the bending strain on the lower rim of the sides. If the effective cross section of the bottom sheets is maintained by the use of two angle rings at their junc-

tion with the base, the thickness given by the standard formula is sufficient; but if there is only an inside angle-ring, the bottom sheets must be 1.275 times as thick as the standard formula requires. With large tanks, however, practically impossible thicknesses are thus indicated; and so, while retaining the flat base, a new form has been worked out, which makes the generating lines of the tank walls agree as closely as possible with the sustaining lines determined from the water pressures (fig. 5). The radius of curvature of the generating lines is several times less than the radius of curvature of the ring; so that the ring strains of the wall come into account only slightly, if at all. The forces running

downwards in the direction of the generating lines of the wall are taken up directly by the base, while the upward forces are taken up by the upper rim. A patent for this construction claims a tank of which the wall is hung between rings—the upper edge being supported by vertical pillars. The vertical components of the forces directed upwards are, therefore, taken up by pillars which are in the water and inaccessible; while the horizontal components are taken up by the ring at the top edge.

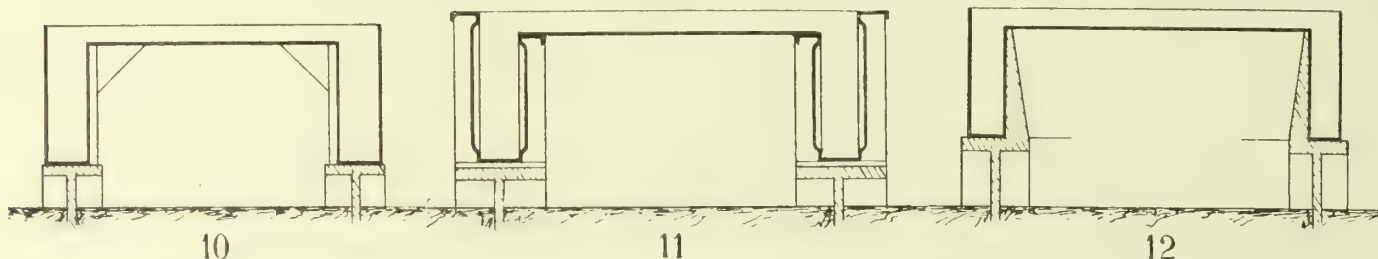
In order to make the base, which for practical reasons is

sufficiently strong and is adapted for taking up the horizontal pressure of the water, serve more than hitherto for the transmission of the forces, a tank, for which a patent has been applied, has been devised by the author, having walls curved in vertical section, and with their upper edge shored-up by tangential props, of which the feet are tied to the base of the tank (fig. 6). This construction transmits the whole horizontal water pressure to the base, and so equalizes it. The props are accessible and on the outside of the tank; and the costly ring is done away with.



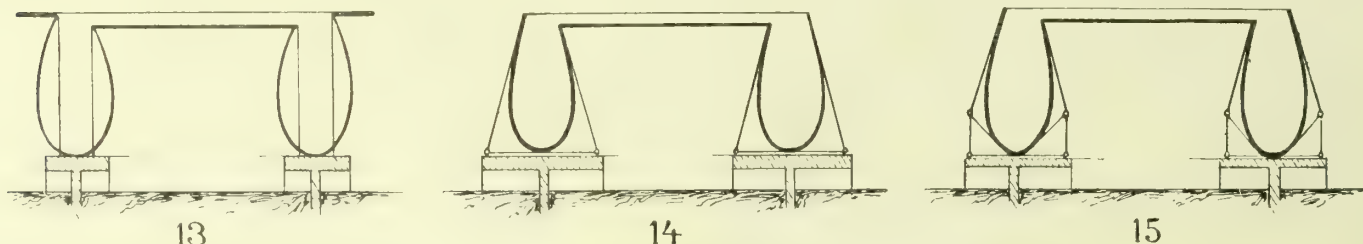
The Intze tanks as well as non-projecting tanks with spherical bottoms (figs. 7, 8, and 9), are only suitable, the author says, for small and moderate-sized holders, as they become too costly for

large ones. Regard must be paid, however, to the possibility of rupture of the surfaces under compression; and a considerable margin should be allowed in respect of the permissible strain on



them. The theoretical shape must be secured as far as possible by butt-jointing the plates. The lap-plates extending on both sides constitute strong trussing ribs for the surfaces under compression. In regard to annular tanks (figs. 10, 11, and 12), the curved

sides adopted for solid tanks may also be applied for both the inner and the outer walls of the ring. They may be either placed between rings and with vertical props, or without the upper rings and with struts tangentially to the upper rim (figs. 13 and 14).



The pressure in the ring of the inner wall is small relatively to the tension in the direction of the generating line of the wall; so that there is no risk of rupture. The middle of the base is absent; and consequently it is not possible to equalize directly in the base the horizontal pressure of water on the walls. But as the horizontal pressures on the two walls act in opposite directions, the small inner pressures are partially neutralized in the annular base in fig. 13, and entirely nullified there in the author's construction—figs. 14 and 15. The sum of all the horizontal forces remaining in the annular base and directed outwards is thus, at the most, equal to the sum of the horizontal water pressures bearing on the two cross sections of the tank, since these two cross sections represent the difference between the vertical projections of the two sides.

The Hamburg Catastrophe.

The author concludes by giving some details of the holder at the Grasbrook works at Hamburg in which the catastrophe on the 7th of December last originated. The local conditions, he says, necessitated the adoption of an annular tank with an accessible interior chamber. The tank might have been wholly of iron as an alternative to the plan adopted of supporting the inner wall of the tank with a concrete ring. Two types of construction for all-iron tanks were available. The first of these would have a cylindrical outer wall, and an inner wall built up of vertical columns, with arched plates stretched between them; the outer and inner walls being united by a horizontal annular bottom. By various devices, the load of the roof is utilized to balance the load on the vertical columns. This type is analogous to the system of construction followed in the Amsterdam gas-holder. [See "JOURNAL," Vol. LXXVIII., p. 706.] The second type of construction would adopt the curved sides already referred to. As an alternative to an all-iron tank is the system of stiffening the cylindrical iron inner wall by a ring under compression in concrete or similar material.

The Hamburg authorities decided to adopt the last-named system, of which there were already a number of successful examples. The foundations were executed by the firm of Wayss and Freytag, of Hamburg, and the holder (as already stated) by Herr F. A. Neuman, in conjunction with the "Bamag" firm. The total contract price was about £75,000. It was decided not to use

wooden piles for the foundations in view of the level of the underground water, the height at which the tank had to be built in order to allow of trains passing under it, and the risk to an adjoining holder tank of pile-driving to a great depth. After trials, it was settled that reinforced concrete piles, about 50 feet long, should be used. These were driven with a monkey, 5 tons in weight, till they settled only about $\frac{1}{10}$ inch at a blow. The contract for the foundations was placed on Feb. 8, 1908, and they were ready for the erection of the iron structure to be started at the beginning of December, 1908. The chief dimensions of the holder were as follows:—

Outer wall of tank—diameter 243 feet, height 42 ft. 4 in.
Inner " " " " " 227 " " 40 ft. 8 in.

The four lifts of the bell were 232 feet, 235 feet, 237 ft. 10 in., and 240 ft. 10 in. diameter, and each 41 ft. 7 in. high. The cups were 20 inches deep. The radius of the crown was 385½ feet. There were 32 guide columns, and four rows of horizontal ties in the framing.

The tank was of the annular type, with a flat roof covered by a little water. The outer wall consisted of steel plates 0·4 to 1·18 inch thick; the bottom of the ring, of wrought-iron plates 0·51 inch thick; the inner wall of wrought-iron sheets 0·20 to 0·28 inch thick; and the level roof of the interior, of 0·20 inch wrought-iron sheets. The vertical seams in the sides were butted with double plates; while the horizontal seams were lapped. The largest rivets used were 1·3 inches in diameter. The inner wall of the tank was stiffened by an annular wall of concrete (mixture 1 to 6), which was 6·56 feet thick at the bottom and narrowed to 1·64 feet thick at the top. The flat roof sheets rested on a course of girders, which were supported by polygonal rings resting on 32 trusses, which were carried on the outside by the annular wall, and in the middle by an iron column. Above the sheet-roof of the tank there was a light iron framing to support the crown of the bell when the latter was grounded. The horizontal pressure of the water was taken up by tension of the outer wall of the tank and by compression of the inner concrete ring. The latter and the horizontal annular base were coated with iron in order to ensure soundness of the tank. The central support of the roof sheets consisted of 16 columns braced together by joists.

The author next describes the principal features of the guide

framing and bell. The latter was in four lifts, each of which was guided at 32 points at top and 64 points at bottom. Each guide carriage had two tangential rollers and one radial. The side sheets of the bell were 4.9 lbs. to the square foot; the crown sheets, 5.7 lbs. The side sheets were lap-jointed, with one row of 0.3 inch (cold) rivets; the crown and cup sheets were lap-jointed with two rows of 0.39 inch (hot) rivets. The pressures thrown by the bell as each lift came into action were: 4.27, 6.9, 8.9, and 10.6 inches. The tank and cups could be heated by steam, for providing which a boiler with 1290 square feet of heating surface was required. Compressed air was used wherever possible in the constructional work. The ironwork was started on Dec. 5, 1908, and by April 1, 1909, the riveting of the two sides of the tank was finished, and the supporting framing of the flat roof and the bottom section of the guide-framing were erected. By May 15 the guide-framing was set up and riveted, and the concrete inner wall of the tank was raised to its full height. The tank and guide-framing were finished by June 21. The construction of the bell was started on June 1, and the whole erection was completed by Sept. 17 last. There was no serious accident throughout the work of construction of the holder.

In regard to the responsibility for the disaster which had overtaken the holder, the author says that as yet blame has not been allocated to anyone. The fire insurance on the two gasholders destroyed by fire has been paid. The Hamburg authorities have deputed the reconstruction of the 7 million cubic feet holder to the two firms which erected it before, and that of the 1½ million holder to the firm of F. A. Neuman, of Eschweiler. The work of erection of the latter was started on the 15th of July last; but preliminary preparations will still occupy some time with the large holder. Having regard to the catastrophe which occurred last year, the author says that naturally in its reconstruction very great attention will be given to the arrangements, and a specially high factor of safety will be adopted in the structure. On the measures to be taken with this object in view, he cannot speak until later.

PAPERS AND THEIR PREPARATION.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

THE expression "paper" is as ambiguous and wanting in point as "article;" and one can imagine a foreigner, in the process of learning the English language, getting very much mixed up over the various colloquial senses in which these words are used. The connection between the "Daily Mail" and a communication submitted to a technical society is not very intimate; but either may be spoken of as a "paper." And the connection between one of the parts of speech and the present deliverance is far from obvious; but either may be called an "article." There is room in our language for additional words that will adequately and distinctively express the nature of a communication to a technical society or to the editor of a magazine. But this is by the way. The purpose now in view is to offer a few remarks on "papers" as submitted to Associations of Gas Managers.

One of the objects or advantages offered to members, either of the parent or any sectional Association, is the facilities afforded for the reading and discussion of papers. As expressed in the Memorandum of Association of the Institution of Gas Engineers, clause 3 sets forth the various objects for which the Institution is established, and among them we find (section d) "to invite from the members and others communications relating to gas engineering, manufacture, and administration, and to receive, hear, and discuss such communications at meetings of the Institution or elsewhere." On several occasions, the number of papers read and discussed has been referred to as affording some indication of the vitality and utility of the Institution. Up to comparatively recent times, the list of papers for the annual meeting of the national or parent Association always ran into two figures, and the District Associations would each raise six to twelve in the course of a year; and this when the membership roll had not attained half its present proportions. If the number of papers is to be taken as to any extent indicating the prosperity of the Association, the outlook, as judged by the experience of the last few years, is not satisfactory. The number of communications diminishes year by year; and the vanishing point is now well in sight.

Let us glance at the number of members of the Institution of Gas Engineers, and of the communications submitted by them, as shown in the following table, extending over the last five years; lectures, reports, and papers from "others" not being included:—

Year.	Members.	Papers.	Per Cent.
1906	812	6	0.7
1907	799	5	0.6
1908	804	4	0.5
1909	825	4	0.5
1910	809	3	0.4

The total number of members who appeared at the readers' desk during this period, out of an average of 810, was only 20. Evidently a very insignificant proportion—it is understood this applies to the numbers only—have ever addressed their fellows or contributed to the proceedings. Referring more particularly to the recent meeting, only two, and one of those the Honorary Secretary, submitted papers. But Mr. Bell contributed a valuable *addendum* to the report of the Carbonizing Committee that may be reckoned as a paper.

Mentioning Mr. Bell reminds one that many of the members are now industriously serving the Institution as members of various Departmental Committees, and that up to a very recent date the preparing of papers was the sole outlet for their activity. A worker on a Committee might reasonably claim exemption; but, as a matter of fact, the Committeemen are taking more than their share in regard to the contribution of papers. If the members to day have less leisure, they have more opportunity for collecting material. The writers of papers in the seventies or eighties had not the literature, the apparatus, or the educational facilities that are now available. One might reasonably imagine that, with the expansion and addition to details of the industry that are continually going on, the number of papers would tend to increase. At any rate, one does not care to suggest that none of the silent 806 members have been doing anything in the direction of technical research or advancement during the year ended the 30th of June last, or, at all events, anything that is worthy of being placed on record for the benefit of the profession.

When the District Associations were started, some suggested that they would be likely to injure the National Association, by intercepting papers that would otherwise have found their way to Victoria Street. I do not think that they can in any way be held responsible for the small proportions of the figures in the third column of the preceding table. It is scarcely necessary to make a detailed examination in their case, which is simply a repetition of the experiences of the Institution. The Southern District Association may be referred to as the one with which the writer is most intimately connected. During the life of the South-West Association, now merged in the Southern District, the two Associations occupied the ground at present covered by the one; and between them they were responsible for not less than a dozen papers a year. But now the Southern District Association only devote one meeting per annum to the hearing and discussion of papers; and if the Secretary can get three papers for the meeting, he thinks himself lucky. The difficulty of making up a programme is notorious. Anyone who has served on a Council or Committee knows that at times the President and Secretary are really embarrassed, and the executive are asked to apply their personal influence to the whipping-up of members, and, as a last resort, to stand in themselves, as they are fortunately well qualified to do. Failing assistance of this sort, the *agenda* paper would cut a sorry figure. I do not think any President or Secretary is bold enough to trust to luck—that is to say, to the voluntary assistance of the members—in regard to furnishing the *pabulum* for the next meeting. If it were possible to distinguish between spontaneous papers originated with the author, entirely apart from outside suggestion, and those that have been the outcome of a personal request or a suggestion from a fellow-member, the class first mentioned would be a very small proportion of the whole. No doubt the power to invite papers has not been allowed to lie dormant, or confined to "others," to the exclusion of members; and one would like to know something of the proportion between the number of such "invites" addressed to members and the number of affirmative responses thus secured. It is a question whether the strain upon the persuasive abilities of the executive is not approaching breaking-point, and if it is worth while to continue a state of affairs in which the stop-gap paper, prepared under the disadvantage of short notice, is the leading feature. This remark, of course, is offered in a general way, and is not a hit at any particular meeting or association.

Though the preparation and reading of papers is a matter with which a good 90 per cent. of the members are out of touch, there is no lack of appreciation or question as to the actual value of such communications to the profession at large. If the members will not write papers, they will attend to hear them read; and every Secretary knows that a good *agenda* paper is the same thing as a good attendance. On returning from a meeting, it is no uncommon thing to find a copy of current technical literature containing a full report of the proceedings already to hand. If not, it arrives in a day or two. Our friends of the Press may be credited with ability to gauge and to supply a general demand. There may be papers of a special character that do not attract attention outside a small circle to which they particularly appeal. But I would venture to say that if 90 per cent. of the members never write papers, there are not 9 per cent. who do not read the reports of the proceedings.

Is the paper an old-fashioned, antiquated notion that may be left to drop out of sight with the present generation, or is it a pressing need of the day? Can it be left to die a natural death, or is it desirable to endeavour to infuse more energetic existence into it. I would suggest that unless more interest is taken by the members in section (d) of clause 3 of the Memorandum of Association, a valuable aid to the maintenance of an adequate roll of members will be lost; and the loss will be individual, in addition to collective. There appears to be very little appreciation of the personal value, as a means of education, of the work involved in writing a paper. I think many whose position in the profession and past achievements are an evidence of a high order of ability, would acknowledge the aid they have derived from the investigations that have been necessitated in order to illustrate their subject, or to prove a line of argument, in the course of preparing a paper. A gas-works manager who has not acquired the facility of setting his ideas on any subject in order on paper, and either reading them or embodying them in an impromptu speech, in a style that will retain the attention of an average audience, must at times labour under very great disadvantage. He is periodically

called upon to prepare reports for the information of his directors, and to reply to discussions upon them. He has to come before the local authorities, in connection with questions of public lighting and various other matters. He should be able to receive deputations from consumers or from the employees. And there are times when he has to call the whole staff together, and discuss important matters relating to rates of wages and conditions of work. The present-day manager cannot count upon being left in peace to go into the retort-house and earn the dividends which, according to excellent authority, are to be made there. A man who has written a paper, and more or less successfully upheld his views in the teeth of a many-sided discussion, is much better equipped for his work than one of the 90 per cent. The fact that a member dreads, or feels repugnant to, the work of preparing a paper is of itself strong evidence of the need, from the personal point of view, that he should undertake it.

Notwithstanding the suggestion that the branches would rob the stem, it will be found that the few who uphold the credit of the Institution in this respect are also the mainstay of District Associations. In fact, the latter have been an advantage, because a member, having undergone the experience of standing up before a local gathering, and finding that his efforts have been well spoken of, and that nothing terrible has followed, has felt encouraged to face a larger audience at the national assembly. The active paper reader is, as a rule, the least in need of the educational training to which reference has just been made. He is interested in public reading or speaking in other directions; and, being quite accustomed to putting his ideas into speech or on paper, he is not troubled with the sense of incapacity which seems to obsess the 90 per cent., and render them averse to standing up at the readers' desk or to seeing their names in print. This may account for the very common, but none the less erroneous, impression that only an exceptional genius can write a paper, and that it is a special gift confined to the few, like writing poetry or painting pictures. Anyone of ordinary intelligence can write a paper; and it would be a libel on the profession generally to say that only something less than 10 per cent. of the members are able to do so.

There are a few pitfalls that beset the embryo author. Perhaps one of the chief difficulties is the selection of a subject. I remember an old friend who could talk most fluently and capably on almost any detail of gas engineering, and was very successful in his profession. On being pressed to assist at the next Association meeting, he raised several small objections, which were disposed of, and finally said he could not think of a subject. If I would find the subject, he would find the paper. After a little further inquiry, a suitable subject was selected; and the result was a communication of acknowledged value that elicited a good discussion. It is putting the cart before the horse to determine to "write a paper" and then to cast about outside for a subject, going perhaps to the lists of papers already read, or to the index of the "JOURNAL." At a later stage, when the subject is somewhat advanced, it will be desirable to look up what other people have had to say about it. A manager requires to look at home for the subject, among the things with which he has been most closely engaged and associated. The material to be worked upon may or may not be in existence. The details required may exist in the form of special memoranda, or the project may involve the opening-up of some track hitherto unexplored, that means commencing *de novo*. The practical man of the present day usually follows the first course, and utilizes matter that has accumulated in the course of his recent occupation. Probably he has neither the time nor the special facilities for carrying out pure research. Whatever the matter selected, the closer one can get to it, and the larger the amount of detail worked out, the greater the prospect of a result that will be satisfactory both in a personal and in a general way. It is better to take too narrow than too wide a field. One is not so likely to fall into the error made by one of the 90 per cent., who, after an immense amount of persuasion, was induced to take part in a discussion on a paper furnishing some practical lessons in retort-setting. After a few disjointed sentences, he said the retort-setting was important, but good washing and scrubbing were equally so, and drifted off into a disquisition upon ammonia, and the money lost by allowing even a small proportion of this impurity to get beyond the inlet to the purifiers.

A paper should not be so diffusive or exhaustive as a magazine article or a chapter in a technical treatise. An original and distinctive style is likely to attract more attention than a copied one. The writer should, above all things, seek to be himself, and not somebody else. He can work more freely and naturally in his own clothes, even if they are homely in appearance and fit, or a little frayed at the elbows and knees, than in a more pretentious vesture that was evidently not made for him. In some parts of the country, it is a usual practice among the labouring classes to bedeck themselves with all the jewellery they can borrow when they are about to sit for a photograph. The author of a paper will do well to avoid a similar blunder. I have seen papers that are so obviously copies, that the original could be safely indicated; and expressions that may be appropriately used by a leader in the profession, are out of place in a communication from a young, and to some extent inexperienced, writer.

In Dickens's "Pickwick Papers," it is related that a young man, who was a member of a debating society, being requested to propose that a picnic should be held on a certain date, introduced his subject by a *résumé* of the law relating to picnics, from

the time of William the Conqueror downwards, with a digression touching upon the legal position of the picnic in other countries. A paper that will lead to a good discussion is not too heavily loaded with irrelevant details; and one of the best ways of smothering discussion is to tire the audience, by anticipating and dealing at length with every conceivable objection. Moreover, the writer should not so far exhaust himself as to have nothing left for the reply. The last word carries most weight; and a competent reply will receive more attention than the original communication. A good plan is to keep a card or two up one's sleeve in the shape of a few telling points that can be introduced into the reply. Diagrams are of great value if used judiciously. They will explain matters of detail that cannot be satisfactorily put into words. But they should be confined to leading features of the subject, and not be too numerous.

COKE MANUFACTURE & PRODUCTS RECOVERY.

Early in the present year, a paper on this subject was read before the Newcastle Section of the Society of Chemical Industry by Mr. Andrew Short, B.Sc. The text of it, fully illustrated, is given in the current number of the "Journal" of the Society, from which we extract the following particulars.

The earliest method of coking coal was very crude, and consisted simply in piling up the coal in the form of mounds or rectangular heaps, covering the heap over with breeze, igniting the coal, and allowing it to smoulder—much in the same way that charcoal is manufactured at the present time. The heat produced was sufficient to drive out the volatile matter, which burned, and ultimately a heap of coke was obtained. Later, these heaps were surrounded by walls having air passages at various places. The brickwork was built in the form of stalls, in which the coal was placed, covered with a layer of loam to prevent excessive waste by combustion of the upper layers. Holes were pierced in the lower portion, the coal was ignited by brushwood, and the rate of combustion was regulated by opening or closing the air-holes in the walls.

Though these methods produced good coke, they were obviously wasteful; and ultimately what is known as the "beehive" oven was evolved. This type of oven is more economical, and is largely in use at the present day, both in England and America, since it produces excellent coke, which is much prized for its silvery appearance and dense, hard nature. But as air is admitted to the charge, in order to complete the combustion of the volatile matter, a certain amount of the coal or coke is burnt and lost. A coal which, heated in an entirely closed vessel, would yield (say) 75 per cent. of coke, yields only 65 to 67 per cent in a beehive oven; the loss being due to combustion. In order to avoid this loss, ovens have been devised in which the coal is baked in a closed chamber; no air being admitted into the oven itself. This kind of oven is known as the retort-oven; and among the earliest and most successful types were those of Coppée and Appolt, introduced in 1861 and 1862 respectively.

The retort type of oven resulted in a higher yield of coke than the beehive type; but it has been still further improved upon by the recovery of the tar, ammonia, and benzol from the products of distillation. The successful recovery of these constituents marks the development of the more purely chemical side of the industry; and the methods evolved for their recovery have reached a high state of perfection. The industry now constitutes an important branch of the chemical trade. Though the beehive type of oven does not lend itself to the successful recovery of bye-products, several attempts have been made to adapt it to recovery processes, among which attempts those of Jameson and Aitken may be mentioned. Pernolet also designed an oven which was practically a closed beehive oven. These processes have not been successful.

The retort-oven, however, lends itself well to the recovery of bye-products; and it is this type of oven which has come to the front of late. The first successful attempt in the bye-product recovery process was made in 1862 by Carvès, who modified and adapted Knab's oven for bye-products recovery. Knab had in 1856 designed a retort-oven heated by flues placed under the floor; Carvès added flues in the side walls. Simon then added a simple form of recuperator; and this design of oven has been extensively used. The bye-products recovery process, however, did not make much headway, at least in England, until 1881, since which date the progress has been rapid, but not so rapid as on the Continent, where no beehive ovens exist to-day.

The type of oven now in use is almost exclusively the horizontal oven similar to the original Simon-Carvès and Coppée ovens, and consisting essentially of a horizontal brickwork chamber about 33 feet long, 6 ft. 6 in. to 7 feet high, and 18 to 24 inches wide, in which the coal is coked. This is provided with heating flues, built into the side walls; and movable doors are provided at each end of the oven. A hole in the crown leads away the gaseous products of distillation to a common main. The gases, after removal of the bye-products, are led back to the ovens and burnt in the side flues in order to carry out the process of coking. The ovens are usually built in batteries of 25 to 60; and plants are in existence which comprise up to 500 ovens.

Horizontal retort-ovens may be divided into two distinct classes: (1) Ovens with horizontal heating flues—Simon-Carvès type;

(2) ovens with vertical heating flues—Coppée type. These again may be subdivided into (a) waste-heat ovens—*i.e.*, those in which all the waste heat is converted into steam under the boilers; and (b) regenerative ovens, where surplus gas is required.

In the original type of Simon-Carvès horizontal flued oven, the walls are hollow, being formed of channel bricks, which divide the partition wall between two contiguous ovens into four horizontal flues. Under the oven runs a sole flue; and this leads up to the top horizontal flues. The gas is admitted at the end of the sole flue along with air for its combustion. The flame travels along the sole flue up to and along the top horizontal flue, then through the lower flues in turn, and finally into a simple recuperator, consisting of two waste-gas flues built in between three air-flues, in which the air is preheated before coming into contact with the gas. Alternate ovens exhaust their waste gases into the two waste-gas flues; there being two chimneys provided for each respective battery of ovens. This type of Simon-Carvès oven has recently been superseded by an improved type.

Semet-Solvay ovens have a somewhat similar arrangement of side flues, with the exception that each oven has its own set of flues. The ovens are separated from each other by a solid wall; and the flues are placed upon either side of this wall. The advantage of this method is twofold. In the first place, the solid wall in question, dividing each oven from its neighbour, acts as a support for the superstructure, and relieves from undue strain the flues, which must be kept gas-tight. It also acts as a storage for heat, and tends to maintain the temperature of the oven when cold coal is thrown in, or during temporary stoppages of the gas supply. A feature of the Semet-Solvay oven is the use of small bricks for building-up the flues. It is claimed that this minimizes the danger of cracks in the flues, with consequent leakage of the gas from the ovens into the flues and loss of bye-products. The flues in these ovens are usually four in number. The gas and air enter at the end of the top flue, travel along this and slowly downwards along the other three in turn, and finally pass along a sole flue into the main waste-gas flue leading to the boiler. The air is generally led through flues built underneath the oven, and is heated to an extent before entering the combustion flues.

The Huessener oven was the first bye-product oven built in Germany. This type also has a separate set of flues for each oven, with an intervening wall. The flues are built up of tongued and dovetailed bricks, which are accurately fitted to each other. In this type of oven the gas enters at the sole flue, of which there are two to each oven, one serving each set of side flues. The gas and air, on entering the sole flue, travel along underneath the oven and rise through a vertical flue to the top flue. The flame then traverses the other flues, reinforced by more gas and air if necessary, and finally passes into the main waste-gas flue.

Coming to vertical-flued ovens, the Coppée modern type has the flues placed somewhat similarly to those in the original type. The side wall is composed of a series of vertical flues, with a flue running longitudinally above and below. The gas is forwarded into the lower horizontal flue through a bunsen mixing-tube, and issues from a series of holes, each corresponding to a vertical flue. Enough air is mixed with the gas to give a non-luminous flame. Combustion takes place in the horizontal chamber; the necessary air for the completion of the combustion being admitted into it. Dampers are placed at intervals to regulate the supply. The hot gases pass up the vertical flues, along the top horizontal flue, and down two vertical flues in the centre, thence through ports into the sole flue, and on to the waste-gas main flue.

In the Koppers oven there are from 30 to 35 vertical flues, the supply of gas to each of which can be regulated. The gas is led into the flues by means of a fire-clay pipe running the whole length of the side walls, with adjustable orifices of ingenious type leading to each flue. An air-distributing channel runs underneath the oven, with ports to each gas-nozzle, where it mixes with the gas, and the flame passes into the vertical flues. The air is controlled by means of dampers at the top of each flue; and the products of combustion pass along the upper horizontal flue, down two vertical flues at the end of the series, and on to the main flue. The new Simon-Carvès type is designed to overcome this adjustment of dampers, by placing regulators on the sides of the oven. The gas is led through several pipes to the various points in the oven, and regulated to maintain the necessary temperature. The air and gas are regulated by dampers, accessible from the ends of the oven; and the heat in the flues can be controlled from this point. The Otto-Hilgenstock oven is an extremely simple and effective design. The gas-flues are replaced by a row of from 15 to 16 large bunsen burners, which heat up the vertical flues. The gas supply is under easy control, and the air is regulated by a damper placed at the opening leading to the main flue.

The advantage of vertical-flued ovens over the horizontal-flued ovens lies in the ease with which the heat can be regulated at various points along the oven by the admission of more or less gas, according to the temperature required, at different parts. Also, owing to the shorter flues, the gases have a shorter distance to travel, and consequently a lower chimney draught is necessary. This avoids the drawing-in of gases from the oven into the flues, with consequent loss of bye-products. Most of the vertical-flued ovens can be adapted to use with regenerators of the Siemens type.

The most successful of the early regenerative ovens was the Otto-Hofmann, which was practically a Coppée oven fitted for bye-product recovery and with regenerators. This type of oven

has been largely used on the Continent and in America; but it has the disadvantage of causing expansion and contraction of the walls at frequent intervals, which ultimately cause leakage of gas. Ovens have been designed which avoid this to a certain extent if not almost entirely. In the Coppée regenerative oven, the side wall is divided into five chambers, and two sets of gas-supply pipes are provided, which are used alternately. Each chamber has six vertical flues, up three of which the gas travels, and passes down the other three alternately. Thus the contraction and expansion are not so severe as in the case of the Otto-Hofmann type. The Collin oven still more completely equalizes the heat; for in this case the only alteration in the flow of gases is that of direction in the individual flues. Each battery of ovens has usually a common set of regenerators, placed longitudinally, running underneath the whole length of the battery. The Koppers ovens, however, are so designed that each oven has its separate regenerator, built underneath the sole of the oven, so that repairs to any regenerator can be carried out without interfering with the working of the battery as a whole.

Of late years, the question of carbonization in vertical retorts has received considerable attention in the gas industry; and experiments in this direction have been rewarded with success. [In this connection, the author refers to the work of Messrs. Settle and Padfield, Woodall and Duckham, Glover and West, and Bueb; and he quotes the figures given by Mr. E. Körting, in the "JOURNAL" for Jan. 14, 1908 (p. 93), showing the results obtained in a battery of 84 Dessau retorts at Mariendorf, in comparison with inclined and horizontal retorts. He also cites the report of Mr. Broadberry and Dr. Colman to the Institution of Gas Engineers, published in the "JOURNAL" the following June, in support of the statement that the yield of tar is greater and of better quality, and that of ammonia higher, with the vertical than with the horizontal retort.]

Encouraged by the results obtained in gas-retorts, coke-oven makers have turned their attention to vertical ovens; and the outcome has been the Elliott-Jones oven, which has been proved so successful on a working scale that a battery is about to be constructed. The design is somewhat similar to the Appolt oven. The tar is much thinner, and contains much less free carbon and naphthalene, than ordinary coke-oven tar. The coke also is of excellent quality.

The use of bye-product ovens has very largely increased in England during the last ten years, and is still increasing; many iron-works possessing ovens built in close proximity to blast-furnaces. [The author describes them in detail.] The method of recovery up to the end of the last year or two has been very similar in the various systems of coke-ovens. But it has several disadvantages. In the first place, the apparatus is somewhat complicated and costly. Ammonia stills and saturators are expensive, and require a considerable amount of attention and upkeep. Also a large quantity of fresh, cold water is necessary for cooling and scrubbing the gases, and steam for distilling. Again, more especially in inland places, the waste liquors from the ammonia stills, containing poisonous substances, such as calcium sulphide and sulphocyanide, are, even when clarified, too poisonous to be run into streams or canals. In some parts of the country, the disposal of this liquid is an extremely difficult question. Efforts have been made to simplify the recovery plant, and to avoid, either partly or wholly, the formation of ammoniacal liquor, and consequently to avoid the injurious still waste. These efforts have been successful, and now several systems are in use, notably the Koppers and the Otto, both of which are being installed in England. The methods consist of the direct recovery of the ammonia; and remarkable developments have been made during the last year or so.

In the Koppers system, the gas is first cooled down to a temperature of about 25° C., and passed through an exhauster to a tar-extractor. This removes the tar, and some virgin ammonia liquor is obtained. The gas is then heated-up by being passed through what is usually the air space in the first cooler. Here it is reheated, and then passed on to a large lead saturator and bubbled directly through a bath of sulphuric acid. At the same time the virgin liquor collected from the cooler is treated in a small still; the ammonia being driven out and mixed with the gas. There is very little effluent liquor, and the salt is free from tarry matter, which proved a source of trouble in earlier direct-recovery processes. The gas is passed into the saturator at a comparatively low temperature, and the salt contains remarkably little free sulphuric acid.

The Otto system is still more simple and very ingenious; for the gases leaving the oven are conveyed hot into the saturator, and no condensation of liquor is obtained. This is a distinct advantage, since many oven plants are charged with washed coal containing from 10 to 12 per cent. of water. Thus 120 ovens carbonizing wet coal would produce about 60 tons of virgin liquor per day; and the disposal of the still waste from this quantity would be a difficult matter. In this system, the gases leaving the ovens are passed into a vessel in which they are sprayed with tar. These tar sprays remove the tar from the gas at a temperature above the dew-point of the gas, and thus no water is deposited. By this simple means the gases are freed from tar, and then an exhauster draws them off, and forces the gas through a large lead-lined saturator in which the ammonia is absorbed by sulphuric acid, the sulphate formed being free from tarry matter and of good quality. The gas is afterwards passed on to the burners, unless it is required to remove the benzol. And only then are coolers

necessary. No ammoniacal liquors are formed; and any condensed water, since it contains no lime salts, can be used for quenching coke, &c. Several plants on this system are working at present in Germany, and some under construction in England will soon be in operation.

Since coke-oven gas approaches very nearly to the quality of ordinary lighting gas, the question of its utilization for this purpose has been raised at various times, and in America attempts have been made to adapt coke-ovens for the purpose. Dr. Schniewind has dealt with this question very fully in a paper read before the Gas Section of the Engineering Congress at Glasgow in 1901,* showing how the quality of the gas varies at different times during the period of carbonization. Recently arrangements have been made with a view to supplying the district of Little Hulton with gas of 550 B.Th.U. and 14-candle power, in quantities up to 400,000 cubic feet per day, from the coke-ovens at the Earl of Ellesmere's collieries. A scheme is also being brought under notice in the Ruhr district of Rhenish Westphalia, where coke-ovens exist in large numbers, to centralize a gas-station supplied from the various coke-oven plants, which if successful would result in a cheap gas supply, and avoid the costly undertakings of many gas-works in the district.

* See "JOURNAL," Vol. LXXVIII., p. 691.

RAISING A HIGH-PRESSURE WATER-PIPE.

In regrading one of the streets in the business section of Seattle, a town in Washington Territory, it was necessary to raise a 1800-foot length of 20-inch cast-iron water-main operating under a pressure of 130 lbs. per square inch. The position of the main was such that it was impracticable to cut it out of service while the raising was in progress; so the decision was arrived at to undertake the work without interfering with the operation of the pipe. The street in which the pipe was laid had a dip in grade about midway on the length of pipe it was necessary to raise. The street improvement was made to remove this dip, and to secure a uniform grade of 4.9 per cent. The pipe was laid at a depth of 4 feet below the original street surface, and the maximum raise required was to be about 13 feet above this surface; making a total of 17 feet. From this maximum the amount of change tapered off gradually towards both ends of the length of main. The particulars of the work here given are taken from "Engineering Record."

The scheme of raising adopted was to carry up the whole length of the pipe by means of jack-screws and cribbing. The trench was first opened, and the pipe brought to the surface in this manner. Then shoring was put across the trench, and the raising continued until the final position was reached. A cross-timber was placed near the bell end of each section of the pipe, to provide a bearing for a pair of jack-screws seated on a crib of 6-inch square timbers built up in cob-house fashion. Side struts were used at intervals to maintain the alignment. Extra cribs were placed under valves and specials. Enough men were employed to turn the jacks so that 60 feet of the pipe could be raised simultaneously. The work was started at one end by raising about 60 feet of the pipe 1 inch. Then the next 60-foot length was raised to this extent, and so on continuously to the opposite end of the work. As soon as that end was reached, the men worked back again, and so on until the pipe was up to the proper height. One man was stationed at each jack, and all the men worked to a signal from the foreman; so the jacks under the 60-foot lengths in which the raising was handled were turned at a regular rate. As soon as the jacks were extended, a 6-inch square timber was slipped under the pipe at each crib, to take the load until the jacks could be removed and another storey added to the crib. The jacks and timbers were consequently manipulated so that the pipe was never unsupported at any point. After the pipe had been raised to the final grade, a framed timber bent was built under each section, to carry it until the fill was completed. While the work was in progress, practically no leakage occurred at the joints, though some of them had to be caulked occasionally. After the pipe was out of the trench, the rest of the raising was done in fourteen days.

Tar Treatment of Roads.—In the course of his annual report to the Birmingham City Council, the City Engineer and Surveyor (Mr. H. E. Stilgoe, M.Inst.C.E.) says that the total area of macadam surfaces tar-sprayed during the year was 893,062 square yards, and that the areas sprayed second and third times were 98,824 square yards—making an area of street equal to 794,238 square yards, comparable with the length of 62 miles 2 furlongs 88 yards. The cost of the work was £2165; being at the rate of 0.582d. per square yard, compared with the previous year's results—viz., 44½ miles, being 578,286 square yards, at 0.876d., equal to £2113. The difference in the cost is accounted for by the work being carried out by the Corporation's own staff, and not partly by contract, as in the previous year. The greater portion of the work was done by two 1000-gallon tar-spraying machines hauled by steam-rollers, and a smaller portion by two single-horse machines and a hand-sprayer. Mr. Stilgoe claims that the advantage of the application of tar to the surface of macadam streets for the purpose of preserving the surface and the reduction of mud and dust is established beyond all dispute, and is a great source of comfort to the users of, and frontagers to, the streets.

WATER SUPPLY OF THE METROPOLIS.

Seventh Annual Report of the Metropolitan Water Board.

We have received from the Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) a copy of the seventh annual report, dealing with the work of the Board in the year ended the 31st of March last.

The report opens with some explanatory remarks on the constitution of the Board, and then sets forth its financial position. On the 1st of April, the capital debt was as follows: Metropolitan Water "A" Stock £6,060,165, interest £181,805; Metropolitan Water "B" Stock £35,510,521, interest £1,065,316; redeemable debenture stocks £7,217,838, interest £216,911—total stock, £48,788,524; interest £1,464,032. In addition to this, the Board are under obligation to pay certain annuities and rent charges (including the Crown "clog" of £400) which amount to £9900; making an annual interest charge of £1,473,932, which is equivalent to 4.3d. per 1000 gallons of water supplied.

From the section of the report furnishing particulars of the sources of supply, we find they continue to be four—viz., the Thames and the Lea; gravel beds adjoining the main stream of the Thames and other gravel beds at Hanworth; natural springs; and wells sunk in the chalk or other strata in the Lea Valley, on the north of the Thames, in Kent, and at certain other points south of the Thames. In the twelve months ended March 31 last, the Thames furnished 58.19 per cent. of the Board's total supply, compared with 57.27 per cent. during the previous year. The daily average quantity gauged at Teddington was 1445.2 million gallons—an increase of 461.5 million gallons compared with 1908-9. The daily average total abstraction from the river was 136 million gallons. The daily average natural flow at Teddington was therefore 1581.2 million gallons during the year, compared with 1118.4 million gallons in 1908-9. The total volume abstracted from the river was 49,641.2 million gallons, or 462 million gallons more than the preceding year. Compared with that year, there was an increased average daily abstraction from the river of 1.3 million gallons last year. Of the 136 million gallons daily average quantity abstracted by the Board and the Suburban Companies, the Board drew 133.6 million and the Companies 2.4 million gallons. The percentage of the river's natural flow abstracted by the Board was 8.45, and by the two Suburban Companies 0.15, or 8.6 per cent., compared with the total abstraction of 12.04 per cent. in the year 1908-9. There was a decrease in the total quantity of water abstracted from the River Lea by the Board equal to an average daily decrease of 0.412 per cent.

The total volume of water supplied during 1909-10 was 82,365.8 million gallons, compared with 81,823.9 million gallons in 1908-9—an increase of 541.9 million gallons. The average daily supply was 225.7 million gallons; the figure for 1908-9 being 224.2 million gallons. The southern district took the largest proportion of the total supply—viz., 26.96 per cent.; and the Kent district the smallest—9.09 per cent. The eastern district consumed 19.91 per cent. of the total supply; the New River district, 19.25 per cent.; and the western district, 24.79 per cent. The month of maximum average daily supply was May in two of the districts and August in three. The month of minimum average daily supply was December in the eastern district and February in the southern, but March generally. The difference in the total average daily quantity of water supplied between the maximum and minimum months throughout the whole area was 31.5 million gallons, or a difference of 4.6 gallons per head per day.

The total estimated population supplied by the Board at the close of the year—viz., 7,108,504—represented 15.6 per cent. of the population of Great Britain and Ireland. This population is nearly equal to that of the two kingdoms of Norway and Sweden, about the same as the Dominion of Canada, two millions more than Australia and New Zealand combined, and larger by about a million than the whole population of Scotland and Wales. Within the County of London, the main increase occurred in the southern district—viz., 12,345; and there was a decrease of 1312 in the western district. In the area outside the county, the greatest increase again took place in the eastern district—viz., 12,602; the total increase outside the county being 47,365, or 2.1 per cent. There was a decreased supply of 0.07 gallon per head per day as compared with the preceding year. The average population is estimated to have increased 0.9 per cent., and the average number of services 1.05 per cent. The largest increase per head per day occurred in the eastern district—viz., 0.95 gallon, or 3.45 per cent. The largest decrease was in the southern district—viz., 1.08 gallons, or 3.16 per cent. For the whole area, the average daily supply per head was 31.87 gallons. In 1908-9, the average daily supply per head was 31.94 gallons; in 1907-8, 31.55 gallons; in 1906-7, 32.84 gallons; in 1905-6, 32.31 gallons; and in 1904-5, 33.54 gallons. Approximately, 55 per cent. of the total population was supplied from the Thames, 24 per cent. from the Lea, and 21 per cent. from wells and springs. The total number of services supplied at the end of the year was 1,094,801—an increase of 11,325 over the preceding year. The average daily supply per service was 206.12 gallons, compared with 206.9 gallons; and the average population supplied per service was 6.47, against 6.48 in 1908-9. The increase in the number of services on the constant supply during the year was 10,635, or 1 per cent. The proportion of supplies on the constant system at the close of the year was

97.72 per cent., compared with 97.74 per cent. in the preceding year. The eastern and western districts are entirely on constant supply. In the Kent district, the percentage of constant supply is 99.71; in the southern district, 91.52; and in the New River district, 99.97. In the last-named district, constant supply is given to the whole of the Metropolitan portion, and to all the outside area except a few houses in Great Amwell.

In the section of the report dealing with storage, attention is called to the testimony borne by Dr. Houston, the Board's Director of Water Examination, to its value in improving the quality of water; and it is stated that he has still further substantiated this important fact, both by the routine work of his department and by his special research work. The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was as follows:—

	No.	Area in Acres.	Total Capacity in Million Gallons.
Thames Valley	30	918'50	6345'5
Lea Valley	17	530'25	2499'2
	47	1448'75	8844'7

No addition was made during the year. The total number of filter-beds is 168, of 166.51 total acreage, or 0.86 acre per million gallons average daily supply of filtered water; the latter figure ranging from 0.62 in the New River district to 1.01 in the western district. The average monthly rate of filtration per square foot per hour during the year varied from 0.84 gallon in the Grand Junction district to 2.08 gallons through the Lea Valley supply beds of the New River district. At Long Ditton (southern district), two filter beds, of 1½ acres each, were completed and brought into use in June, 1909; and three, of the same dimensions, in April, 1910—leaving one to be completed. In the New River district, 4½ acres of filter-beds are contemplated.

The total number of service reservoirs for filtered water (as distinct from storage reservoirs for raw water) is 83, of 311.072 million gallons total capacity. Only two, at Hanger Hill, near Ealing, of 53 million gallons capacity, are uncovered. The remarkable covered reservoir at Honor Oak, of which some particulars were given in the Board's sixth annual report, was formally opened by the Lord Mayor (Sir George Wyatt Truscott) on May 5, 1909. The four sections of the reservoir (an illustrated description of which was published in the "JOURNAL" for May 11 last year) were filled with water on Nov. 9; and the reservoir was brought into use for the first time on the 14th of March last. Its actual capacity is 56,322,000 gallons. The source of supply to it is a 42-inch pipe connected to the Board's 42-inch main which conveys filtered water from the pumping-station at Hampton to the Nunhead reservoirs, a distance of about 17 miles. The following figures show the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:

	Before June, 1904.	At March 31, 1910.
Storage reservoirs for unfiltered water	57	62
Acreage of ditto	886	1497
Capacity of ditto in million gallons	4077 6	8913 6
Service reservoirs for filtered water	74	83
Capacity of ditto in million gallons	241 5	311 1
Filter-beds	137	168
Acreage of ditto	140	166 5
Engines	235	264
Horse power of ditto	32,177	38,380
Miles of water-pipes	5,759	6,258

In the section of the report which deals with the miscellaneous work of the Board, reference is made to the various legal decisions given in the course of the twelve months—including the South Suburban Gas and the Brighton and South Coast Railway cases, both of which have been reported in the "JOURNAL." The important work of the Director of Water Examination (Dr. Houston) is also dealt with; and other matters touched upon are the rainfall records furnished to the Board by Dr. H. R. Mill, the uniform scale of charges, &c. The total rateable value of the Board's properties (including the mains) is £1,192,184, distributed as follows: Bucks, £791; Essex, £77,712; Herts, £14,337; Kent, £32,311; London, £637,698; Middlesex, £286,524; Surrey, £142,811.

The report closes with a few remarks on the future water supply of the Metropolis. The report issued two years ago contained the resolutions passed by the Board on Dec. 6, 1907, in reference to the question of the sources of supply in relation to their capacity for dealing with the future requirements of the Metropolis. The first resolution committed the Board "to seek parliamentary powers to enable them to provide additional supplies from the Thames for as long a period as is economically practicable." Since the passing of the resolution, the Works and Stores Committee and the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) have given the closest consideration to the problem presented by the reference; and early this year an exhaustive report was submitted by the Committee on the subject, in which they recommended the adoption of a scheme for the construction from time to time of additional reservoirs in the Thames Valley, in the vicinity of the existing Staines reservoirs. The main feature of the scheme carries out the principle of the construction of storage reservoirs contained in the report of the Royal Commission presided over by Lord Balfour of Burleigh in 1892-3. The complete scheme submitted by the Chief Engineer includes five reservoirs, having a total capacity of about 20,900 million gallons, and suffi-

cient, with the existing works, to ensure, during a drought as severe as that which occurred in the years 1898-9 and 1901-2, a supply of 35 gallons per head per day for a total population of 12 millions, which it is estimated the Board may have to provide for in the year 1941. This report was accompanied by reports from the Finance and Water Examination Committees dealing with the financial considerations affecting the question and the value of storage; and they were adopted by the Board at their first meeting after the close of the year under review.

Accompanying the report (which is signed by Mr. Pilling) are appendices containing a collection of tabulated statistics, and also Dr. Mill's report on the rainfall in the Thames and Lea Valleys.

REGISTER OF PATENTS.

Recording Gas Calorimeter.

BEASLEY, C. H. & F. G., and BRADBURY, R. H., of Oldbury.
No. 16,647; July 16, 1909.

This gas calorimeter is of the type in which the quantity of heat developed by the combustion of a known amount of gas in unit time is transmitted to a continually flowing body (such as water), whose consequential increase in temperature is measured differentially by means of thermometers at the points where the water enters and leaves the appliance. This calorimeter is so constructed that, in addition to providing for the "expeditious and accurate" estimation of the calorific value of gases (particularly gaseous fuels), it also admits of the products of the combustion of the gases being analytically examined during the time that a calorimetric test is being made; while all variations in the temperature of the flowing water are automatically indicated and recorded.

The calorimeter (illustrated, p. 526) is so made that the gas to be examined, together with the requisite quantity of air, is forced into the instrument at considerably above atmospheric pressure, and is burnt in a burner enclosed within a water-jacketed combustion chamber through which a constantly flowing stream of water is caused to circulate. This combustion chamber has only a single outlet, consisting of a pipe fashioned into a coil or other suitable form, and entirely contained within the water circulating chambers.

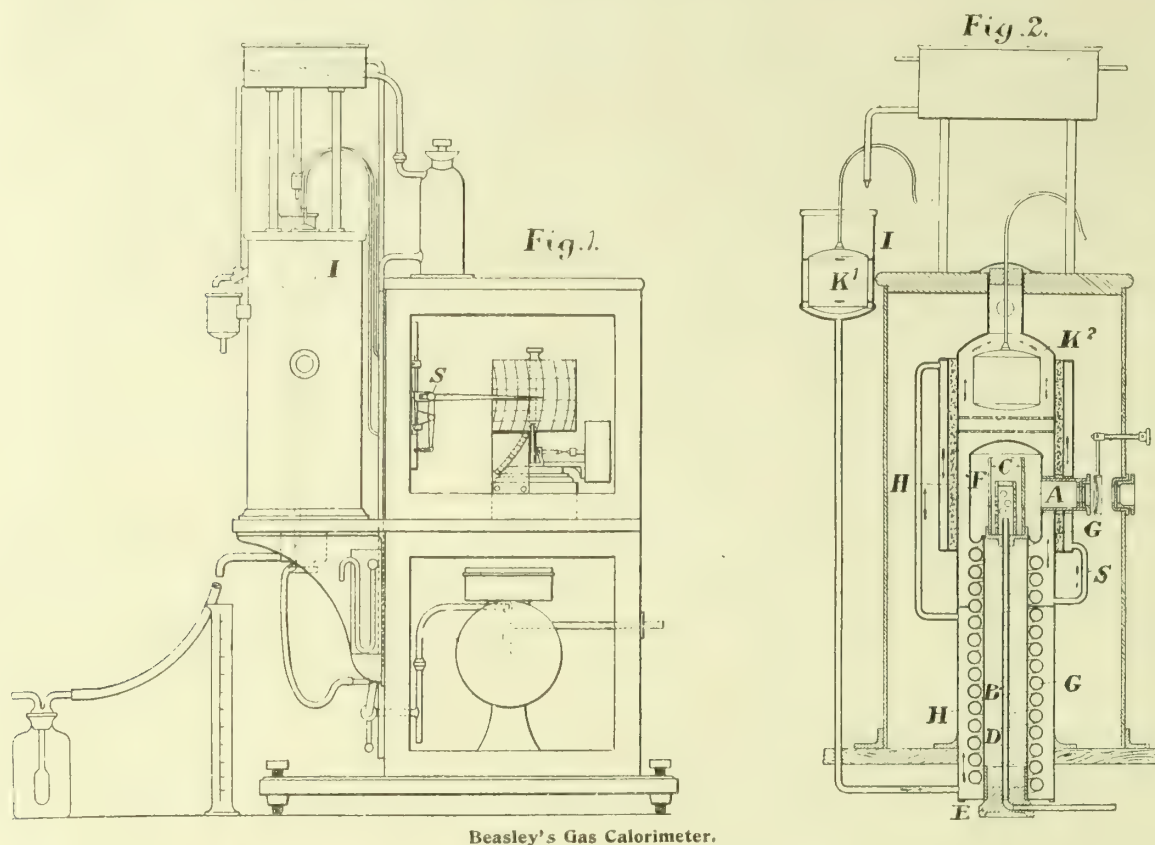
Owing to the fact that the gas is supplied and burnt under pressure, the products of combustion are forced to travel downwardly through the outlet coil at a constant rate, which can be readily varied as desired, and are cooled within the coil to the temperature of the water where it enters the jackets or chambers. This is effected by providing the entrance for water at the bottom of the coil-jacket and compelling it to flow through upward, or in the inverse direction to the travel of the products of combustion. Further, the fact that a pressure exceeding atmosphere pressure is maintained in the combustion chamber also provides that the burnt gases, after their passage through the water-heating coil, can be forced to traverse any form of apparatus for chemically analyzing them, "from which it follows that gases can be simultaneously, or at one operation, tested to determine both their calorific value and their combustible constituents."

To provide for measuring of the differences in the temperature of the water at the entrance to the circulating chambers and at the outlet therefrom, a differential thermometer system is employed, consisting of two thermometer bulbs, each connected by a fine-bore pipe to an aneroid box. Each bulb, with its associated aneroid, is filled with oil or other liquid susceptible to expansion and contraction under variations of temperature. One bulb is immersed in the water at the entrance to the jacket, and is under the influence of the minimum temperature; while the other bulb is immersed near the outlet, where the water attains its maximum temperature by virtue of the heat taken up from the walls of the coil and combustion chamber. In order to indicate and record all variations in the differences between the minimum and maximum temperatures as measured by the respective thermometers, both the aneroids are mechanically connected, through a system of levers, with the shiftable fulcrum of a pen-staff forming part of a recording device, whereby the fluctuations are recorded on a moving band of paper driven at a constant rate by clockwork.

The instrument also comprises an arrangement for automatically maintaining a constant rate of flow of water past the combustion chamber and heating coil, and which consists of an elevated tank wherein a constant head is maintained by the usual weir method, and from which the water flows at a constant rate from a jet into a deep cup that forms the entrance to the water-circulating system and contains the bulb of the minimum thermometer. Provision is also made whereby, in the event of any increase of resistance to the flow of the water through the instrument, such increase is compensated for by the head of water that builds itself up in the cup.

Further, provision is made whereby the gas and air to form the combustible mixture, and the water used in making the tests, can be readily brought to a uniform temperature before they pass into the instrument, which is effected by arranging within the elevated water-tank a coil of a few turns, through which the gas and air are forced before passing to the burner in the combustion chamber, and are thereby brought to the same temperature as the water in which the equalizing coil is immersed, and which proceeds from the tank to the jackets enclosing the combustion chamber and heating coil. To provide for the maximum saturation of the gas and air prior to combustion, or to bring them to the same degree of saturation as the exhaust burnt gases, the gas and air are passed through a chamber containing water interposed between the injector and the temperature-equalizing coil. This obviates the necessity of making tests to correct the records of the instrument for humidity.

Fig. 1 illustrates the connection between the different parts, including the gas, air, and water temperature equalizer, the gas and air saturator or maximum humidifier, the arrangement of the aneroids pertaining to the differential thermometer system, and the mechanical



Beasley's Gas Calorimeter.

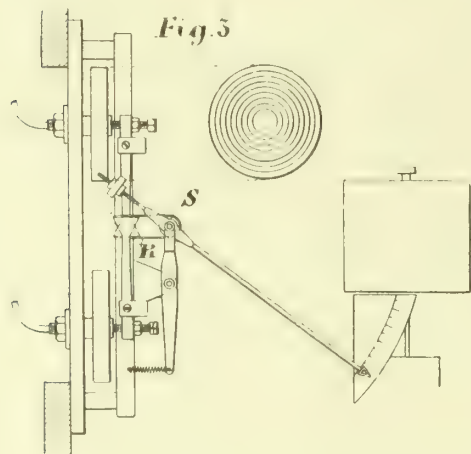


Fig. 3

means for automatically recording the fluctuations in temperature differences between the minimum and maximum thermometers. Further, it exemplifies the manner in which the invention provides for the analytical examination of the products of combustion, and it also shows a convenient disposition of appliance for controlling the delivery of gas to the burner so as to ensure the constant delivery of a given weight of gas in a given unit of time. The arrangement for taking up the appropriate quantity of air is shown; also the injector device whereby the gas and air are forced through the humidifier and temperature equalizer to the burner, and whereby also the pressure is maintained for forcing the products of combustion through the water-heating coil and through the analysis apparatus.

Fig. 2 represents (on an enlarged scale) a sectional view showing the burner combustion chamber and water-heating coil and the water jackets pertaining thereto; also the water entrance and outlet, and the dispositions of the bulbs of the minimum and maximum thermometers in relation to the entrance and outlet.

Fig. 3 shows (also on an enlarged scale) the arrangement of the aneroids and the pen-staff mechanism which is actuated thereby.

The body of the instrument consists of a casing enclosing a cylindrical combustion chamber *F*, to which access is obtained by a tubular passage *D*, whose lower end is closed by a removable stopper *E* fixed to a pipe *B* that carries the burner *A*. The burner is mounted on the gas-pipe so as to come within the middle of the combustion chamber, and is supplied with a mixture of gas and air controlled "to keep the supply constant or regular," so as to ensure that the same weight of gas shall be delivered to the burner during every unit time that the instrument is in action. And to provide for the delivery of the gas with the appropriate quantity of air, a quantity-controller is connected on to an injector operated by air forced into it by a pump, fan, or the like at a few pounds pressure per square inch.

The resulting mixture of gas and air under pressure is ignited at the burner, while the latter is outside the instrument; and when it is in proper action, it is introduced into the combustion chamber by way of the open-bottomed shaft *D*, and secured in position by the stopper *E* on the supply pipe. The stopper also serves to close the bottom of the shaft and prevent the escape of any of the products of combustion therefrom.

The form of burner shown consists of a double cylindrical mantle or shroud *C*, made of refractory non-corrosive material—preferably silica. Combustion takes place within the mantle when the burner is

ignited, before its introduction into the instrument; and the burner is placed in position before being passed up into the combustion chamber.

The combustion chamber *F* has only a single outlet consisting of a spiral or coil of relatively small bore tubing *G*, which serves as a water-heating element. Both combustion chamber and spiral are enclosed in a jacket or cylinder *H*, through which water is compelled to circulate at a constant rate. The water enters the lower part of the jacket from an elevated cup *I*, and is compelled to rise within the jacket or flow through it in the inverse direction to that in which the products of combustion from the chamber *F* are forced by the action of the gas and air supply pressure through the coil *G*. The result of this arrangement is that the water, in passing through the jacket at constant unit quantity in unit time, absorbs from the walls of the coil *G* and combustion chamber *F* the whole of the heat generated by the combustion of the known quantity of gas per time unit at the burner, so that the combustion products are discharged from the outlet of the coil at the temperature of the water as it enters the jacket. Thus the thermal value of the gas being tested is accurately arrived at by measuring the difference of temperature between the water where it enters the bottom of the jacket and at the upper part where the water leaves; while to examine the products of combustion, it is only necessary to couple the outlet end of the coil on to an ordinary gas analysis apparatus, as shown in fig. 1.

To automatically record the differences in temperature between the water at the points of intake and discharge, an arrangement is used that comprises two metal spherical or cylindrical vessels *K*¹ *K*², constituting thermometer bulbs, one of which (*K*¹) is contained within the cup *I*, where the cold water enters the instrument; so that it is maintained at, and measures, the minimum temperature of the water, while the other bulb is situated in the upper part of the water-jacket *H*, just above the combustion chamber, where it is influenced by the hot water leaving the instrument, and consequently measures the maximum temperature of the water. The two thermometer bulbs are connected to aneroids *L* *L*¹, mounted in the recording part of the instrument. The bulbs, connecting tubes, and aneroids are filled with oil or other liquid, the expansion and contraction of which, under the influence of temperature variations, result in a corresponding outward or inward movement of the aneroid faces. In order that these deflections may be mechanically recorded, a pair of levers are fulcrummed to small brackets on the frame of the mechanism, and the short arm of each lever contacts (by means of a small adjustable pin) so that one lever is influenced and oscillated by deflections of the aneroid *L*, caused by variations in the minimum water temperature, while the other is similarly influenced by the deflections of the aneroid *L*¹ under variations in the maximum water temperature. The two ends of the longer arms of the levers are coupled to one another by a bronze strip or thread *R*, whose extremities are fastened to the lever ends, while the middle part of the strip is made to take a complete turn round a roller or rock-shaft *S* (which carries a pen-staff) mounted in the forked end of a lever *X* having its fulcrum on a small fixed bracket. The other end of the lever is acted upon by a spring, whereby the connecting strip is maintained in tension, and the contact screws of the aneroid levers are kept bearing against the deflecting aneroid faces, so that they follow up the latter when they move inwardly in unison with any contraction of the liquid contents. The pen-staff, connected to, and turning in unison with, the rock-shaft, is furnished with a pen, whereby the movements of the mechanism are recorded on a band of paper carried upon a clock-driven drum.

With this arrangement, should both aneroids contract or expand to the same extent—as a consequence of a common change of temperature—no turning motion will be imparted to the rock-shaft and pen-staff, as both the aneroid levers will make an equal angular movement

in the same direction, and when the aneroids expand, the strip R will act simply as a link and impart a corresponding movement to the lever for tensioning the spring to obtain a return movement of the parts when the aneroids contract. If, however, the aneroids are influenced by different temperatures such as obtains when the calorimeter is in use, then their differential expansion causes the one aneroid lever to make an angular movement relatively to the other, and which movement is transmitted to the roller or rock-shaft by the tensioned strip R acting like a band upon a pulley. The turning over the roller produces a corresponding movement of the pen-staff, and alters the position of the marker upon the surface of the travelling paper.

Thus, when the instrument is in use, every movement produced at either of the aneroid faces by changes in their influencing temperatures results in a change in the position of the pen-staff, which vibrates in synchronism only with variations in the difference between the temperature as measured by the minimum thermometer and the temperature as measured by the maximum thermometer, and these differential variations are marked by the pen, and are automatically recorded on the travelling paper, either as temperature or corresponding thermal value.

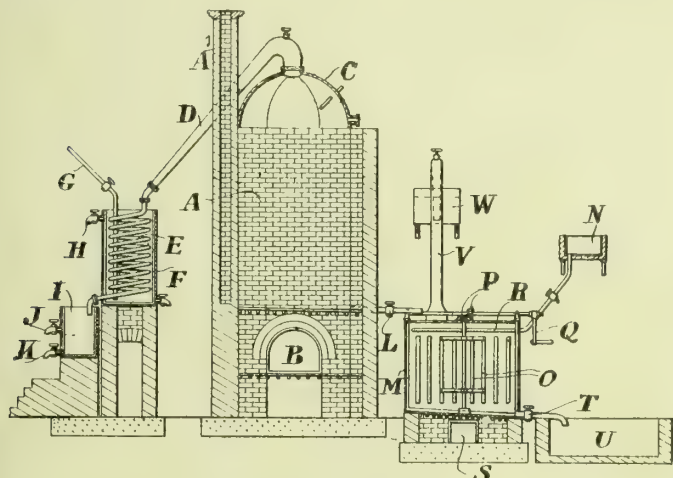
Solidifying Tar.

LEAVER, E. T., of Cannon Street, E.C.

No. 17,209; July 23, 1909.

This invention relates to the extracting of tar and treating it for use in the manufacture of briquettes and for other commercial purposes—for instance, in processes whereby the crude liquid tar is placed in a still, and (after the naphtha or other vapours have been allowed to pass off) the tar is led into a pan and stirred with the addition of sulphuric acid and finally run into moulds. The object of the invention is "to improve the mixing apparatus and facilitate the mixing operation."

The tar from the still is led into a mixing-tank, separate from the still and arranged at a lower level; the tank being also independently heated to a temperature of about 200° Fahr. It is provided with stirring devices operated by hand through bevel-gearing, as hitherto proposed for stirring tar in a still wherein the mixing with acid also occurred. The mixing-tank is practically closed in, so that any fumes arising may be led off and trapped; and it is further provided with a sprinkling pipe fed with sulphuric acid. The bottom of the tank is sloped to one side to facilitate discharge through a cock into a tank or moulds—the whole arrangement being such that the tar and acid are fed by gravity from one vessel to the next, so as to avoid the necessity for raising either the tar or the acid in its passage through the plant.



Leaver's Tar Solidifier.

The liquid tar is placed in a still in the structure A having a furnace B; the still being provided with the dome-like top C, which terminates in the goose-neck pipe D, the lower end of which is connected to the coil condenser E in the tank F, through which cold water is passed from the pipe G and is allowed to escape through the tap H. While the tar is heated, the naphtha light oils and water vapour pass off through the pipe D into the coil, and, condensing therein, run into the tank I, from which they may be drawn off by the taps J and K. After extraction, the tar is run off from the still through the pipe and valve L into the mixing-chamber M, where it is thoroughly mixed with sulphuric acid (flowing from the lead-lined tank N and through the sprinkling pipe R) by the mixing rods or agitators O, operated by bevel-wheels P and the handle Q. The mixing-chamber is arranged over furnace S; and when the mixture is sufficiently heated, it is drawn off through the valve and pipe T, into the tank U, which may (if required) contain moulds to receive the mixture.

The fumes arising from the mixing-chamber M are conveyed through the pipe V into the tank W; the outlet of the pipe being sealed in the tank by tar or water. As an alternative, the fumes may be conveyed from the pipe V into the furnace B or the chimney.

Treatment of Gases Produced by the Destructive Distillation of Coal.

HIBY, W., of Southampton Row, W.C.

No. 17,420; July 27, 1909.

In the course of his specification, the patentee says: A recently-suggested method of recovering ammonia from gases derived from the destructive distillation of coal consists in first removing the tar from the hot gases and then passing the gases, while still hot, through con-

centrated acid at such a temperature that the water vapour in them is not condensed in the acid. This method presents the advantage that the production of ammoniacal liquor is avoided. Nevertheless, there is always some effluent produced from the gases leaving the concentrated acid because these are cooled. In his experience, this effluent is objectionable and a source of trouble, since he finds it "offensive" or "poisonous." Another trouble in both gas and coke making plants is the deposit of naphthalene crystals from the gases during the cooling and the distribution of them. The difficulties arising from this are well known; and many attempts have been made to minimize them—such as washing the cooled gases by passing them through a suitable solvent for naphthalene.

According to the present invention, these troubles—due to the production of offensive or poisonous liquor and to condensation of naphthalene crystals in the cooling vessels and conduits—may be avoided if the temperature of the gases leaving the hot concentrated acid be maintained above a certain degree until, in the case of coke-ovens, these gases are burnt either in the oven flues, or elsewhere, or, in the case of gas making, until the formation of solid naphthalene during the subsequent cooling of the gases is prevented by treatment with the solvent.

The specific degree of temperature may be termed the "dew-point of naphthalene" in the gases under treatment. This dew-point is not the same for gases from all coke and gas-making plants, as it depends on many factors. In the case of gases which have been produced by distillation of washed and moist coal in coke-ovens, for instance, and subsequently scrubbed with tar and hot acid, the naphthalene dew-point is generally between 40° and 50° C. In the case of such gases, therefore, the temperature of the gases is to be maintained above 40° to 50° C. by any suitable means until the gases are burnt.

This overcomes the naphthalene trouble. But since the dew-point of water vapours in such cases is about 75° C., the temperature must be kept above this degree if the production of liquor is to be avoided entirely. Thus by covering the pipes with heat-insulating material, or otherwise preventing the cooling of the pipes, the gases can be consumed without the production of liquor or the deposition of naphthalene. Another advantage accrues from feeding the hot moist gas to the heating walls of coke-ovens—viz., the deposition of carbon, which brings about the choking up of such gas-conduits as are exposed to a red heat, is entirely prevented by the presence of the water vapours; the reaction being similar to the formation of water gas.

It is not always economical, however, to feed to the coke-ovens or other place where the gases are to be burnt so much water vapour as the gases contain at this temperature. Hence it may be found more advantageous to cool the gases to below the dew-point of the water vapour without allowing the temperature to fall below the dew-point of naphthalene—say, in the case in point, to 50° or 60° C. There is then obtained some effluent, which, however, only contains minute quantities of poisonous constituents, and is therefore less objectionable than that obtained when the gases are cooled as in former practice.

In the case of illuminating gas, this must ultimately have the temperature of the air. In the method according to this invention, a known expedient for preventing the separation of solid naphthalene from gases, and for collecting the naphthalene should the gases cool, is used. That is to say, before the gases are cooled below the dew-point of the naphthalene vapour in them, vapour of a solvent oil is introduced into the gases, which are then passed through a condenser, whereby the solvent oil and the naphthalene are condensed together. This condensate may be separated from aqueous liquor, simultaneously condensed, and returned to a still in which the required vapour of the solvent oil is being produced. In this way, the operation becomes continuous; and marketable naphthalene may be periodically withdrawn from the still.

Manufacturing Incandescent Gas-Mantles.

KREIDL, I., and HELLER, G., of Vienna.

No. 17,862; July 31, 1909.

This invention relates to the manufacture of gas-mantles of artificial silk. In the existing processes, the impregnating salts are converted on the fibre of the mantle into the corresponding hydrates by treating the salts—such as thorium nitrate, for instance—with ammonia. Now in this treatment not only the hydrate salts, but also alkali-salts (such as ammonium nitrate) are formed on the fibre; and these alkali-salts have to be completely eliminated, because their presence prevents the proper formation of a mantle. The present invention has for object to provide an improved process, in which the formation of the alkali-salts is prevented, and which consists substantially in the direct impregnation of the raw mantle fabric with thorium hydrate in the form of a colloidal solution of thorium hydrate ("sol").

The process is carried out by impregnating the raw mantles (preferably those made of artificial silk) with a solution of colloidal thorium hydrate ("sol"), to which there has been added the usual proportion—that is, about 1 per cent. of the amount of the thorium oxide—of cerium oxide in the form of a salt or of a colloid. This impregnation may be carried out according to any of the methods usually employed in the case of thorium nitrate solutions. After impregnation, the mantles are dried.

After drying, the mantle is subjected to an additional treatment having for object to impart a more coherent structure to the mantle after it has been incinerated. With this object, the "sol" on the fibre is converted into the "gel." For this purpose, it is best to use ammonia as a coagulating agent—preferably in solution. As no salts are formed in this treatment, no subsequent washing of the mantle is necessary. After drying, the mantle is incinerated.

Whereas the treatment of the raw mantle with ammonia according to existing methods has for its object, the patentees remark, to convert the thorium salts into hydrates on the fibre itself, the treatment with

* According to Graham, "Philosophical Transactions" of the Royal Society, 1861, "the colloidal solutions, *per se*, are called 'sol,' and those colloidal bodies which have become insoluble by mechanical treatment, or the influence of heat, or under the action of chemical agents, are called 'gel.' See also 'Liebig's Annalen der Chemie,' 1862."

ammonia according to this invention is merely an additional treatment intended to coagulate the hydrate existing already on the fibre.

Mantles produced by the process are said to be extremely elastic and strong, and possess great illuminating power.

Vertical Gas-Retorts.

GIBBONS, W. P., and MASTERS, J. R., of Palace Chambers, Westminster, S.W.

No. 17,112; July 22, 1909.

This invention relates to retorts of the vertical (or inclined) type, of the kind where the retorts of a setting are subdivided into groups and the heating and secondary air ducts are so arranged that one or more groups may be cut out and rendered accessible for repairs while the remainder in the setting continue in use. The regenerator is subdivided into sections corresponding in size with the capacity of the respective groups of retorts with which they are associated; the secondary air required in the heating of each group of retorts being pre-heated in a separate section of the regenerator, separately led to the combustion chamber of the corresponding group of retorts, and separately controlled by suitable dampers or valves.

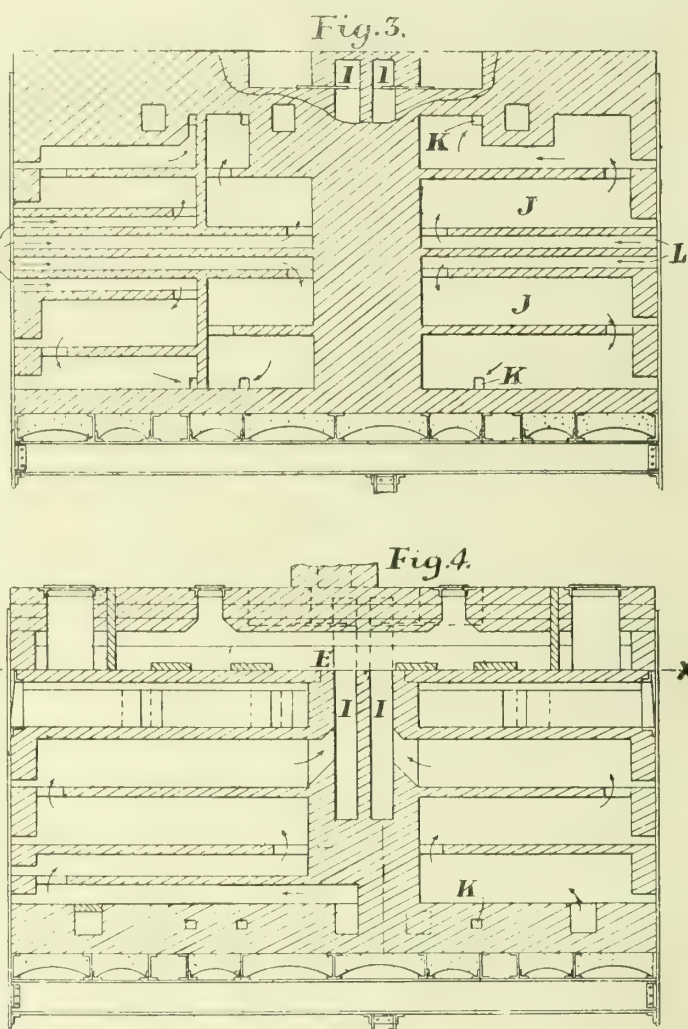
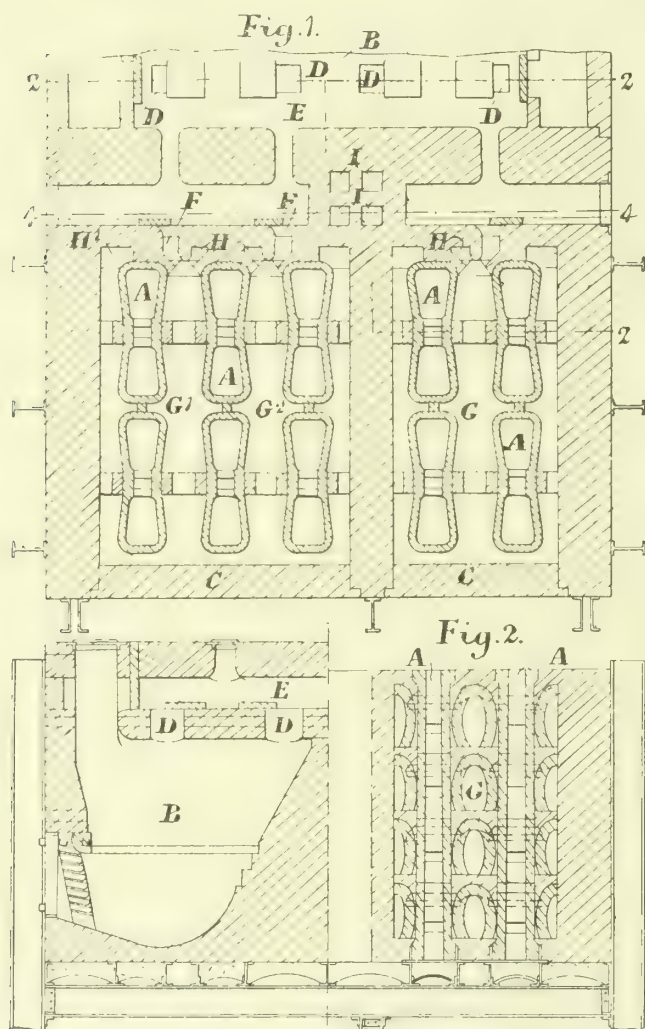
The invention consists in arrangements according to which the producer for generating heating gases for the retorts is placed between the

parallel rows of retorts and the heating gases are delivered to a central gas-duct extending between the two rows. Ports controlled by sliding dampers or other suitable valves connect, in the usual manner, this main gas-duct with the ducts leading to the combustion chambers of each group in which the heating gases mix with the secondary air supply and are burned.

In order to obviate the necessity of shutting down the whole setting of retorts for the purpose of repairing the producer or regenerator, the producer may be duplicated—the two producer furnaces being placed back to back, so that there will be a furnace always ready as a standby. Each producer is arranged to deliver the heating gases to the central flue; the communicating ports being controlled by dampers so that either furnace can be cut off as may be necessary.

Fig. 1 is a sectional plan view of one side of a duplicate setting of retorts in which the producer is interposed between the two halves of the setting. Fig. 2 is a vertical section on the line 2 of fig. 1. Fig. 3 is a longitudinal section through the regenerator showing the arrangement of secondary air flues. Fig. 4, above the line X, is a section on the line 2 of fig. 1, and below the line X is a section on line 4 4 of the same figure—showing the course of the waste-gas flues through the regenerator.

In fig. 1, each of the retorts A is shown as a double retort, the two members of which are placed back to back, as described in patent No. 16,925, of 1909 (see *ante*, p. 468); but the double retorts may be replaced by single ones of ordinary construction, and no claim is made



Gibbons and Masters' Vertical Gas-Retorts.

to double retorts *per se*. As shown, the double retorts are divided into two groups on each side of the producer B—one of six and the other of four. This arrangement is duplicated on the other side of the setting. In any case, the setting is so constructed that each group of retorts is accessible for repairs by the removal of an outer wall, or part of an independent outer wall (as C), of the setting.

Preferably (as shown) the producer is placed between the parallel rows of retorts, and is double; the two producer furnaces being placed back to back, and each being provided with ports D, which can be closed by dampers, so that either furnace can be cut off for purposes of repair without shutting down the whole setting. The heating gases from the producer pass to a central flue E, and thence, through ducts F controlled by dampers, to the combustion chambers G¹ G² between adjacent retorts, where they mix with the secondary air supply—entering the chambers by the ducts H. Here they are burned; the burnt gases passing around the retorts and thence by the ducts through the regenerator, in which the secondary air supply is pre-heated, to the damper controlled waste-gas flues I.

The regenerator is divided into sections, according to the capacity of the respective groups of retorts with which they are associated; the secondary air required in the heating of each group of retorts being separately heated. Thus the secondary air delivered to the combustion chamber G is, in the arrangement shown in the drawings, heated in the sections J, passing thence, through the ducts K, to the upper and lower ends of the combustion chamber. Similarly, the heated air from other sections is led through ducts to the combustion chamber G¹, and

that from still other sections through ducts to combustion chamber G². The various air inlets L to the regenerator are independently controlled by dampers or valves not shown.

Gas-Lighting Apparatus.

GAS-LATERNEN-FERNZÜNDUNG (SYSTEM DR. ROSTIN) G.M.B.H., of Berlin.

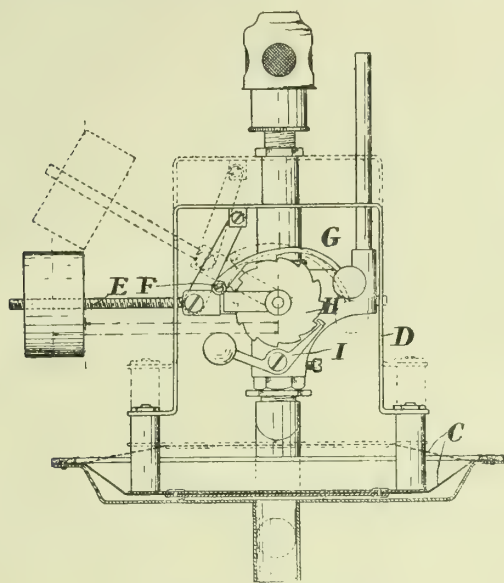
No. 25,081; Nov. 1, 1909. Date claimed under International Convention, Nov. 6, 1908.

This invention relates to apparatus for igniting and extinguishing gas-jets from a distance, of the type in which "the valve is operated by a predetermined maximum pressure in the gas supply pipe, and which will not again operate the valve until the pressure has been reduced to normal and raised again to the maximum." The use of steadying valves, as described in patent No. 7289 of 1904, increases the cost of the apparatus; and the object of the present invention is the construction of such apparatus without the use of these valves.

The apparatus is arranged with a swinging lever by which the ratchet wheel of the valve is rotated; and to the lever a weight is applied to determine the maximum pressure—the length of the lever and the weight applied to it being such that, when the lever swings upwards to rotate the ratchet wheel of the valve, a reduction of the effective leverage, and therefore of the opposing force, takes place.

A diaphragm C (which may be substituted by a bell or a piston)

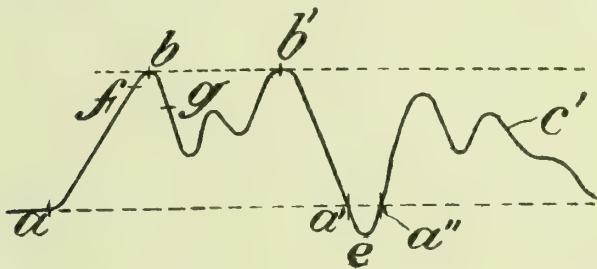
under the action of the gas imparts its motion by a yoke D to a lever E, which rotates round a pivot of the valve spigot. On the outer end of the lever a counter pressure weight is mounted—adjustable on a screw thread; and to this lever is pivoted at F a pawl G engaging in the teeth of a ratchet wheel H. A catch I prevents the ratchet wheel being rotated backwards unintentionally. The movements of the wheel are imparted to the spigot connected with it; so that the latter is alternately moved into its open and closed positions during the corresponding movements of the wheel H.



Rostin's Gas-Lamp Lighter.

The position of the individual parts of the device shown in full lines corresponds to the preparatory position for the next actuation of the valve. The position of the weight corresponds to the greatest operative leverage A; so that the counter load produced by it is equal to a definite gas pressure. If this pressure is exceeded, the lever arm E begins to rise until the weight has moved into the position shown in dotted lines, when the maximum pressure has been reached. The operative leverage of the weight has now diminished to the amount B. When it moves, the wheel H has been rotated one tooth by the pawl G, and has actuated the spigot, and consequently opened the passage of gas to the burner.

In order to prevent fluctuations of pressure between the amount g and the initial degree of pressure a from acting on the tap, the length of each of the teeth of the ratchet wheel must bear a definite ratio to the lift of the lever E. When the pressure has again fallen to normal—for example, a^1 —then the nose of the pawl G will engage in the next tooth, without, however, actuating the ratchet wheel. The latter is consequently again in the working position. If the pressure sinks still further—for example, from a^1 to e —then the pawl will not move further backwards inasmuch as the stroke of the diaphragm or bell is limited.



Now if pressure again returns to the initial pressure a^1 , then the parts of the apparatus will occupy the same position as at a^1 . Now if the pressure again rises in the manner shown according to the curve c^1 , then the ratchet wheel will not be rotated, as the weight with its greatest effective lever length of arm will prevent the lever lifting, and consequently rotating, the ratchet wheel. Only on again attaining a degree of pressure f will the pressure begin to overcome the counter-pressure; while only on reattaining the maximum pressure b will the lever be raised and the ratchet wheel rotated, and the gas tap again actuated and the closing of the tap effected.

From this, it will be seen that a reopening or reclosing of the gas-tap after a previous opening or closing can be effected independently of all fluctuations in pressure, only after the gas pressure has first been reduced to the initial pressure and subsequently raised to the maximum pressure b , or to an amount f nearly equal to it.

Brighton and Hove Gas Company.—At the ordinary general meeting of the Company next Friday, the Directors will report that, compared with the results for the six months ended the 30th of June, 1909, the sale of gas in the past half year showed an increase of 5,556,900 cubic feet; while the sale of residuals produced £394 more. The half-year's profits, including £32 received for interest, amounted to £32,186, to which is added £12,958 brought forward; making a total of £45,144. After charging interest on the debenture stock, &c., and £2000 in respect of the cost of the new Act, a sum of £40,425 is available for distribution; and the Directors recommend the declaration of dividends for the half year at the statutory rates of 6, 4, 11, and 8 per cent. per annum on the several classes of consolidated stock. The payment of these will require £23,653, and leave £16,772 to be carried forward.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Free Wiring and Fittings' Sales by Electrical Undertakings.

SIR,—May I draw the attention of your readers, and especially of those interested in the gas industry, to the extraordinary activity now being shown by the Incorporated Municipal Electrical Association, in trying to persuade all corporations who own electrical undertakings, to support them in again introducing a Bill in Parliament that will allow them to undertake free wiring and the sale of electrical lamps and fittings. Through the energy displayed, and the work done by the Electrical Contractors' Association and the Ironmongers' Federated Association, we were able to prevent this being embodied in the Electric Lighting Acts (Amendment) Bill of last year.

I am writing to point out how serious will be the position of private gas companies, and the gas industry generally, if the object is attained for which these municipal traders are working. Donations in support of a scheme whereby municipalities might do all the work themselves are being asked by municipal associations all over the country.

I have addressed a letter to Mr. J. W. Helps, the Past-President of the Institution of Gas Engineers, pointing out to him that the two Societies named—the Electrical Contractors' Association and our own—received no support from the gas industry in the parliamentary work we did last year.

Gas companies and private consumers are, at the present moment, compelled to pay rates—so supporting electrical undertakings, many of which are not paying their way. In this city, the Electrical Committee voted some £25 to support the Leicester Corporation in fighting a case against private traders. The Corporation, in general meeting assembled, struck out this item, and fortunately would not allow the rates to be used for business of this description. This, however, has not been the rule over the country, and sums of money have been promised and collected out of the rates, and will be used practically to fight an industry that your readers support.

We shall have a big fight in Parliament over the new Bill that is to be introduced; and surely, before it is too late, the gas industry should support those who did such good work last year in opposing this municipal trading, the object of which is to bolster up a particular industry out of the ratepayers' pocket.

R. H. SMITH, F.R.G.S., F.C.S.,
General Secretary of the Ironmongers' Federated Association.

Apsley House, Sheffield, Aug. 12, 1910.

LEGAL INTELLIGENCE.

Position of the St. David's Water and Gas Company.

Last Wednesday, Mr. Morrison applied to the Vacation Judge (Sir Samuel Evans), on behalf of Mr. Painar, a debenture-holder in the above-named Company, for the appointment of a Receiver and Manager, on the ground that several creditors were threatening to take proceedings for the recovery of the amounts owing to them, and that the Company could not obtain credit for coal to enable them to carry on the business. The Company did not object to the appointment. His Lordship said he had no power to appoint a manager in the case of a statutory company. Mr. Morrison said he understood Mr. Justice Joyce had made such an order in a similar case. His Lordship inquired what was the amount of the debenture. Mr. Morrison said it was £50, and the interest was a year in arrear. Counsel for the Company said he was not in a position to oppose the appointment of a Receiver, and if a Manager could be appointed it would be as well, as otherwise the consumers in the district would be deprived of their supply of gas. Creditors were prepared to give further credit if there was someone in control in whom they had confidence. His Lordship: If the Company cannot get further money, how can a Receiver get it? Mr. Morrison: He could collect the rents. His Lordship asked whether the Secretary had made an affidavit; and on being informed that he had not done so, he said he could not make the order. The application might be renewed on a future occasion.

Bucks and Oxon Gas Company.—Messrs. Corbould-Ellis and Mitchell have presented a petition for the compulsory winding-up of the Bucks and Oxon Gas Company, and it will be heard before Mr. Justice Neville on the 18th of October. The "London Gazette" contains formal notice that any creditor or contributory of the Company desirous to support or oppose the making of an order on the petition may appear at the time of hearing, by himself or his counsel, for that purpose if he intimates his intention to do so not later than 6 p.m. on Oct. 17.

Increased Gas Supply at Taunton.—In the report presented at the annual meeting of the Taunton Gas Company last Tuesday, the Directors stated that the total quantity of gas sent out during the twelve months ended the 30th of June had been 109,164,800 cubic feet. The amount of profit available for distribution was £7568, out of which the Directors recommended dividends at the rates of 5 per cent. on the preference stock, 9 per cent. on the consolidated "A" stock, and 7½ per cent. on the "yellow" shares and on £12,900 of new ordinary stock, absorbing £4174. The Chairman (Mr. J. Barrett), in proposing the adoption of the report and accounts, said that the Company had been on the progressive grade for a great many years; and in the past year there was an increase of 3,372,800 cubic feet in the quantity of gas sent out, while it had been of extremely high quality. The report was adopted. Among the votes of thanks was one to the Secretary and Manager (Mr. A. J. Edwards) and the members of his staff, for the zeal and efficiency they had shown in connection with the Company's business. At a special meeting, the Directors were authorized to issue new ordinary 7 per cent. stock to an amount not exceeding £5000.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

Retirement of the Secretary and Treasurer—Reduction in Price.

The Half-Yearly General Meeting of this Company was held last Tuesday—Mr. H. WADE DEACON in the chair.

The report and accounts for the year ended the 30th of June showed that the sale of gas produced a revenue of £521,681; the rental of meters and stoves came to £16,549; residuals yielded £98,806; and the total receipts were £637,637. The expenditure on the manufacture of gas was £388,856 (coal and oil costing £273,256, and repair and maintenance of works and plant £64,215); on distribution, £54,426; on management, £21,632; the contributions to the officials' superannuation fund and the Company's moiety to the superannuation of old officials came to £5205; and the total expenses were £508,327. The balance of £129,300 was carried to the profit and loss account. After deducting the amount taken for the dividend declared in February and interest on the debenture stock, there remained a balance of £71,323, out of which the Directors recommended the payment of a dividend for the half year of 5 per cent. on the consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock.

The CHAIRMAN, in moving the adoption of the report, said that, in accordance with a resolution passed at a special meeting in February, the Company, along with other gas companies, promoted a Bill for the introduction of a standard burner for the testing of gas. The Bill had passed through the House of Lords and through the Committee of the House of Commons, and was now awaiting the third reading in that House, which they hoped it would receive in due course. He had considerable pleasure in reporting that the accounts showed the past year to have been a very satisfactory one; for they had had an increase of about 1½ per cent. in the consumption of gas. The capital expenditure had gone up by £7557, partly owing to the new oil reservoir at Garston [see *ante*, p. 463], and partly owing to meters. The expenditure on the manufacture of gas amounted to £388,856—a decrease of £9502 as compared with last year. The decrease was chiefly in coal (£9983); and there was a drop of £3866 in wages, which was most satisfactory as showing the economical working resulting from better apparatus. But there was an increase of £4000 in repairs and maintenance. The distribution of gas cost £54,426, a decrease of £2000; public lamps showed an increase of £150; rent and taxes were £667 more; there was a small increase in management expenses of £300; and law and parliamentary expenses were increased by £800, due largely to promoting the Bill referred to, and partly owing to expenses connected with the arbitration with the Corporation. The superannuation funds and moities had increased by about £300. The total expenditure of the year was £508,327, compared with £508,000 odd for 1908-9. The receipts from the sale of gas amounted to £521,681—an increase of £7303, which was extremely satisfactory. He was glad that the increase concerned all classes—private tenants, users of automatic meters, and public lighting. Meters and stoves showed an increase of £529; but coke had done badly, as the receipts—£55,542—were £4271 down. The price of coke had not been satisfactory; and the Company had had to suffer in common with other gas undertakings. Tar had done better for them; the receipts (£22,304) showing an increase of £2867. Ammonia had not done so well; the receipts (£20,959) being £1645 less than before. The total receipts were £637,637. Deducting from this amount the total expenditure of £508,327, there was left a balance of £129,310, which was placed to the credit of the profit and loss account. After deducting the interest on the two half-yearly dividends, there was a balance of £71,323 to carry forward. From this fell to be deducted the half-yearly dividend now to be paid; and assuming that the dividend recommended would be passed, there would be a balance of £18,140. The Directors proposed to reduce the price of gas to ordinary consumers by 1d. per 1000 cubic feet, as from the 1st of July last, and to prepayment meter users by 2d. per 1000 cubic feet, which would come into operation by the beginning of next month. These reductions would amount to something like £19,000; but this sum represented money which had accumulated. He hoped the reductions would prove satisfactory to those who used gas. The endeavour of the Directors had always been to do everything in their power to cheapen the cost of production, and so reduce the prices at which they could afford to sell gas. He had now two important announcements to make. The Board had received a communication from the Secretary, Mr. P. F. Garnett, resigning his position. He had also to announce the resignation of the Treasurer, Mr. John Frederick Robinson, who had been with them for 37 years. Mr. Robinson had seen great changes in the constitution and in the working of the Company. He had taken the keenest interest in the work; and, on behalf of the Board, he (the Chairman) desired to express sincere regret at losing him.

Alderman JAMES LISTER seconded the motion, and it was carried.

BOURNEMOUTH GAS AND WATER COMPANY.

Increased Output—The Standard Burner Bills.

The Ordinary General Meeting of this Company was held on Friday, at the London offices—Mr. G. CRISPE WHITELEY presiding.

The half-yearly report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he had less than usual to say on this occasion. The Company had had a most successful half year, and he doubted whether he, or his predecessors in the chair, had been able to put a happier state of affairs before the shareholders. There had been an increase in the output of gas of 4·56 per cent.; while there was an increase of nearly £1000 on the water-rental. Residuals had gone up by £2000. The Company had, moreover, been able to get cheap oil and coal, with the consequence that everything had gone well. Under the circumstances, there was very little for him to do but to congratulate their Engineer and General Manager

(Mr. Harold W. Woodall) upon the result of the half-year's work. He congratulated Mr. Woodall, both in his capacity as their Engineer and as representative of the staff. As to the future, he (the Chairman) thought that those who held gas shares and were interested in gas-works could look forward calmly to what was in store for them. It might be that they would have to pay more money for coal. But, on the other hand, they would probably have to give less for oil; and even the higher price of coal would to some extent be compensated by an increased price for their residuals. Electricity would not, of course, stand still. But neither would they; and they must leave it to their Engineer to meet the lessened price of electricity by reducing the price for gas. The Company had held their own in the past and at present; and there was no reason why they should not hold their own in the future. But the proverbial rainy day might arrive; and the Directors were providing against this by strengthening their undertaking. They had completed the purchase of their freehold stations at Longham and Alderney. During the last few years, their General Manager had properly called upon them to expend considerable sums for the improvement of the business; and they had used a portion of their reserve for this purpose. During the past six months, however, there had been a lull in this expenditure; and the Directors had been able to increase the amount of the reserve put into outside securities. They had invested £20,000 of the reserve, £15,000 of which had been lent to the Bournemouth Corporation. This should strengthen the tie between the Corporation and the Company. The Company's offices at Poole Hill were now insufficient to cope with the increased work. The Directors were therefore going to make a reasonable expenditure in remodelling, enlarging, and beautifying them. Their co-partnership scheme had turned out a complete success. Although it had only been going on for two years, they had now 393 members, practically all who were qualified to join. The Company had given in bonuses during the past two years £3500; and, what was better, the workers themselves had invested £700 of their own money with the Company, which showed how the scheme was encouraging thrift. There were 83 shares in the Company held by workers, and 43 workers were shareholders. Referring to the Gas Companies (Standard Burner) Bills, now before Parliament, the Chairman explained that the Company had been working for many years with an obsolete standard burner, and, together with other companies, they thought it was time to secure modern apparatus. This would benefit the Company and do no harm to the consumers. For reasons he was unable to faim, the Bill had been contested at every point in its passage through Parliament; but it had now passed the Committee stage of both Houses, and only awaited the final reading. The Directors hoped that the time and money spent over this matter would not be wasted, and that the Bill would ultimately become law. Although the Bournemouth Corporation had opposed them, they were not going to allow this to affect the good relationship still existing between the two bodies, as the dispute was in the nature of a "lovers' quarrel." Whether the Bill passed or not, the Company had gained an advantage in the clear and interesting evidence given on their behalf before the House of Commons Committee by their colleague Mr. Cash, whom he called upon to make a short statement on the matter to the meeting.

Mr. WILLIAM CASH, in seconding the motion for the adoption of the report and balance-sheet, said they had more than one object in view in asking for the standard burner. He believed that the adoption of such a burner would be an advantage to consumers and likewise to the Company. Then there was the question of uniformity of test. The burner had been adopted by many other companies and local authorities, and it was approved by the London Gas Referees, who had the power to prescribe the kind of burner which should be used for the testing of gas in the London area. The Corporation of Bournemouth opposed the application by the Company, not in any spirit of hostility, but to secure what they believed to be the interests of the ratepayers. The burner would be an advantage in this way. The Company were compelled to give 15½ candle power light, and with the present burner they had now to give a slightly higher power in order not to fall below the standard. The new burner would enable them to get the true illuminating value. Consumers need have no fear but that they would get the best value commercially possible, because it was to the interest of the Company to give it to them in view of the great competition they had to face. They had not only to meet the competition of electricity, but gas had a rival light in acetylene; and for power purposes, in oil and steam engines. It was therefore essential that the Company should supply a suitable article. Not only had they done so, but they had very much decreased the price of gas from year to year. The figures as to this were striking. Their price in December, 1897, was 3s. 6d. per 1000 feet, which was reduced in 1898 to 3s. 4d., and in 1901 to 3s. 2d. In 1903, the price was brought down to 3s.; in 1908, it had got as low as 2s. 9d.; and from Ladyday this year, it had been 2s. 7d. When the Company took over the Poole gas undertaking in 1902, the price in the district was 4s. 4d.; now it was 2s. 11d.—a reduction of 1s. 5d. in a short period of 7½ years. He also asked the shareholders to remember that, though they made these reductions, the Company had never taken out of the business the full money they might have done for division among of the shareholders—in fact, they could have paid much larger dividends than they had done. As to the co-partnership scheme, this was bound up with the question of gas. The interests of both the co-partners and the Company were identical; and this was another inducement to the Company to sell gas at the lowest price possible. As a matter of fact, the shareholders in the Company had not received a large return for their money, because the dividends and interest paid worked out at 5½ per cent. on the total sum put into the undertaking. He hoped the Bill for a standard burner would become law, and give the Company the advantages they hoped for from it.

The motion for the adoption of the report was unanimously adopted, and was followed by a vote of thanks to the staff.

Mr. HAROLD WOODALL, in responding, said that in the ten years he had been at Bournemouth the output of gas had increased 127 per cent. The staff were glad to know that they had the confidence of the Directors, and would continue to do their best for the success of the business.

Mr. H. A. PLUMB (the Secretary) also returned thanks; and the meeting terminated with the usual compliment to the Chairman.

WANDSWORTH AND PUTNEY GAS COMPANY.

Low Capital, Low Prices, and Large Dividends—Apotheosis of the Horizontal Retort.

The Half-Yearly Ordinary General Meeting of this Company was held last Tuesday, at the Offices, Fairfield Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice of meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said there was one matter in the former to which he must first make reference. The Directors had lost their esteemed colleague, Mr. Edwin Ransome, who had given service to the Company as a member of the Board for forty years. He was one of the most consistent, painstaking, and broadminded of Directors. He came on to the Board at an important epoch in the Company's history, just when it had emerged from the Court of Chancery. A section who had revolted (and this extended even to the Directors) succeeded in landing the Company in the Court of Chancery. Mr. Thomas Symonds Howell, the son of the first Chairman and founder of the Company, was then the Chairman. He looked about him to find a Board to carry on the business; and he found two Directors in the persons of Mr. Edwin Ransome and Mr. Robert Jones. Had Mr. Howell searched London through, he could not have found two gentlemen who would have given more devoted or valuable service. Mr. Ransome had taken care of the finances and their audit. The difficulty that they had through the defalcations of a former Secretary would be remembered. Since then there had been very great care exercised over the audit; and there had also been a Directors' audit. Mr. Ransome devoted himself so thoroughly to the revision of the accounts of the Company, that in him they had an exceptional and quite abnormal colleague. He was a genial colleague—very determined, and very firm; but at the same time he was unpretending and modest. They all regretted, and mourned for him.

Turning to the accounts, the Chairman said he thought that probably never in the history of the Company had they more reason to congratulate themselves than on this occasion. He might fairly say it was a record that the Company had supplied gas at such a low price, and yet had such a favourable report to present. The report informed them that the Directors recommended dividends at the rates of £8 5s. per cent. per annum on the "A" stock, £6 15s. on the "B" stock, and £5 15s. 6d. on the "C" ordinary stock. These dividends, so far as they referred to the original stocks, were very large indeed, because the capital was added to on conversion. He was not ashamed to call attention to the fact that they were very large, and never should he be while he could show the world they were supplying gas at a low price. The dividends appeared much larger than in reality they were, because the sum of the "A" stock was small; and, on the report such as they had here, the dividend worked out to less than 5½d. per 1000 cubic feet. This circumstance was derived from the fact that, though they paid handsome dividends, the capital was extraordinarily small. It was only small through the engineering "foundation-stone" laid by Mr. Robert Jones, and supported by Mr. Thomas Howell and Mr. Ransome in the early days of the Company, and perpetuated afterwards by Mr. H. S. Freeman, their late Engineer (who was one of the most valuable Directors the Company could have), and now to some extent by their present Engineer (Mr. H. O. Carr). These dividends and the low price of gas proved the value of good engineering—not merely gas management—in the administration of a company. The dividends, handsome as they were, and small as the profit was which was necessary to pay them through the low capital, were not arrived at by the starvation of the works. There was one factor in the accounts that would go home to anyone who understood gas accounts, and that was that the charge for the upkeep of the undertaking was not less than 9½d. per 1000 cubic feet. Large profits and high dividends that were arrived at without due attention to this important consideration were of little value. Before dismissing the working, he should like to say that the details of it—the gas made per ton of coal carbonized, the coke returns per ton, the ammonia, the tar, and, in fact, all the residuals, and the wages spent on carbonization—were all creditable to the administration and to the Engineer. He did not, however, think they were at their best, because during the half year they had been engaged in installing some new plant.

They had, in consequence, been working off some of the old machines which were the invention of Mr. Freeman, and which had produced a great deal of profit in their time, because, for a great number of years, the Company had been carbonizing by machinery, and they commenced doing so when such machinery was not well known to the gas undertakings generally in the kingdom. Good and serviceable as these machines had been, they were not now comprehensive enough for the work required in connection with the extensions they had been recently making; and one of the advantages from the changes they had effected would be that they would get better returns from their retorts than they had had before. Not only in connection with this Company, but generally, the period might be described as that of the apotheosis of the old horizontal retort, which many people for years past had been decrying, and had been endeavouring to improve upon by setting their retorts at angles and perpendicularly. But never, in his long experience of fifty years, had he seen such splendid returns and low carbonizing costs as were being produced from horizontal retorts at the present day by a number of gas undertakings in the kingdom, and especially those in the Metropolis, which he hoped would continue to keep the lead in this respect in the country at large. They would have the benefit of this at their own works through their new extensions, which comprehended a system by which the retorts could be fully charged, and the spent charges expelled by a pusher. If they obtained the results to which they were looking forward, it was possible the present low price of gas to ordinary consumers—1s. 10d. per 1000 cubic feet—might even again be reduced, and the dividend be further increased. Neither the Board nor their Engineer saw any particular virtue in the 1s. 10d. Though it might attract the admiration of some of their friends, and the envy of others, it was not in this spirit that they worked for the low price. They simply went on in the hope of getting the lowest price and

the highest dividend by adopting processes economical in working, and so realizing what was of capital importance—that was the meeting of the demand of the present day for gas for fuel purposes. Gas must be so cheap now that people would burn it in preference to any other fuel. It was the ideal fuel; and the means of delivery and use occasioned no labour to the user, either in the home or in the factory, and, moreover, it made no smoke. In spite of the 1d. reduction in price (which last half year represented £2280 to the consumers), they had actually made an increase in the revenue of £157; and this in a half year when the increase in consumption was only equal to ½ per cent. This proved they could not always force the consumption by reducing the price; but it was right to reduce it, because, if it did not bear immediate fruit, it would do so in the near future. The secret of success were the economies of their working, which went on in spite of the 9½d. spent on upkeep, and which made their expenditure £2734 less, the larger part of which, of course, was represented by coals and oil.

The number of consumers had been increased by 290; more stoves had been fixed to the number of 270; and they had 224 more coin meters and fittings connected. This brought him to a point that had struck him very much—that was, the growing necessity of capital for the purpose of putting meters, fittings, and stoves into consumers' houses. It was business they would not have obtained without providing this capital. But it was not very remunerative capital, except by the sale of gas; for the rental from meters, stoves, fittings, and so on amounted in the half year to £10,400. But on the other side of the account, the upkeep of meters, stoves, coin meters and fittings, incandescent burners, and so forth, practically amounted to £9400; and this though the capital represented by all these things could not amount to much less than £150,000. In other words, the whole of the income disappeared in the upkeep of them. But what of that, if they could not get this business without supplying these things? And they did by these means enhance the sale of gas for day purposes compared with night purposes, which made the business in the long run profitable to the Company. He had some figures that had been got out in connection with their quinquennial rating; and they showed how large was the expenditure of capital nowadays for this sort of thing, as compared with works, in which (as he had said) they had been especially economical. They found that, in the past five years, they had had to spend no less than £32,500 upon meters, stoves, and fittings, as against £9361 for such things as works, mains, and service-pipes. This showed that the new business was demanding four times as much capital as the ordinary extension of the works. The figures were striking; and indicated the trend of their business.

It would be seen that the Board had filled the position held by Mr. Ransome by the election of Mr. Frank Harding Jones. He (the Chairman) was never more gratified than he was when informed by the Deputy-Chairman and Mr. Freeman that their views and those of their colleagues—Colonel Jones and Mr. J. B. Howell—were that the vacancy should be filled by a technically qualified Director, and that, looking at his (the Chairman's) advancing age, it would be as well to provide for the continuance of the policy which had been such a fortunate one for the Company. It was indeed gratifying to him that the selection by his fellow-Directors should have fallen upon his own son. He might say that, in addition to his technical training, Mr. Frank Jones was a Director of certain other companies with low prices and low capitals; and having been Auditor of this Company, he was specially acquainted with the business and figures. Quite apart from his professional interest, he was sure the historical association of the family with the Company would ensure that the new Director would give of his very best to the furtherance of their affairs. Regarding the vacant Auditorship, the Board felt that they could not do better than obtain the services of Mr. Ernest Burton, who was a competent accountant and had been for many years secretary of important gas undertakings, and knew the whole business from top to bottom.

They had now adopted a profit-sharing system among their workmen, who had taken it up in an enthusiastic spirit. The Deputy-Chairman was the Chairman of the Committee who had the matter in hand. He was glad to say they were able to begin with 6½ per cent. bonus on the wages, owing to the price of gas having been reduced just before it started. About 200 of the men had entered into the scheme; and he did not think there was more than a single case of any hesitation to take up the matter. He was sure it would in their own case, as it had done in other companies, operate to the benefit of the whole undertaking. In another direction they had not been idle. A large and important property—Murray's wharf and dock—which adjoined their works, came into the market a few months ago. It was a dock lying between the River Wandle and the Company's own gas-works' boundary. The Directors had bought this; and it had made their position almost unrivalled. They had now a river frontage and territory for future development which was, practically speaking, not enjoyed by any other gas company of which he knew. The Company's steamers ran direct with coal from Newcastle to opposite the works, and were unloaded between the works and Hurlingham polo ground; and the dock would give them further facilities. The property was purchased on excellent terms. It was going to almost immediately pay them 4 per cent. on the outlay; and, apart from this, it would add very much to the convenience and improvement of the whole works. In his concluding remarks, the Chairman mentioned that he came to serve the Company as Manager when he was only 17 years of age; and as he was now 67 years of age, he had had a tolerably long connection with the concern.

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell) seconded the motion.

Mr. ERNEST L. BURTON congratulated the Directors and the officers on the accounts. He noticed that the residuals had returned 73 per cent. of the cost of coal, oil, coke, and water, and carbonizing wages. It was the best figure he had come across so far as he could charge his memory; and it reflected the greatest credit on the Chairman, Directors, and executive officers. He also congratulated the proprietors generally on the appointment of Mr. Frank Jones as a Director. As to co-partnership, it was the right thing to do; and he had every sympathy with it.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by the DEPUTY

CHAIRMAN, the dividends mentioned in the opening address of the former were unanimously agreed to.

Moved by Mr. DUKE, and seconded by Mr. JOHN HENNEL, Mr. Burton was unanimously appointed Auditor.

Mr. BURTON, having acknowledged his election,

A vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded, moved a vote of thanks to the Engineer and the Secretary, their staffs, and the employees generally. In doing so, he took the opportunity of mentioning that the Company withdrew from participation in the promotion of the Standard Burner Bills, seeing that they were threatened with strong opposition from the Borough Council (with whom they were on excellent terms) and the London County Council, who would very much like to get an oar in the Company's boat. He learned that the County Council had been testing their gas with the wheelbarrow photometer; and the return was 13.97 candles—only a small fraction below their standard. As this result was obtained behind the Company's back, under crude conditions, and round the corner as it were, he thought it very flattering to the Company and their Engineer.

Mr. FREEMAN seconded the motion, which was cordially passed.

Both Mr. BRAINE and Mr. CARR responded; and the proceedings terminated.

CROYDON GAS COMPANY.

Consumption—Gas-Fires—Standard Burner Bill—Co-Partnership.

The Half-Yearly General Meeting of the Company was held last Friday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice of meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said it would have been noticed that there had been a slight diminution in the sale of gas in the half year. This, in great measure, must be attributed to the very mild winter that was experienced. But he was sure it would be gratifying to the proprietors to know that, since the end of the half year, the consumption of gas exhibited an $8\frac{1}{2}$ per cent. increase; so that, it would be seen, they were still able to hold their own, and show a satisfactory increase when the weather was anything like favourable. There had been a steady, quiet growth both in the number of consumers, and in that of stoves on hire. The former had increased by 636, to a total of 36,280; the latter by 561, to a total of 24,882. When considering the number of stoves on hire as an indication of the increasing extent to which gas was being used for heating and cooking, it must not be overlooked that a large number of consumers elected to own the fires they used. Some bought them outright at low cash prices, others by easy instalments, and very frequently consumers, after hiring a stove, and thus satisfying themselves as to its convenience and utility, took advantage of the favourable terms the Company offered, and purchased at a price in fixing which the rents they had paid were taken into account. The Company had sold to consumers in these ways over 1300 stoves in the last three years. No doubt also a good many stoves had been bought by consumers direct from the makers, or through tradesmen. Of these, the Company had no record. It was gratifying to note that the appreciation shown by consumers of the Company's offer to give free attention to incandescent burners continued to be a steadily growing one. As he had before said, the cost to the Company of giving this free attention to consumers' burners was considerable; but the increased efficiency which the consumer was able to obtain from the gas used, made the value of this service to him far greater than was its cost to the Company.

It would have been seen from the report that the Standard Burner Bill, the promotion of which was approved by the proprietors at the meeting in February last, had not yet actually passed into law, though the Directors had grounds for confidently expecting that it would do so before the end of the year. Both in the House of Lords and in the House of Commons, it was strenuously opposed before Committees by certain local authorities, who apparently failed to realize how completely the interests of gas companies and their customers were identified nowadays. He was pleased to be able to tell the proprietors that the local authorities in the Company's area did not take part in this attempt to prevent gas companies securing a standard which would assist them in adopting those methods of manufacture which the progress of gas engineering in recent years was showing to be best adapted for enabling gas undertakings to give to their consumers the gas best suited to their requirements at the lowest possible price. The case for the adoption of a fair and uniform method of testing had been so fully substantiated during the full and costly examination of the question by both Committees that it was hardly likely to be fought again. It was too early yet to say what might be the exact results of the adoption in the district of the new burner for gas testing, when its use was sanctioned by Parliament. This much he could, however, say: That while care would be taken to see that the consumers got in the future a gas certainly not less suited to their requirements than that now supplied, the freedom to adapt manufacturing methods to modern requirements would be of material assistance to the Directors in their efforts to reduce the price at which gas was sold. The proprietors would all, he was sure, share the satisfaction with which the consumers would receive the announcement that the Directors had seen their way, without waiting for the passing of the Bill, to make a reduction in the price of gas after the end of the quarter. This was a very considerable gain to users of gas; it would represent above £5000 a year to the Company. Put in another way, it was about the same thing, so far as their pockets were concerned, as a penny reduction in local rates. This should, and he was sure would, be satisfactory to everyone concerned. The Directors were hopeful, if circumstances continued favourable, to follow this reduction by another in the not distant future.

In the report mention was made of a very pleasant function which took place at the works in June, when the Directors had the pleasure of receiving a visit from the members of the Institution of Gas Engineers, of which body Mr. Helps, the Company's esteemed Engineer and

General Manager, was President last year. The large attendance—he (the Chairman) believed that it was a record one—at the excursion to Croydon was a testimony (which would be as pleasing to the proprietors as it was to the Directors) to Mr. Helps' popularity in the profession of which he is one of the foremost members, and to the reputation of the works he had designed and controlled. The Company regarded it as an honour also that, when early in October a representative gathering of German Gas Engineers would be visiting England, at the invitation of their English colleagues, the works at Waddon would be one of the few selected for inspection by the Council of the Institution as typical of the best and most up-to-date in English gas-works design.

He need but briefly refer to the figures in the half-year's accounts. There had been a considerable reduction in the cost of coal and oil, both of which had been obtained at lower prices than a year ago. On the other side of the account, residuals had given very good results all round. The use of tar for road treatment still increased, and appeared likely to continue to do so. Sulphate of ammonia had realized an improved price. They might hope for good results regarding this residual from the active steps which were being taken by the Sulphate of Ammonia Committee to make farmers in this country better acquainted with its great value as a fertilizer. A small subscription, based on their annual make, was paid to the Committee by this and many other companies; and the money was expended by them in popularizing the use of sulphate, and finding fresh outlets for its sale. Recently a valuable and instructive conference was held at the offices of the Gaslight and Coke Company, when delegates from the United States, Germany, and Belgium attended, and described the propaganda work carried on in these countries. It was to be hoped that the value of this work might be more widely realized in this country; and that the companies who did not now support the Committee would see their way to join in a work from which they, in common with others, would benefit.

The question of joint advertising by gas companies, not only in regard to residuals, but to extend the use of their primary product, gas, had been receiving a great deal of attention lately. Tentative suggestions in this direction were put forward by Mr. Helps in his presidential address this year to the assembled gas engineers. Several gas companies had intimated their willingness to subscribe to a central fund for the purpose; and the proprietors, he was certain, would concur in the approval the Directors had expressed of the project. Large sums were already being spent in this way by a few of the larger companies, notably the Gaslight and Coke Company, who were now to be found in the front in all matters concerned with the welfare of the industry. But general advertising of the advantages of gas on anything like an adequate scale entailed too large a burden to be borne on the shoulders of one or two undertakings, broad though the shoulders might be; and it could hardly be gainsaid that an expenditure from which all gas companies would benefit alike could, and should, be shared by all.

The items in the revenue account other than those to which he had referred called for no special comment. Expenditure under the heading of "general charges" was higher than usual, owing partly to exhibitions of gas appliances held in Croydon and Caterham, and partly to the reception of gas engineers at Waddon which he had mentioned. Law and parliamentary charges were increased by the expenditure so far incurred on the Standard Burner Bill. He might, however, say that this would have been heavier, if there had not been a strong combination on the part of a large number of companies in fighting this Bill before the House of Lords and House of Commons Committees. He had mentioned before that they undertook to contribute a certain sum with many other companies, and they had to pay a small amount compared with what they would have had to do had they fought singly. The sum of £1000 had been added to the renewal fund; and after payment of dividends, the carry-forward was increased by more than £2000, amounting now to the sum of £9671.

Looking to the early future, they would have, in the coming year, to pay rather higher prices for coal. Against this, however, might be set the fact that they had been able to buy at low prices sufficient oil to meet their requirements for a considerable time; and these gains and losses would about neutralize each other over the next twelve months. The sales of coke made under contract had been at much better prices than last year; and as the contract price of tar showed an improvement, they might, he thought, look with equanimity on their future prospects.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby), in seconding the motion, said he fully agreed with the Chairman as to the reason for the slight diminution in the sale of gas. He was confident it was on account of the weather, and that it was not due to any want, or lack, of energy on the part of the distribution department. They had done exceedingly well. There had been keen competition with the electric light in the district; and it required the keenest activity to rebut it. Against the electric light, however, they were holding their own very well indeed.

There were a few inquiries made regarding the accounts, to which the Chairman made satisfactory reply. Among other points, there was agreement with the Directors' support of the work of the Sulphate of Ammonia Committee.

Mr. WILLIAM CASH moved the declaration of dividends at the rates of $14\frac{1}{2}$ per cent. on the "A" stock, $11\frac{1}{2}$ per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock, all less income-tax. In the course of his remarks, he said that, although they had not in the half year enjoyed quite the amount of progress which they were accustomed to associate with the Company half year by half year, he thought the accounts were extremely satisfactory. They were carrying to net revenue £1800 more than in the corresponding half of last year; and they were also increasing their carry-forward, which was £9671. It was sometimes interesting to look back more than one half year; and if they went back three half years it would be found that the carry-forward had gone up rather more than £2000. At the same time, the reserve fund was steadily, though slowly, growing. They had added to it £2800; and to the insurance fund, £750. Therefore, the position of the Company was getting stronger each half year. Regarding co-partnership, the Board were extremely pleased with the way the scheme was progressing. The Directors had the clearest possible evidence of the value of the scheme to the Company. The proposed reduction of 1d. in the price of gas would increase the

bonus to co-partner workers for the year before them. The amount of bonus declared this half year was equal to £1300; and this was quite a substantial sum for division among the workmen. On June 30, they had fifty of the workmen who had become shareholders; and the Board were hoping with the bonus this half year to add 100 to the number of employee shareholders in the undertaking. There was no doubt the operation of the scheme benefited the Company in more ways than one. To show how much the men appreciated the scheme, he might say that the co-partners had themselves deposited with the Company, irrespective of the bonus, and out of their savings, a sum of more than £1000 during the past year. This was evidence of what an excellent staff and body of men they had working for the Company. They were really animated by the true spirit of thrift. The balance standing to the credit of the co-partners at the end of the half year was £3745; and as the scheme had only been in operation two years, the Directors were pleased with the results. For the way the scheme had been adopted, they were indebted to their General Manager, to the staff, and to the whole of the employees.

Mr. W. J. RUSSELL seconded the motion, which was unanimously adopted.

Proposed by Mr. MAITLAND, and seconded by Mr. BROWN, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded, proposed a vote of thanks to the officers, their staffs, and employees. He expressed the satisfaction of the Board with all that had been done in every department—especially naming Mr. Helps, Mr. Topley, Mr. Sandeman (the Superintendent of the Outdoor Department), Mr. Caddick (Mr. Helps's Assistant), Mr. Anderson (Mr. Topley's Assistant), and Mr. Haines, of the Rental Department. With regard to the workmen, he endorsed what Mr. Cash had said as to co-partnership. Neither the Company nor the workmen had any cause for regret, but just the contrary, in respect of its institution. Mr. Helps had reported that the men were all doing their best, under happy conditions.

Mr. SAMUEL SPENCER, in seconding, said he had been down to the works that day; and it was a real pleasure to go round the place among their workmen.

Mr. HELPS, in responding for his staff and the men, acknowledged the kind way in which their efforts were seconded, and every encouragement given them. He had personally to thank the Directors for the way in which they had enabled him to make his year of office as President of the Institution of Gas Engineers a successful one, and to give pleasure to the members of that body by inviting them to visit the works, and see the way in which the Board were adopting modern plant. It was something that would redound to the honour of the Company in coming years. Reverting to the staff and workmen, he said the conditions under which they worked, both in the offices and works, might be envied by the employees of many other undertakings; and he should like to acknowledge how every one of the staff and men interpreted the principle of co-operation and co-partnership, which was now, he believed, the animating principle of the Company.

Mr. TOPLEY, in his reply, also expressed the view that it was the interest the Directors took in the whole of the staff and employees, that had brought the efficiency with which the Company's work was carried on to such a high state of perfection.

GAS SUPPLY IN NORTH LONDON SUBURBS.

At the half yearly meeting of the Southgate and District Gas Company last Thursday, the Directors reported that there had been an increase of 3,411,300 cubic feet, or 4.73 per cent., in the sale of gas in the six months ended the 30th of June last, compared with the corresponding period of 1909; and the revenue from residual products was higher by £469. The balance of profit was £6076; and the Directors recommended dividends at the rates of 5, 10, and 7 per cent. per annum upon the preference, original, and additional capital. After payment of these, there would be left a balance of £3184.

A report in very similar terms was submitted to the proprietors by the Directors of the North Middlesex Gas Company at the half-yearly general meeting yesterday. There was an increase of 4,658,800 cubic feet in the quantity of gas sold in the first half of the year compared with the corresponding six months of 1909; and the sale of residuals produced better results. There was a disposable balance of £7594; and the payment of dividends at the rates of 5, 10, and 7 per cent. was recommended, together with the addition of £609 to the reserve. This appropriation amounted to £3942, and left a balance of £3652.

TUNBRIDGE WELLS GAS COMPANY.

At the recent half-yearly general meeting of this Company, the Chairman (Mr. W. H. Delves, J.P.) said the year ended the 30th of June had been an uneventful one; and consequently there was practically nothing to report. The winter had been very mild; January, February, and March being as much like summer months as June and July had been. They had a considerable decrease (owing to the weather) in the quantity of gas consumed during the three months named. For the half year, the quantity sold showed an infinitesimal increase over the corresponding six months of 1909. The Company had not been affected by the increase in the price of coal, because they had enough raw material to last them over the half year. The consequence was they were using coal all the time bought at favourable contract prices. They were able to make a satisfactory purchase of oil, not only for this but for next year, and into about the middle of the one succeeding. Altogether, their carbonizing materials had cost them less than in the corresponding half of last year. The price of gas had been 1½d. lower per 1000 cubic feet, which was very satisfactory. The Company reduced the price by 1d. last Christmas; and the rental had been affected by it for the past half year—there being a difference of £625. The residuals, on account of the smaller quantity of coal used, had produced £164 less; but this was more than set off by the reduc-

tion in the price of coal and oil. As far as they could tell, they had had a very successful half year, and the profits abundantly justified them, not only in paying their usual dividend, but in the reduction of the price of gas. The prospects for the current six months were distinctly good. The Directors, as the shareholders were aware, had found that the storage capacity was getting short; and they had now entered into a contract to telescope one of the holders to provide more room at a moderate outlay. It was hoped to complete the work by the beginning of September. Referring to the Standard Burner Bill (No. 2), of which the Company are one of the promoters, the Chairman said that, though it had been exhaustively considered by the House of Commons Committee, and unanimously passed, further opposition was threatened for the third reading—a most unusual course—and the Royal Assent would not be given to it until after the meeting of Parliament for the autumn session. The Directors had every hope that the Bill would benefit the Company and be no detriment to the consumer. Indeed, he did not suppose the consumers would be any the wiser, except that they would find that reductions in the price of gas came about a little sooner than would otherwise be the case. Dividends at the usual rates of 12½, 10, and 9½ per cent. per annum were declared.

PROFIT-SHARING AND SAVING AT GLOUCESTER.

Satisfactory Results.

The Second Annual Meeting in connection with the Profit-Sharing and Saving Scheme of the Gloucester Gas Company was held at the works on Monday last week. Mr. J. H. JONES (the Chairman of the Committee) presided over a large attendance of members. The balance-sheet showed on one side a total of £1121 11s. 6d., and on the other the following items: By money on deposit at bank, £684 9s.; interest on ditto, £13 16s. 1d.; amount due from Company to June 30, 1910, bonus £416 11s. 10d., balance of interest £6 14s. 7d.

The CHAIRMAN, in presenting the balance-sheet, said those present would remember that when they started the scheme two years ago it was said that if it was not satisfactory either to the Directors or to the men it would be withdrawn at the end of two years. They had come to the end of the second year; and the question was whether things were satisfactory or not. So far as the Directors were concerned, they were satisfactory; and he thought, when they looked at the financial statement before them, when they saw that the sum in the bank had increased from £698 to £1121, members would come to the same conclusion. What he was so pleased to see was this—that on the withdrawal account (half of the bonus might be withdrawn) £398 2s. 7d. had been paid into the bank, and £60 1s. only had been withdrawn, and this by men who had left the Company's service. Then there was also another great cause for satisfaction—viz., that the savings bank account had largely increased. He had always thought that the opening of a savings bank account in connection with the scheme was one of its most satisfactory features; and when they found the account had increased from £231 to nearly £412, it showed that a good many of the men had taken advantage of it to do something on their own account beyond what was done for them by the bonus. It was a further cause of satisfaction to see that the price of gas had gone down—a fact which had enabled members of the scheme to have an additional ½ per cent. bonus. He was also glad to be able to tell them that the Directors had now reduced the price of gas by another 2d. per 1000 cubic feet; so that, instead of 5½ per cent. which they received for the past year, it would be 6½ per cent. for the current year. He thought they might really look upon the scheme as being beneficial to three classes of people. In the first place, it was beneficial to the shareholders—as creating a better feeling—as oiling the wheels between the Directors and shareholders and those who were engaged in the manufacture of gas. Then the object of the scheme was to prevent waste as much as possible—waste of time and waste of materials. As a result of this prevention of waste, they made the cost of gas cheaper, and the consumers got the benefit; and when they found the gas cheaper, they went in for consuming more, and this brought down the price again, and the employees got the benefit in the shape of additional bonus. This was always the way when people joined together for mutual benefit and mutual help; and this was what they wanted to see in this country and in other countries. They wanted to see good fellowship—good feeling between all classes; and he thought there was nothing more likely to bring about this state of things than some such arrangement as they had at Gloucester.

Mr. PIKE moved—"That this meeting hereby approves of the statement of accounts in connection with the Gloucester Gaslight Company's Profit-Sharing and Saving Scheme now presented, up to June 30, 1910." In doing so, he said he thought the scheme was a first-class affair, and if it was properly carried out by the men, it would be to their benefit to an increasing extent, and especially to the benefit of the younger ones.

Mr. F. JONES seconded the motion, and expressed his satisfaction at the statement of accounts.

Criticism having been invited, and none being forthcoming, the motion was unanimously carried.

Mr. W. E. VINSON (the Secretary of the Company), in proposing a vote of thanks to the Chairman, said Mr. Jones had taken a very hearty and deep interest in this affair, and to his mind it was almost entirely due to his exertions that it had been built up.

Mr. W. S. MORLAND (the Engineer and Manager), in seconding the motion, emphasized the fact that in the two years the scheme had been in operation £1100 had been got together; and this sum would, he thought, otherwise have been spent and largely wasted. He also pointed out that the Directors had in twelve months reduced the price of gas by 3d. per 1000 cubic feet; making the net price 1s. 10 81. to ordinary consumers, and 1s. 8d. for gas-engines.

The CHAIRMAN acknowledged the vote, and expressed his gratification that the scheme had been so satisfactory. He proposed a vote of thanks to the Secretary (Mr. T. B. James).

This having been accorded, the proceedings closed.

WAKEFIELD GAS COMPANY.

The Recent Explosion in the Purifier-House.

In moving the adoption of the report and accounts at the half-yearly meeting of the Wakefield Gas Company on Monday last week, the Chairman (Dr. W. A. Statter, J.P.) referred to the explosion which took place in the purifier-house on the 20th of June, which was noticed in the "JOURNAL" at the time. He said it had given the Directors some anxiety, but he was thankful that it had not interfered in the slightest degree with the supply of gas to the consumers. The house which was wrecked had long been a source of anxiety to their Engineer and Manager (Mr. H. Townsend), as it was built over an old gasholder tank which was now used for storing ammoniacal liquor; and in carrying out the repairs to the purifiers, which was the immediate cause of the accident, he had used every possible precaution, having thrown the house out of use altogether, and warned the men of the risk of dropping anything hot. They had fortunately well insured their works against fire and explosion, and had been met in a very fair spirit by the Insurance Companies, who had agreed with the Directors that it would be better, especially after their recent experience, to erect new purifying plant on another site than to attempt to restore the old purifiers. Plans were accordingly prepared by their Engineer and Manager, and the contract for new purifiers and revivifying sheds was let within a week of the accident. Their erection was now well in hand, and the insurance money would go a considerable way towards paying for them. He was happy to say that two of the men who were injured had now been at work some time, and the third had been sent by the Directors to the seaside, whence they hoped he would soon return fit for work again. He should like to take this opportunity of acknowledging the pluck and loyalty shown by their Manager and staff and all the workmen, and also by the Wakefield Fire Brigade, who all toiled, utterly regardless of danger, to remedy as soon as possible the damage done, and get the works going again, which they were fortunately able to do within about seven hours of the accident. This unfortunate occurrence had strengthened the Directors' belief in the value of insurance, and in the straightforward and upright manner in which the Insurance Companies agreed to meet their obligations. Referring to the progress of the Company, the Chairman said they had had a prosperous half year, having more than earned their usual dividend, while the make of gas per ton of coal carbonized—11,441 cubic feet—exceeded all previous records in the history of the Company, and was particularly gratifying, as they were still working under their old standard. He concluded by proposing the payment of the usual dividends; and this was agreed to. Dr. Statter and Mr. E. White having been re-elected Directors, and Mr. W. H. Shaw appointed Auditor, in succession to Mr. Hopkinson, who had retired through ill-health, Mr. A. Firth proposed that the best thanks of the shareholders be given to the Chairman and Directors for their conduct of the Company's business during the past half year. This was seconded by Mr. H. H. Audsley, and carried. In responding, the Chairman proposed a hearty vote of thanks to the Engineer and Manager and to the Secretary (Mr. R. B. Wilson) and their staffs. The proposition was carried, and responded to by both gentlemen. These votes of thanks were passed by the shareholders with more than the usual heartiness, in appreciation of the heavy strain which had recently been borne by all concerned.

MAIDSTONE GAS AND WATER COMPANIES.

At the recent annual meeting of the Maidstone Gas Company, the Directors reported that the balance in favour of the Company for the year ended the 30th of June was £13,208; and they recommended a dividend at the rate of £7 5s. 6d. per cent. per annum (less income-tax)—an interim dividend at this rate having been paid on the 1st of March. In moving the adoption of the report, the Chairman (Mr. G. Marsham) said that, notwithstanding several adverse circumstances, the Directors were able to present a more favourable balance-sheet than last year; for, in spite of a decrease of 1½ per cent. in the quantity of gas sold, and a considerable falling away in the prices obtained for residuals, there was a net surplus of £2133. Out of this, £2000 had been set aside for depreciation of stoves and fittings on hire—a larger sum than for several years—and £133 was carried forward. The falling away in the sale of gas was owing, no doubt, to its more economical use in large institutions, and to the extended employment of incandescent burners. He was pleased to say that the prices of residuals, which had been exceptionally low, were now showing signs of improvement. The increased profit was partly due to the price of coal, to the larger make of gas per ton of coal—there having been extracted the record of 11,733 cubic feet—and to the decreased leakage, which now stood at 5·71 per cent., which was a very satisfactory figure when it was considered that the Company served 9807 meters through nearly 78 miles of mains. A considerable part of the decreased sale of gas was, he might also mention, due to the action of the Corporation in converting a number of public gas-lamps into electric lamps. But, as shown by the increased rental of meters, stoves, and fittings, the Company's business continued to expand satisfactorily in various ways. For the first time, the revenue account showed a contribution to the new workmen's superannuation fund; the amount for the year being £48 12s. 3d. It was proposed to invest this fund in the debenture stock of the Company, which would give the men, with their existing sick fund investment and individual holdings in gas stock, an increased interest in promoting the success of the Company's business. Last year, he alluded to the adoption of the Botley system for the prevention of stoppages in the mains and services through the deposit of naphthalene; and he was glad to say these stoppages were gradually decreasing. This was obviously a boon to the consumer as well as a saving to the Company. The report was adopted and the dividend recommended declared.

In the report presented at the half-yearly meeting of the Maidstone Water Company, the Directors stated that the water-rents for the six months ended the 30th of June amounted to £6882—an increase of £54 compared with the first half of 1909. The accounts accompanying the report showed a sum of £5299 to the credit of the profit and loss

account; and the Directors recommended the payment of a dividend, free of income-tax, for the half year at the rate of £7 10s. per cent. per annum on the 10 per cent. shares, and of £5 5s. per cent. on the 7 per cent. shares and the ordinary share capital. These payments would absorb £1680, and leave £3609 to be carried forward. The Chairman (Mr. W. H. Bensted), in moving the adoption of the report, said the increase in supplies, both domestic and by meter, was a matter for congratulation, though the number of empty houses in the town had gone up from 262 in February to 279 at the present time. He read the report of Dr. Sims Woodhead, who expressed the opinion that the gathering-grounds, springs, and water-works of the Company are efficiently protected. A report was also presented by Mr. W. Burgess, showing that, as the result of chemical analysis, the water is of high organic purity. The Directors' report was adopted, and the dividends recommended were declared.

PROPOSED SALE OF THE AMERSHAM GAS-WORKS.

The Terms of Transfer.

It was briefly mentioned in the "JOURNAL" last week (p. 479), that the shareholders of the Amersham Gas Company had agreed to a proposal to sell the undertaking to the Uxbridge Gas Company. The decision was come to at a special meeting held for the purpose of considering the provisional agreement entered into; and the notice convening it furnished the following particulars.

The proposed arrangements with the Uxbridge Company were the result of negotiations entered into in consequence of the resolution passed at the general meeting on the 26th of April, recommending the Directors to approach a neighbouring Company with a view to amalgamation or sale. The Directors strongly recommended the shareholders to approve of the arrangements, and pointed out the difficulty of raising capital for a small non-statutory Company; and they feared that without sufficient capital to extend operations, the Company would in time find itself squeezed out by larger adjoining concerns. The terms obtained from the Uxbridge Company were, in the opinion of the Directors, fair and generous, as the shareholders would receive their money in full, and, with the reserve fund, stock, and the profits of the last half year to divide, a substantial dividend on the final completion of the business. The Directors added that, as to the public, the proposed arrangements would be very advantageous, as the price of gas would be reduced as from the 30th of June last from 5s. to 3s. 6d. per 1000 cubic feet; and this consideration had effect with them in recommending approval of the sale.

The provisional agreement is to the following effect: (1) The Uxbridge Gas Company take over the business as from June 30, 1910. (2) The undertaking is sold subject to debentures of the Amersham Company, which the Uxbridge Company will either pay off in due course, or the holders may have in exchange for their debentures 4 per cent. debenture stock of the Uxbridge Company. (3) The purchase price is the par value of the Amersham Company's shares. (4) The Amersham Company retain their reserve fund, and are to be paid for stock at June 30, 1910. (5) The Uxbridge Company will promote a Bill or Provisional Order next session to obtain parliamentary powers for supplying the Amersham district. The Amersham Company are to concur in such application; and any expenses incurred by them are to be paid by the Uxbridge Company. (6) The agreement is subject to sanction by the shareholders of the two Companies, and to the necessary parliamentary powers being obtained.

MELDRETH AND MELBOURN GAS AND WATER COMPANY.

Serious Financial Position.

A Statutory Meeting of creditors in the Meldreth and Melbourn District Gas and Water Company, Limited, was held at the offices of Messrs. J. W. Barratt and Co., Coleman Street, E.C., last Wednesday. There were five creditors present.

Mr. BARRATT explained that the debenture-holders and shareholders in the Company had already met and asked him to act as Liquidator (see *ante*, p. 217). The position of the Company made it impossible to hope that there would be anything for the shareholders or creditors; and it was very doubtful if the debenture-holders would see their money back. All the negotiations he had entered into for the sale of the Company's business had failed even to produce an offer, except in a few cases where the price tendered would not have covered half the debenture debt. In the circumstances, the only thing to be done was to offer to sell the concern to the local authorities. All the facts had been placed before the President of the Local Government Board, whose reply they were now awaiting. If they could get the Board to take the matter up, they would do much better than by going elsewhere—at least, they would get a fair price. Failing this, there would have to be a sale by public auction; and this was certain not to realize the amount of the debenture debt.

A CREDITOR inquired as to the validity of certain debentures that had been issued before Mr. Barratt was appointed.

Mr. BARRATT said the debentures in question amounted to £100. Whether or not there had been an informality in their issue was a matter which did not concern them, unless there was a surplus from the sale of the business after meeting the other debenture debts. If there was one, he should certainly not distribute it until this point had been settled. He did not know that there was a valid consideration for these debentures; and the only question to be considered was the date of their issue.

Mr. ROOK said that, as creditors, they could not do anything better for their own interests than follow the example of the shareholders and others, and leave the matter in Mr. Barratt's hands.

This suggestion was formally agreed to without discussion; and the meeting terminated.

IMPROVEMENTS AT GISBORNE (N.Z.) GAS-WORKS.

Manager's Salary Increased.

According to an account given in a paper published in Gisborne (N.Z.), the increased business of the local Gas Company has necessitated considerable extension of the works and plant; and this has been carried out under the supervision of Mr. Henry Hoare, the Engineer, Manager, and Secretary of the Company. The extent of the changes effected will be seen from the following particulars.

When the Company commenced operations 27 years ago, they had only one bench of two retorts; whereas now they have six benches, with a total of 32 retorts. In the early days, the price of gas was 17s. 6d. per 1000 cubic feet; now it is only 7s. 1d. The original gas-holder, capable of containing only 7000 cubic feet, becoming inadequate, another, of 15,000 cubic feet capacity, was erected. This was followed by one equal to holding 60,000 cubic feet of gas. Subsequently, the services of Mr. Hoare were secured, and he has reorganized the whole of the works. A new retort-house, of ample dimensions, and a large coal-shed have been built, and two benches of six retorts, with regenerative furnaces, installed. An order was placed with Messrs. C. & W. Walker, of Donnington, Salop, for a two-lift gas-holder capable of containing 150,000 cubic feet, which nearly doubles the storage capacity. With the exception of the holder, this plant has been in operation for some time. A new condenser was made and erected by the Company's own staff; and an exhaustor, capable of passing 10,000 cubic feet per hour, was purchased and fixed last September. A Livesey washer and a Kirkham washer-scrubber, each of the above-named capacity, a 10-inch governor, and a station meter are in operation. The old boiler has been replaced by another of 10 H.P., to contain which and the exhaustor a house has been built, with mess-room, bath-room, and hot and cold water for the comfort of the employees. These changes have, of course, necessitated a considerable number of alterations to the pipes and connections all over the works; but they have been carried out without for a moment stopping the supply. Outside the works, nearly three miles of mains, from 3-inch to 9-inch, have been laid, and the side streets connected up. Exterior shop lighting by "Graetzin" inverted burners has been introduced; and in order to show the public the latest types of gas appliances, a commodious room at the offices has been set apart for the purpose. In carrying out these improvements, Mr. Hoare has been his own architect, engineer, and clerk of works; and, with the exception of the gas-holder and tank, which were erected by Messrs. Niven and Co., of Napier, he has done all the work with his own staff.

At the last ordinary general meeting of the Company, the Directors, in presenting their report, accompanied by a statement of accounts for the fifteen months ended the 31st of March, congratulated the proprietors on the continued success of the undertaking. The consumption of gas showed an increase of upwards of 4.33 million cubic feet, or 15 per cent., compared with the preceding similar period. The cost of production and distribution had been increased, owing to the long-continued miners' strike at Newcastle raising the cost of coal, and also to the considerable advance in labour. However, there was a

sum of £11,932 available for distribution; and the Directors recommended that £6500 should be carried to the reserve fund, £2500 to a plant and buildings adjustment account, and a dividend of 9d. per share paid on 21,800 shares, or £794—the balance of £2138 carried forward. These recommendations were approved of. The Directors testified their appreciation of Mr. Hoare's services by giving him a bonus of £100 for his extra work in connection with the extensions described above, increasing his salary £100 per annum, and entering into an agreement with him for five years' continuous service.

METER AND GAS TESTING IN EDINBURGH.

The Official Inspector of Gas-Meters for the City of Edinburgh (Mr. William Gordon) lately presented his fifth annual report, containing an account of the working of the department under his supervision from May 16, 1909, to May 15, 1910. He states that the number of gas-meters tested was 89,027, of which 13,658 were wet and 75,369 dry; and fees to the amount of £2441 10s. were collected. Of the wet meters, 20 were incorrect; of the dry ones, 834.

During November last year, the Government standard gas models were re-verified by officials from the Standards Department of the Board of Trade; and the results of the test were very satisfactory—the instruments being practically correct. The largest meter tested during the twelve months was manufactured by a local firm to the order of the War Office. It was constructed to pass fully 20,000 cubic feet of gas per hour, and was to be erected at the Government Balloon Factory, Farnborough, to accurately measure the gas required for the British Army airships.

Last April, Major P. A. MacMahon, F.R.S., Deputy-Warden of the Standards, visited the department for the purpose of supervising the re-verification of the working gas-holders—twenty in number. The usual period for re-verifying test gas-holders belonging to a local authority is at the expiration of ten years; but Mr. Gordon considers that, owing to the great number of meters tested in Edinburgh, it is advisable, in the interests of exactitude, that a quinquennial test of the gas-holders should in future be carried out.

The total number of meters tested by the Department since its institution in 1861, up to and including May 15, 1910, is 2,429,671—i.e., 1,027,548 wet and 1,402,123 dry; the fees received for the same period being £71,316 8s. For the year ended the 15th of May, the number of automatic meters tested exceeded those of the ordinary type by 2407. Last year the difference was still greater; 40,985 automatic meters being stamped, against 30,704 of the ordinary kind. These figures appear to point to the fact that local authorities and gas companies are continuing to recognize the benefits derived from fixing automatic meters, and are consequently encouraging consumers to purchase gas "by the pennyworth."

Following the report on meters is one on the testing of gas. It is set forth therein that on Dec. 21, 1908, the Edinburgh and Leith Gas Commissioners' Provisional Order was duly confirmed; and since that

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 508.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr 1	5	Alliance & Dublin Ord.	80-83	..	6 0 0	4,940,000	Stk.	May 12	8	Imperial Continental	177-179	..	4 9 5
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Aug 12	3½	Do. 3½ p.c. Deb. Red.	92-94*	..	3 14 5
200,000	5	May 12	7	Bombay, Ltd.	6½-6¾	..	5 7 7	200,242	Stk.	Mar. 16	6	Lea Bridge Ord. 5 p.c.	122-124	..	4 16 9
40,000	5		7	Do. New, £4 paid.	48-52	..	5 9 3	561,000	Stk.	Feb. 25	10	Liverpool United A.	219-221	..	4 10 6
50,000	10	Feb. 25	15	Bourne- 10 p.c.	29-30	..	5 0 0	718,100	"	"	7	Do. B.	165-166	+1	4 4 4
311,810	10	"	17	mouth Gas B 7 p.c.	16½-16¾	..	4 3 7	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10	"	6	and Water Pref. 6 p.c.	15-15½	..	3 17 5	75,000	5	June 29	6	Malta & Mediterranean.	41½-41¾	..	6 4 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	246-249*	..	5 0 5	560,000	100	Apr. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	184-186*	..	5 2 2	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	..	..	..	541,920	20	May 27	3½	Monte Video, Ltd.	12½-13	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 28	48	Newcastle & Gateshead Con.	101-102	..	4 5 9
220,000	Stk.	Mar. 16	11	Brighton & Hove Orig.	214-217	..	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	90-91	+½	3 16 11
246,320	"	"	8	Do. A Ord. Stk.	153-156	..	5 2 7	55,940	10	Feb. 25	7	North Middlesex 7 p.c.	132-133	..	5 1 10
460,000	20	Apr. 1	10½	British	44½-45½	+½	4 13 5	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Aug. 11	6	Bromley, A 5 p.c.	117-119*	..	5 0 10	60,000	5	Apr. 1	8	Ottoman, Ltd.	62-62½	..	5 3 1
105,700	"	"	4½	Do. B 3½ p.c.	88-90*	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A.	134-136	..	5 1 0
82,278	"	"	5½	Do. C 5 p.c.	106-108*	..	5 1 10	60,000	50	"	13	Do. B.	126-128	..	5 1 7
55,000	"	June 29	3½	Do. 3½ p.c. Deb.	85-87	..	4 0 6	100,000	50	"	12	Do. C.	119-121	..	4 19 2
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	97-99	..	4 0 10	114,800	50	"	10	Do. D and E.	100-102	..	4 18 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	..	398,490	5	Apr. 29	7	Primitiva Ord.	71½-71¾	..	4 14 1
100,000	50	"	—	Do. 4½ p.c. Pref.	5½-6½	..	..	796,980	5	June 29	5	Do. 5 p.c. Pref.	51½-51¾	-1½	4 14 1
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	103½-104½	..	4 10 6	250,000	10	Apr. 1	9	San Paulo, Ltd.	15½-16½	..	5 10 9
1,513,280	Stk.	"	5½	Commercial 4 p.c. Stk.	105-107*	..	4 17 2	62,500	50	"	5	Do. 6 p.c. Pref.	11½-12½	..	4 18 0
560,000	"	"	5	Do. 3½ p.c. do.	101-103*	..	4 17 1	125,000	10	July 1	5	Do. 5 p.c. Deb.	49½-50½	..	4 19 0
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	135,000	Stk.	Mar. 16	10	Sheffield A	234-236	..	4 4 9
800,000	Stk.	June 10	5	Continental Union, Ltd.	93-95	+3	5 5 3	209,984	"	"	10	Do. B	234-236	..	4 4 9
200,000	"	"	5	Do. 7 p.c. Pref.	135-137	..	5 2 2	523,500	"	"	10	Do. C	233-235	..	4 5 4
492,270	Stk.	"	7½	Derby Con. Stk.	122-124	..	4 8 9	70,000	10	May 27	7	South African	11-11½	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.	120-122*	..	4 9 7
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	79-81	..	3 14 1
486,090	10	July 14	12	European, Ltd.	23½-24	..	5 0 0	209,822	Stk.	Mar. 16	8	South Shields Con. Stk.	157-158	..	5 1 3
354,060	10	"	12	Do. £7 10s. paid.	17½-18½	..	4 18 8	605,000	Stk.	Aug 12	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 13 7
16,179,445	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	104½-105½	+½	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	110-121*	..	4 2 8
2,600,000	"	"	3½	light 3½ p.c. max.	87-89*	..	3 18 8	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	120-122	..	4 2 0
4,062,235	"	"	4	and 4 p.c. Con. Pref.	102-104*	..	3 16 1	502,310	Stk.	May 12	5	Southampton Ord.	110-112	..	4 9 3
4,531,705	"	June 29	3	Coke 3 p.c. Con. Deb.	85-82	..	3 13 2	120,000	Stk.	Aug. 12	7	Tottenham A 5 p.c.	136-138*	..	5 1 5
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93-95	..	5 5 3	483,940	"	"	5½	and B 3½ p.c.	111-113	..	4 17 4
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 5 3	149,470	"	June 29	4	Edmonton 4 p.c. Deb.	57-59	..	4 0 10
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	17-17½	..	6 5 9	182,380	10	June 10	8	Tuscan, Ltd.	9-9½	..	3 8 6
131,000	Stk.	Mar. 16	7	Iford A and C	145-147	..	4 15 3	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,780	"	"	5½	Do. B	114-116	+3	4 14 10	230,476	Stk.	Feb. 25	5	Tynemouth 5 p.c. max.	113-115	..	4 6 11
65,500	"	June 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	255,636	Stk.	Feb. 25	6½	Wands- B 3½ p.c.	139-141	..	4 15 9
								85,766	"	June 29	3	worth 13 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

date the work of testing the gas for illuminating power has been carried on continuously. The minimum is fixed at 14 candles, when measured with a "Metropolitan" No. 2 argand burner consuming 5 cubic feet of gas per hour; the standard of light being a Harcourt ten-candle pentane lamp. The Inspector carried out tests at various hours, chosen at his own discretion, and without any previous intimation to the Gas Commissioners of his intentions; and during the year, 303 tests were made at the City Chambers—the average result being 17.22 candles, compared with 18.65 candles in the preceding year.

The Inspector points out that the Legislature have recently induced the Gaslight and Coke Company to initiate a test to accurately determine the calorific value, in addition to the illuminating power, of the gas supplied by them. But the Board of Trade have authority to vary the standard, on appeal by either of the interested parties, at the expiration of three years. It can therefore be assumed, he says, that the calorific test "is at present in an experimental stage." It may, however, at a future date be necessary to have a subsidiary test to ascertain the heating value of the gas supplied to Edinburgh consumers; but, under present conditions, he considers that the existing illuminating power tests meet all requirements, and that the interests of the consumers are adequately safeguarded. The minimum results of the testings were on all occasions considerably above the standard illuminating power of 14 candles; and all the tests were carried out under the conditions prescribed by the Metropolitan Gas Referees.

MUNICIPAL LOANS FOR TRADING UNDERTAKINGS.

Local Government Board's Power to Dispense with Public Inquiry.

That the Local Government Board may dispense with the holding of a public inquiry in the case of a local authority's application for sanction to borrow money for trading departments, extension, or development, seems to be borne out by what has happened recently at Manchester. The Electricity Committee of the Corporation applied for sanction to a loan of £40,000 for extensions; and the necessary permission was granted without a public inquiry being held.

The right of the Department to do this was challenged by the Manchester Ratepayers' Association. Mr. P. Percival, the Secretary, in the course of a communication to the Local Government Board on the subject, said: "I am informed that tentative sanctions were given to some portions of the loan by the Board before coming to the decision not to hold an inquiry. My Association would like to be informed whether any portion of the £40,000 referred to has been the subject of a public inquiry, and also, if possible, when the sanctions referred to were conferred." Replying to this letter, the Assistant-Secretary of the Local Government Board said that loans amounting to £40,000 were sanctioned by the Board for works connected with the Manchester

Electricity undertaking on June 2. The Board did not consider it necessary to hold a public inquiry before sanctioning the loans.

Mr. Percival was not disposed to let the matter rest there. In a further letter to the Department, he said that, for the satisfaction of his Association, he would like to know on what authority the Board relied in holding itself at liberty to dispense with a public inquiry into such an application as that of the Manchester Electricity Committee. "I may say," he added, "that my Association feels very strongly the necessity for maintaining the control of the ratepayers over the expenditure of the various Committees of the Manchester Corporation, and seriously deprecates any change of procedure in the sanctioning of loans calculated to weaken that control, or in any way to remove the financial operations of any Committee from the field of local criticism."

THE SUGGESTED NATIONAL WATER BOARD.

Two Views on the Proposal.

As the result of the publication as a Blue-Book last week of the report of the Joint Committee of the two Houses of Parliament on the Water Supplies (Protection) Bill, a representative of the "Birmingham Daily Post" had an interview on the subject with Mr. E. Antony Lees, the Secretary of the Water Department of the Corporation. In the course of their conversation, Mr. Lees said: There is a natural limit to the water supply of the country, and, looking at the matter in the wider sense, I believe all the practical water administrators in the country are in favour of the establishment of a Board charged with the duties outlined by the Parliamentary Committee. The scheme will be beset with a great deal of difficulty when practical details come to be dealt with; but the idea is a good one. It has been mooted by water administrators for years and years, and has been mentioned in parliamentary reports two or three times. If it were carried out as it is desired it should be carried out, the Board would certainly take very much more than formal cognizance of big water schemes. It would have regard to the economical distribution of the national water resources from the standpoint of the requirements of the whole country; not merely from that of the needs of an individual authority seeking a particular source of supply. Taking note of the water resources of the country as a whole, the Board, in the allocation of any particular source to the needs of any one district, would consider whether, in the interests of the country at large, it was right that the water should be allocated for distribution. For example, if it had been in existence before the Birmingham scheme was initiated, the Board would have had to consider whether, from the national point of view, it was well that the particular water area in Wales should be given over to Birmingham, having regard to the city's distance from the source, its prospect of development, and the ultimate yielding capacity of its own watershed.

Some objectionable features of the scheme were indicated by Mr. P. W. Walker, the Secretary of the East Worcestershire Water Com-

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pany. He said it was difficult to ascertain what was really behind the proposal; but he thought it might represent a desire to get water supplies out of the hands of companies into those of local authorities. It was to the interest of a company that its sources of supply should be most economically used; and in his Company's district the greatest care was taken to this end. A National Water Board would, however, be useful as an authority for the consideration of applications by companies and local authorities for the extension of their areas of supply. At present, the country was not properly supplied with water; and it was very likely that many new water companies would be launched. In these circumstances, it might be most desirable to have an authority that would see that the best use was made of the supply available for a particular district. Mr. Walker added that in his Company's district there were many probable sources of good water untapped; and he thought the same might be said generally of the country as a whole. On the subject of the Bill which gave rise to the Joint Committee's suggestion, he declared that some of its provisions were perfectly absurd. It not only proposed to make water undertakers liable to give compensation for injury to private supplies caused by their works, but placed upon them the onus of proving that no injury was inflicted. It also proposed that where water was taken from one district to supply another, the local authorities of the districts from and through which the water was taken should be given the right to demand a supply from the works of the undertakers on terms to be agreed or fixed by the Local Government Board. In reference to both of these provisions, there was, he said, considerable ground for objection by the proprietors of water undertakings.

MANCHESTER CORPORATION WATER SUPPLY.

The New Pipe Line from Thirlmere.

At the Meeting of the Water Committee of the Manchester Corporation last Thursday, it was reported to them that the work of laying a third line of pipes from Thirlmere to the city is progressing satisfactorily. The Contractor at the northern end has laid $4\frac{1}{2}$ miles of pipes out of the 14 miles that he has to put down. In another case, the Contractor has got through his task to the extent of $6\frac{1}{2}$ out of 18 miles. A contract for another length has been let, and the work is about to begin. The third Contractor has undertaken to lay the line of pipes between Little Hulton and the Denton reservoirs—a distance of 14 miles, through Worsley, Stretford, Davyhulme, Chorlton, and Levenshulme. Altogether, when the work is finished, there will be about 52 miles of iron piping for Manchester's service.

It may be remembered that the work of bringing water from Thirlmere to Manchester was begun in 1886; but it was not until 1894 that a daily flow of 10 million gallons from the lake was a reality. Ten years later, in 1904, the second pipe was brought into action; and it is stated that the Committee will be well satisfied if by 1914 the third pipe is ready for use. After that they will doubtless lose no time in

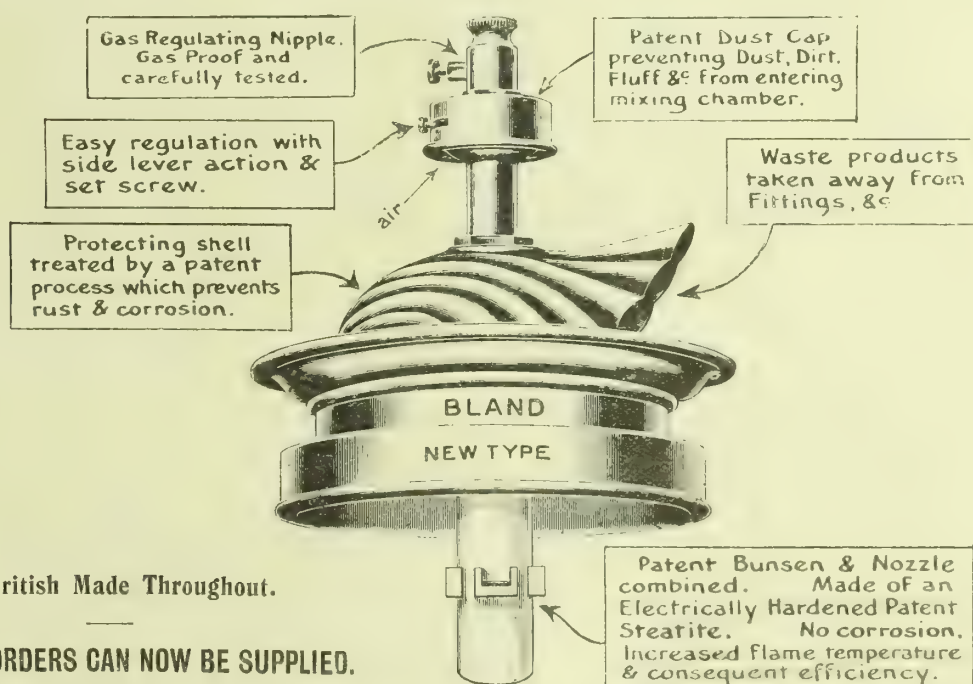
setting men to work on the fourth, and subsequently on the fifth and final pipe. With five pipes in use, the daily flow will be nearly 50 million gallons; and this is all Thirlmere can give. The tunnelling through some miles of rock was, of course, done for all the pipes in the first instance. The biggest piece of work that has now to be carried out is between Little Hulton and Denton. New tunnels have to be made under the Ship Canal and the Bridgewater Canal, and eight or nine railways have to be crossed. At Denton, the Corporation have land for two more reservoirs; but it is hoped the present one will suffice for the reception of the water brought by the third new pipe, and perhaps by the fourth and fifth pipes.

INCREASED WATER SUPPLY FOR MINEHEAD.

In view of the growing popularity of Minehead (on the Somersetshire coast) as a holiday resort, and the consequent extension of the town, the Urban District Council some four years ago found themselves compelled to deal with the problem of improving the water supply. They accordingly consulted Mr. A. P. I. Cotterell, M.Inst.C.E., of Bristol and Westminster, on the formulation of a scheme providing for a population of 2700 in winter and 5000 in summer. He advised the Council to further utilize the water from Longcombe; and it was decided to erect works at a spot some 300 yards farther up thecombe than that from which the present supply is obtained. The Council were met most liberally by the late Mr. G. F. Luttrell, the owner of the property, who allowed them to take water from a gathering-ground of some 400 acres, at the low rental of £30 a year for the first twenty years, and £50 afterwards. The Council obtain from this area, which is 1000 feet above the sea, 200,000 gallons per day of pure spring water—double the amount of the present supply. A stream is tapped at a point 550 feet above sea level, where the water is first directed into roughing filters, and then passes into a collecting-tank, whence it flows through a 4-inch main along the route of the old main, and into the existing service reservoir, 300 feet above the town. In future, the pipe-line may be extended to a new storage reservoir of 5 million gallons capacity in the Moor Valley, 400 feet above the sea, giving sufficient pressure to serve the highest houses in Minehead. Under the present arrangement, the intermediate village of Alcombe takes 20,000 gallons a day; and the remainder will be sufficient for Minehead for some years to come. The scheme has the great advantage of being easily extended as need arises. Mr. Cotterell personally superintended the construction of the works, which were carried out by Messrs. F. Small and Co., of Taunton. The ceremony of turning on the fresh supply was performed on the 13th inst. by Mr. A. F. Luttrell, the Squire of Dunster, in the presence of the Chairman (Mr. J. Phillips), members, and officials of the District Council, and a number of friends. Congratulations were expressed at the Council having secured, at the low figure of £3500, a supply of excellent water sufficient for present and future needs.

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WATER DIFFICULTIES IN SPAIN.

The question of water supply in Spain seems to be one of almost perpetual difficulty—at least that is the general impression one gets from the information imparted to shareholders at a recent meeting of the Seville Water-Works Company. But so far as that Company are concerned, there is an easy way out of the difficulty, if reason and experience prevail. The matter was referred to at length by the Chairman (Mr. Cowley Lambert) at the annual meeting the other day, after he had presented the report and accounts, which, by the way, showed an income amounting to £39,131. After deducting working expenses, the cost of laying on services, and the service of debentures, the net profit for the year was £8853, as compared with £4708 in the previous year. Adding the unappropriated profit at March 31, 1909—namely £10,125—the amount standing to the credit of profit and loss account was £18,978. The Directors recommended that a dividend be paid of 2 per cent. on the share capital for the year free of income-tax (absorbing £5422), that £5000 be transferred to reserve (bringing this account up to £10,000), and that the balance of £8556 be carried forward.

In his comments on these figures, the Chairman said the net profit for the year amounted to £8853—£4145 more than last year. This was accounted for by an increase in the net revenue in Seville of £3689, by a decrease in London expenses of about £200, and by differences in the Company's favour in exchange of some £250. Regarding the increase in the net revenue in Seville of £3689, there was an increase in the water-rentals of some £800, and a decrease in the expenditure of £2700. This decrease was principally due to a diminution of expenses in connection with the additional supply of water during the drought. There was also a considerable reduction in the taxation account owing to the rearrangement of the incidence of taxation in Spain. There was also a considerable decrease in the pumping and engine charges. The Manager in his report referred to the solution of the water difficulty, and told them that conferences had been going on between himself and the authorities during the past twelve months. These conferences had at length been brought to an issue by the presentation of a scheme on the lines the authorities had stated they were prepared to accept for a further supply of water, and the scheme was now being considered by the Water Commission. The Chairman paid a handsome tribute to the energy, ability, and tact the Manager (Mr. J. J. Bitbell) and his associates on the one hand, and the Alcalde, the members of the Water Commission, and the local leaders of the political parties on the other, had displayed in this matter. Dr. Seras, the Chief of the Hygienic Institute of Seville, had been to London, Paris, Antwerp, and certain German cities, to make a personal study of the question of water supply; and he (the Chairman) was confident that the knowledge he had gained would be of great service to Seville. A company that was dependent on springs for water could not possibly give a full supply when the springs ran

dry. This was their case; and they had been anxious to give a perfectly pure and wholesome supply of water from the River Guadalquivir; but up to now there had been great hostility. He was amazed in this Twentieth Century that there should be found, among such intellectual and accomplished people as the Sevillians, persons who were capable of putting obstacles in the way of furnishing a good and pure supply of water to the people of Seville by casting doubts on the scientific assurances of some of the greatest of the hygienic professors of the day. He hoped and believed that more reasonable counsels would now prevail; and that a river scheme would be carried out for the great benefit of the city, the people, and the Company. He could not yet put the scheme definitely before the shareholders; but this he could say, that, in order to execute it, an issue of preference shares would have to be made. The Board were satisfied, through estimates and figures, that the business would be so much increased that, after paying a dividend on the preference shares, they would be able to add considerably to the dividend now paid on the ordinary shares.

The report and accounts were adopted, the dividend recommended declared, and the retiring Directors (Messrs. Easton Devonshire and Cowley Lambert) were re-elected, as were also the Auditors. A special vote of thanks was passed to Mr. Bitbell and his staff.

Effect of the Coal Mines (Eight Hours) Act.

At the monthly meeting of the Cardiff Chamber of Commerce last Wednesday, the President (Mr. Trevor Jones) said the Eight Hours Act, since it came into force, had done an immense amount of harm, and resulted in a big loss to the South Wales coalfield. The figures prepared by Mr. F. L. Davis showed that there was a lessened production per man, despite the facts that large numbers of extra men had been given employment and that several new collieries had been opened up in the district. During the first seven months of the present year, the decreases in South Wales were: Cardiff, 307,722 tons; Newport, 252,800 tons; and Swansea, 55,213 tons. There was a gain at Port Talbot, however, of 220,377 tons. Mr. W. Straker, the Secretary to the Northumberland Miners' Association, reporting to the International Miners' Committee on the recent trouble in the county arising out of the Eight Hours' Act, states that during the whole of the strike the men were supported from the funds of the Association, which many regarded as unconstitutional. But such was the general feeling against the three-shift system, that this support was approved by a large majority of members. The cost to the Association amounted to upwards of £83,000.

Accounts appeared in the papers last week of a pathetic incident which had occurred at Lynmouth, North Devon, where a young man named Morris, of Roehampton Street, London, who was on his honeymoon, was drowned in sight of his wife. The unfortunate man was one of the clerical staff of the Gaslight and Coke Company.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In preparation for the Smoke Abatement Exhibition which is to be opened in Glasgow in a few weeks' time, there was published in the "Glasgow Herald" of Thursday a long article, in which much information was given as to the use of gas for heating purposes. The writer began by remarking that many suggestions for the removal of the smoke evil had been put forward. Smokeless fuel and heating by electricity had their advocates; but so far as the domestic chimney was concerned—and admittedly the domestic chimney was a great contributor to the fouling of the atmosphere—the solution was likely to be found in the greater utilization of gas for purposes of cooking and heating. Electric heating was still too costly for the average householder. On the other hand, the development of gas engineering within recent years had been so great that there seemed no good reason why there should not be a general adoption of gas-fires. Certainly the Gas Department of the Corporation could not now be accused of inactivity in pushing their wares. Show-rooms had been opened in various districts of the city and in the suburbs; and the recent opening of central premises in Sauchiehall Street had already resulted in an increased demand for gas-stoves and heating apparatus. The prejudice against the use of gas for the purposes indicated, which undoubtedly existed in Glasgow, was, owing to the more aggressive policy of the Corporation, being gradually broken down. The gas-cooker was coming into greater vogue. The number of stoves on hire was, of course, small in proportion to the number of gas consumers; but during the past seven years there had been a steady increase. In 1903-4, there were only 26,657 cookers on hire; whereas there were now 52,696, in addition to 15,106 free grillers. Recently there had been a gratifying increase. There were in use 4000 more stoves than was the case a year ago, and 5000 more grillers. The outlook was very encouraging, for the low price at which gas was now sold was bound to assist towards the more general adoption of gas-cooking appliances. It was satisfactory to learn, also, that, synchronizing with the increase of stoves, there was a decrease in the capital outlay of the Gas Department. Thus in 1903-4 the total capital standing in the books against the Stoves Department was £50,398, or £1 19s. 3d. per stove. The latest return showed the total capital to be £66,593; being £1 5s. 3½d. per stove. The total annual charges against the Stoves Department in the revenue account, including rents of shops, attendance, cartage, fixing, repairs, &c., amounted last year to £13,598, compared with £11,479 in the preceding year and £6968 in 1903-4. It had to be remembered, however, that all the expense incurred in connection with advertising and educating the public was charged against this department, which seemed scarcely fair. The hiring rate for cooking-stoves in Glasgow was fixed on a basis of 15 per cent. on the cost of each stove. In some places, stoves were provided and fitted free of charge. It was not

improbable that a similar system would be advocated for Glasgow.—at all events, it seemed worth the serious consideration of the Corporation. It might be inferred that the system of free service proved profitable in the places where it was in vogue; the profit obtained from this class of gas consumption more than repaying the cost of providing, fitting, and maintaining the cookers. The revenue from the hire of stoves in Glasgow last year was £9069, or 3s. 5½d. per stove. It was estimated that the gas consumed through appliances let on hire amounted to 550 million cubic feet per annum. This was less than an average of ¾d. worth of gas per cooker per day, leaving the small griller out of account altogether. This quantity, taking the cost of supplying gas at even 1s. 4d. per 1000 cubic feet, gave, at the present selling price of 2s., a profit to the department of over £18, which not only cleared off any apparent deficit on the stoves, but assisted materially in reducing the price of gas for other purposes. Apart from the purer atmosphere which would inevitably follow the general use of gas for heating and cooking purposes, it seemed clear, the writer concluded, that greater encouragement by the Corporation in the use of such appliances would prove highly lucrative to the department. Some critics objected to such enterprise on the part of the Corporation, on the ground that it invaded the sphere of the private trader. It would seem, however, that the use of gas as a fuel could only be adequately developed if the apparatus were supplied on favourable terms to the consumer, by hire or hire purchase. This was the experience of other municipalities. A careful census showed that, in the area supplied by the Glasgow Corporation, only 4000 cooking-stoves were owned by users, while 52,000 were on hire. These figures were significant of public feeling on the question; and also suggested the lines on which the use of gas-stoves was to be developed. A similar principle applied to the supply of heating apparatus would, there was no doubt, result in a great increase of gas-fires. While there had been a gratifying increase in the use of cooking-stoves, there were in the area of the Gas Department only 19,000 gas-fires and heating-stoves. Many householders were desirous of installing gas-fires; and it had been ascertained that the principal reasons which deterred them from doing so were: (1) The fear that the type of appliance might be found unsuitable after purchase; and (2), the initial cost. The adoption of the hire-purchase system would obviate these difficulties. The system of smokeless heating had been greatly improved of late; and it was admittedly one of the most practical and economical methods of dealing with the problem of air pollution. In gas undertakings where heaters were provided on the hire-purchase system, it was the rule to spread the payments over three or four years. It was estimated that gas-fires might be installed in Glasgow for rentals varying from 2s. 6d. to 4s. per quarter.

The question of the filling up of the vacancy in the managership of the Dumfries Corporation gas-works, caused by the appointment to Stirling of Mr. John Smith, who was Joint Manager with Mr. S. Dickie, came before a special private meeting of the Town Council on Tuesday. Bailie Macaulay, in the Council, moved, as he had done in Committee, that Mr. Dickie be appointed sole Manager. Mr. Newby seconded. Provost Lennox moved that the Council take steps to secure



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Extract from letter:—

"The plate rack, wall plate and hood arrived safely yesterday, and the whole household approves highly of the arrangement—in respect of its usefulness, protection and the enhanced appearance of the stove."

the services of a competent gas engineer as manager. Bailie Smart seconded. The question of what was a competent gas engineer was asked; and it was replied that he would be a gentleman who would be capable of designing gas-works and of preparing the plans. Judge Thomson, the Convener of the Gas Committee, asserted that it was not possible to secure such a man for Dumfries. The counter-argument was used that a town possessed of valuable gas-works, in which a capital of £100,000 is invested, ought to employ a capable engineer. Bailie Macaulay expressed the opinion that they would be able to get, for a weekly wage of £2 10s., a practical man good enough for their purpose. Bailie Macaulay's motion was carried by 16 votes to six. The resolution will be reported to the Town Council at their first public meeting. Provost Lennox intimated that he would then renew his opposition to the resolution. It is understood that, in the event of Mr. Dickie being appointed Manager, there will be no change made in the salary.

The annual meeting of the Fauldhouse Gas Company was held on Thursday. Mr. W. Prentice, the Chairman, who presided, said that the Directors, instead of paying a dividend, had preferred to spend the money earned in making connections, as they believed that this was the soundest policy to adopt in order to increase the consumption of gas. The prospects of the Company were good, and he had no doubt that the results of the current year would allow of their paying a dividend. Mr. T. Wilson, Gas Engineer, Coatbridge, was of opinion that the Directors could easily have paid a 4 per cent. dividend if they had carried forward the share of the preliminary expenses which they had written off. The report of the Directors was adopted.

The expenditure for the past financial year in the Gas Department of the Greenock Corporation was £34,383, and the income £50,884. The gross surplus is thus £16,501. After deducting interest, sinking fund, and depreciation, the net balance is £7198. It has been decided to wipe out a deficit of £1963 on the previous year's working, which will leave a surplus of £5235 for disposal at a special meeting of the Gas Committee.

The first ordinary general meeting of the Cardenden Gas Company, Limited, was held on Tuesday. Mr. R. A. Muir, who presided, explained that the Directors had laid down plant which would be capable of supplying gas to a much larger population than they had. Their balance-sheet was quite satisfactory. The gas-works had been open for eight months, and they had a profit of £203. A dividend at the rate of 2½ per cent. was recommended and agreed to. The Directors are considering the subject of the extension of the gas supply to Kinglassie.

In last week's "Notes," I mentioned the case of the man named Murdoch Barnett, of St. Mary Street, Arbroath, on whose behalf a claim was made against the Corporation of Arbroath for compensation in respect of injury sustained through an escape of gas in his dwelling-house on June 14. The claim was for £37 13s.; and the Town Council offered £15 and part expenses, which, it would appear, had been accepted. It is announced that Barnett died on Monday morning. His death is attributed to the effects of gas poisoning.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Aug. 20.

The market has continued strong throughout the week, and available supplies have again been readily taken up at advancing prices. The fact of the keen demand having come along at the time of minimum production has no doubt accentuated the firmness of the situation, and at the close values have reached £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Hull, £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith. Buyers have shown more disposition to operate in the forward position at the present level of prices, and sales are reported for October, 1910, to March, 1911, delivery at £12 5s. per ton f.o.b. Leith. Makers are now quoting £12 7s. 6d. per ton for delivery over the first six months of next year; but no business has transpired at this figure.

Nitrate of Soda.

This article meets with good inquiry, and holders are very firm at 9s. 3d. per cwt. for ordinary and 9s. 6d. for 96 per cent. quality, spot.

Tar Products.

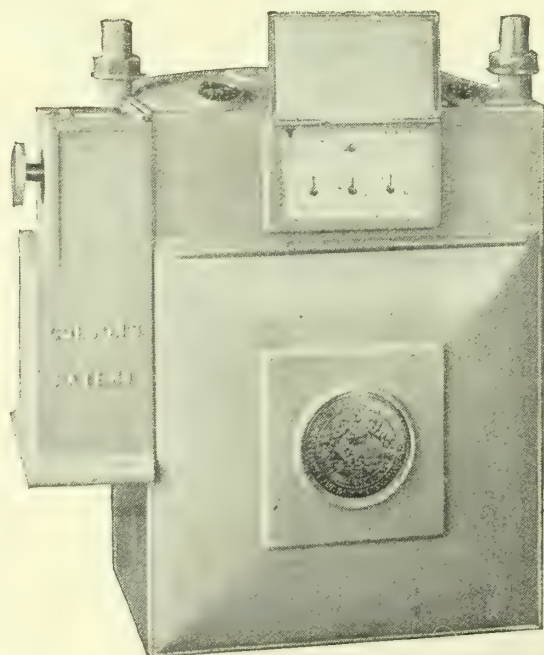
LONDON, Aug. 22.

The markets for tar products have been steady during the past week. In pitch, there has been a little more inquiry, and prices have improved still further. Creosote is steady, and there is a fair amount of fresh inquiry. Prices remain about the same for benzols, and in many cases manufacturers are asking improved prices for forward delivery. In solvent naphtha, there is a fair amount of inquiry for prompt and forward delivery, and prices are being maintained. Crude carbolic is very dull, and new business is hard to negotiate.

The average values during the week were: Tar, 18s. to 22s., *ex works*. Pitch, London, 36s. 6d. to 37s.; east coast, 36s. to 36s. 6d.; west coast, 35s. to 35s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7½d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has remained very firm, but there has been no further substantial increase in prices. Actual Beckton make is quoted at £11 15s. to £11 16s. 3d.; outside London makes, £11 8s. 9d. to £11 10s.; Hull, £12 to £12 1s. 3d.; Liverpool, £12 to £12 1s. 3d.; Leith, £12 5s.; and Middlesbrough, £12 to £12 1s. 3d.



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COAL TRADE REPORTS.

Northern Coal Trade.

There has been a steady but not very brisk trade in coal during the last few days. The shipments have been fair, and the output good; but for forward orders some competition is shown. In the steam coal trade, the demand is on the whole good. Best Northumbrians are about 10s. per ton f.o.b., second-class steams 9s., and steam smalls from 5s. 6d. to about 6s. 9d.—the demand for the latter kind being fully an average. In the gas coal trade, the demand is now heavier, both for home use and for export; but the production is full, and it meets the request well, though some of the best-known collieries have their immediate output well taken up. Prices of Durham gas coals vary from 9s. to 9s. 3d. per ton f.o.b. for second-class descriptions to 9s. 10½d. to 10s. for best sorts. Special "Wear" gas coals are quoted from 10s. 3d. to 10s. 6d. Sales of good qualities have been made for delivery over next year at Genoa, at about 16s. to 16s. 1½d. per ton, delivered at the Italian port named. The tenders have been sent in, and are now under consideration, for about 30,000 tons to 40,000 tons, for Palermo. Coke is rather steadier; and gas coke is a little more plentiful as the make increases. Good gas coke is quoted from 15s. 6d. to 15s. 9d. per ton f.o.b. in the Tyne; but the exports seem slightly heavier.

Scotch Coal Trade.

Trade shows no signs of improvement. For shipment, ell has been in better demand. Other sorts, and particularly splint, are being disposed of with difficulty; prices being easier. Steam coal is very plentiful. The prices now quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 346,105 tons—an increase of 15,196 tons upon the previous week, and of 25,988 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,958,161 tons—an increase of 928,287 tons upon the corresponding period.

Public Lighting of Church Stretton.—The Church Stretton Gas Company, Limited, have again secured the contract for the public street lighting for the ensuing three years. The Electricity Company were asked to tender for it; but they failed to do so.

Reductions in Price.—The Directors of the Leighton Buzzard Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet; making it 3s. 1d. to ordinary consumers, and 2s. 1d. to users of gas for motive power. At the meeting of the Normanton Gas Company on the 13th inst., the Chairman announced a reduction of 1d. per 1000 cubic feet in the price of gas as from the end of the current quarter. As from the 1st ult., the price of gas in Liverpool has been reduced by 1d. per 1000 cubic feet; and at the beginning of next month the charge to the users of prepayment meters will be lowered to the extent of twice this amount.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which were submitted at the thirty-third ordinary general meeting of the Company) show that the balance at the credit of profit and loss, after payment of the dividends in respect of the year to June, 1909, was £2028, to which has to be added the net revenue for the past twelve months, £7904—making a total of £9932. Deducting the interim dividend paid in January (£2600), there was available a sum of £7322. From this, the Board recommended the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4½ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These absorbed £3899, and left a balance of £3433. After transferring £410 to the water back-dividend reserve, £650 to the gas, and £150 to the water contingency and plant renewal fund, and adding £167 to the gas reserve fund, there was left a sum of £2056 to carry forward. The dividend scheme, together with the interim dividend paid in January, made a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The gas reserve fund stands at £1731. The quantity of gas supplied last year to private consumers and the public lamps was 58,367,999 cubic feet. The price of gas during the period under review was 3s. 6d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Voelker Lighting Corporation, Limited.—The annual meeting of shareholders was held last Friday at the Wandsworth works, when the highly satisfactory report and statement of accounts referred to in our last issue were unanimously adopted. The shareholders congratulated the management upon the excellent results obtained, especially in view of the constant uphill work it has been to combat almost unprecedented competition—showing that an "all British made" mantle is appreciated by gas engineers throughout the country.

New Joint-Stock Companies Registered.—The Float Turquand Gas Detector Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with F. J. Turquand, W. E. Gray, and C. Weld-Blundell, for the acquisition of an invention for improvements in gas detecting apparatus, and patents granted in respect thereof throughout the world, and to develop and turn them to account. The British Water-Main and Sewer Company, Limited, has been formed with a capital of £2000, in £1 shares (500 being 7½ per cent. preference), to carry on the business of cleaning out incrustations from water-mains and deposits from sewers, pipes, or tubes of any kind, &c., and to acquire the business carried on by the British Pipe-Cleaning Company at Hipperholme, Yorks, and to adopt an agreement with W. Glossop. There was registered in Edinburgh last week the Victor Gas-Machine Company, a private Company with a capital of £2000, in £1 shares, the purpose of which is to manufacture, sell, and supply light, and to carry on business in connection with air gas, petrol gas, or gas manufactured from petrol, gasoline, or other spirit.

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Opening of the Cardiff Gas-Works Recreation Ground.

With the view of providing the workmen with the means of healthy athletic exercise, the Directors of the Cardiff Gas Company a short time ago gave them a piece of ground abutting upon the Grange Gas-Works; and it was opened on Saturday, the 13th inst., when a programme of sports was gone through in the presence of a large gathering, including the Chairman (Dr. Taylor), who started the first race, and two of the Directors (Colonel Oakden Fisher and Mr. C. E. Dovey). The ground is an ideal one for the purpose, having a depth of about 10 feet of cinder; and on the opening day its condition was almost perfect, notwithstanding the fact that its preparation had occupied only seven weeks. This was due to the assiduous efforts of the Company's Engineer (Mr. H. D. Madden), the Superintendent (Mr. A. E. Williams), the Assistant-Superintendent (Mr. C. H. Carder), the Secretary of the sports (Mr. A. R. Taverner), and a willing band of workmen. The athletic club is an offshoot of the air-rifle clubs and baseball club, in which Mr. Madden has taken a great interest; and it is intended to form other clubs, to include football, harriers, bowls, and lawn tennis. The meeting attracted a large entry, including several well-known men in the running world. Prizes to the value of £30 were offered; and at the conclusion of the sports they were presented by Mrs. Madden, to whom and to the Directors a vote of thanks was proposed by Mr. Taverner and heartily accorded. During the afternoon, the proceedings were enlivened by selections of music given by the Loudoun Brass Band, under the conductorship of Mr. A. J. Moore. The success of the Company's Workmen's Institute and the athletic and other clubs is due in a large measure to the hearty support and encouragement they receive from the General Manager and Secretary (Mr. George Clarry), who was unavoidably prevented from being present at the opening of the new ground, on account of being away on his holidays.

East Worcestershire Water Company.—In the six months ended the 30th of June, the average quantity of water pumped daily by this Company was 1,293,451 gallons. The net profit of the Company was £2362, and the disposable balance is £3249, which it is proposed to appropriate as follows: To pay a dividend for the half year at the rate of 5 per cent. per annum, free of income-tax, £1831; to provide depreciation on buildings, £100; ditto on machinery and mains, £500; to carry forward the balance, £818.

Bonus for Truro Water Shareholders.—The accounts presented at the half-yearly meeting of the Truro Water Company showed that the balance to the credit of profit and loss account was £2174. The Directors recommended that a dividend of 5 per cent. should be paid, and that the balance of £1774 should be carried forward. Mr. A. C. P. Willyams, the Chairman of the Company, announced, however, that the Directors had been reconsidering the matter; and, in view of the balance in hand, they thought they would be doing right in granting the shareholders a bonus of 5s. per share. He explained that they had already given bonuses to the extent of £2 10s. per share.

Fatality Caused by a Gas-Ring.—An inquest was held at Battersea last Friday on the body of Mrs. Mabel Gertrude Jones, aged 32, of Kelmescott Road, Wandsworth Common, who died on Wednesday at the Bolingbroke Hospital. The evidence showed that Mrs. Jones, who was wearing a muslin dress, was making tea, and boiled the kettle on a gas-ring. Her dress became ignited, and she was quickly enveloped in flame. She ran across the passage with her dress on fire, and a man who was passing by in the street tried to extinguish the flames with a rug; but Mrs. Jones was so badly burned that she died from shock. A verdict of "Accidental death" was returned.

Failure of the Electric Light at Southend.—On the night of Saturday, the 13th inst., when Southend was crowded with people and business was at its best, the electric light failed, and a large portion of the town was in semi-darkness. Shopkeepers who had not abandoned gas as an illuminant, at once brought it into use; but those who had given it up had to resort to candles and other means of obtaining light. At places of amusement, the entertainments had to be stopped till the gas could be lighted. On the Westcliff Parade, where the band of the Black Watch was performing, all the lights went out. After the lapse of a quarter-of-an-hour, the light was restored; but a second failure (fortunately only for a few seconds) occurred shortly afterwards.

South Essex Water Company.—In moving the adoption of the report at the ordinary general meeting of the Company last Tuesday, Mr. Courtenay C. S. Fooks said the accounts showed the growing prosperity of the undertaking. For the past half year, the gross revenue was £27,430, or £160 more than for the corresponding period of 1909. With regard to the expenditure, the actual pumping charges were less; but the total expenses were more by about £110, due partly to an increase in rates and taxes. It was recommended that 5 per cent., less income-tax, should be paid for the half year on the preference stock; and that dividends, less income-tax, should be paid upon the ordinary stocks 1861, 1882, and 1901, at the rates of £9 15s., £6 16s. 6d., and £4 17s. 6d. per annum respectively. The report was adopted.

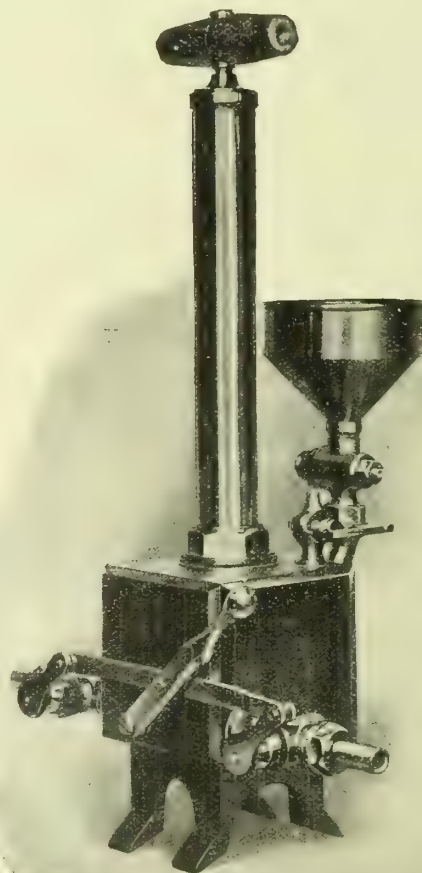
Frimley and Farnborough Water Supply.—At the ordinary general meeting of the Frimley and Farnborough District Water Company on the 13th inst., the Directors reported that in the half year ended the 30th of June the trunk and service mains had been extended about four miles, and the third new subsiding reservoir completed. The floor and walls of the high-level reservoir at South Warnborough were finished, and the roof was in course of construction. Two large softening tanks at Greywell, Hants, were in a forward state; and the building of the engine house had been commenced. The gas plant and pumps for this station were ready for delivery and erection. The Directors hoped that the whole of these works would be completed by the end of this year, and the new sources of supply made available. The accounts accompanying the report showed that the revenue balance was £5284. After paying the interest due upon the debentures, &c., and adding the balance brought forward, there was produced a sum of £13,667, out of which the Directors recommended the payment of a dividend at the rate of 7 per cent. per annum, carrying forward £920. This was agreed to.

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Aberystwyth Water Supply.—At the meeting of the Aberystwyth Town Council last Tuesday, the Town Clerk (Mr. A. J. Hughes) read a letter from the Local Government Board with reference to the proposed new service reservoir which, at a cost of £7300, it is intended to construct on the outskirts of the borough. The Board pointed out that unless the objections raised to the intended work were withdrawn, there must be a second inquiry on the spot by one of the Inspectors. The Town Clerk said he had written to Dr. Harries, who had made the objections referred to, asking him for particulars of his alternative scheme. To this Dr. Harries replied that he was having plans prepared, and hoped to be very shortly in a position to discuss the whole question with the Council.

Mitcham and Wimbledon Gas Company.—The accounts which the Directors of this Company will submit at the half-yearly general meeting next Tuesday show that, after providing for interest charges and carrying £900 to the insurance fund, the sum available for distribution, including the amount brought forward, is £18,180; and in their report they express their pleasure in recommending the payment of the further increased dividend at the rate of 5½ per cent. per annum (less income-tax)—the full statutory rate to which the proprietors are entitled under the sliding-scale, consequent upon the reduction of 2d. per 1000 cubic feet in the price of gas from January last. There was a substantial increase in the sales of gas in the six months covered by the report, which, having regard to the comparatively mild weather experienced early in the year, the Directors consider highly satisfactory.

Prepayment Meter Charges for Gas at Bolton.—At last Friday's meeting of the Bolton Corporation Gas Committee, a deputation from the Local Trades Council attended and were heard with reference to the charges now made for gas to consumers by prepayment meter. Mr. France, who at the last meeting of the Town Council unsuccessfully moved that the charge to penny-in-the-slot meter consumers be at the rate of 1d. for 30 cubic feet, instead of 25 cubic feet as at present, was also heard. The members of the deputation and Mr. France urged that it was unfair that consumers by prepayment meter should be charged at the rate of 3s. 6d. per 1000 cubic feet, while those using ordinary meters paid only 2s. 6d., particularly seeing that the former were, as a rule, the poorer class of citizens. After a long discussion, the Committee decided to defer the matter until the next meeting.

West Ham Electricity Loans.—Last Wednesday, a letter was received by the Town Clerk of West Ham from the Local Government Board, giving sanction to the Corporation's application for loans to the extent of £118,525. This covers two applications—one of 1908 and the other of May last. The original amount of the former was £74,000; and this has been reduced to £67,025, owing to sums put aside by the Corporation for repayment. The second application was originally for £53,500; but it was reduced by the Corporation to £51,500 at the inquiry held last month, when Mr. Robb, who appeared for the India Rubber and Gutta Percha Company, of Silvertown, made an application for an adjournment. The sanction of the Board to these loans will simplify the Council's task in considering the situation arising from the recent decision given in the High Court on the action brought against them by the Company.

Barnet District Gas and Water Company.—At the half-yearly general meeting of the Company next Monday, the Directors will report that the balance standing to the credit of the profit and loss account amounts to £29,079, out of which they will recommend the declaration of a dividend, less income-tax, for the six months ended the 30th of June at the rates of 7½ per cent. per annum on the "A" and "C" stocks, 6½ per cent. per annum on the "B" stock, and 5½ per cent. per annum on the "D" capital gas and water stocks. The Directors express their pleasure in reporting, with respect to the injunction obtained against the sinking by the Company of a well at Tyttenbanger, that, in the final appeal to the House of Lords, the decision of the Court of Appeal was upheld, and judgment given entirely in favour of the Company with costs. The work is proceeding. The Engineer and Manager (Mr. F. J. Bancroft, B.Sc., M.Inst.C.E.) reports that the works are in good repair and condition.

APPLICATIONS FOR LETTERS PATENT.

- 18,635.—INGRAM, J., "Stop valve." Aug. 8.
 18,645.—BELLAMY, N. F., "Pipe and joint." Aug. 8.
 18,649.—WALTON, C. & J. B., "Reciprocating conveyors and screens." Aug. 8.
 18,689.—KRONE, F., and KAHLE, E., "Inverted lamps." Aug. 8.
 18,698.—SOCIÉTÉ L'AIR LIQUIDE (SOCIÉTÉ ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE), "Desiccation of air and other gases." Aug. 8.
 18,703.—GALBRAITH, H., and WAITE, J. N., "Liquid meters." Aug. 8.
 18,710.—DUNN, J., "Pipe-grips." Aug. 9.
 18,735.—WILLIAMS, J., "Air carbureting apparatus." Aug. 9.
 18,836.—JAEGER, C. H., "Rarefying and compressing air and gases." Aug. 10.
 18,872.—BUWALDA, C. W., "Turning on and off the supply of gas to gas-burners." Aug. 10.
 18,878.—MILNE, J., "Governors for gas." Aug. 11.
 18,918.—DEUTSCHE GASGLÜHLICHT ART.-GES. (AUERGESELLSCHAFT), "Lighting and extinguishing gas-lamps." Aug. 11.
 18,922.—HIBY, W., "Charging coke-ovens." Aug. 11.
 18,959.—SULLIVAN, P., "Fire-lighter with the aid of gas." Aug. 12.
 18,967.—AIRD, K., "Gas-fires." Aug. 12.
 19,012.—WARREN, C. H., "Connecting delivery pipes and water and gas mains while under pressure." Aug. 12.
 19,022.—MATHOT, R. E., "Regeneration gas-producers." Aug. 12.
 19,039.—FABRY, R., "Extracting water from saturated solutions of ammonium sulphate." Aug. 13.
 19,073.—SKRIWAN, E., "Incandescent mantles." Aug. 13.
 19,074.—LOWE, F. R., and ELY, B., "Treatment and purification of ammoniacal liquors and of waste ammoniacal liquors." Aug. 13.

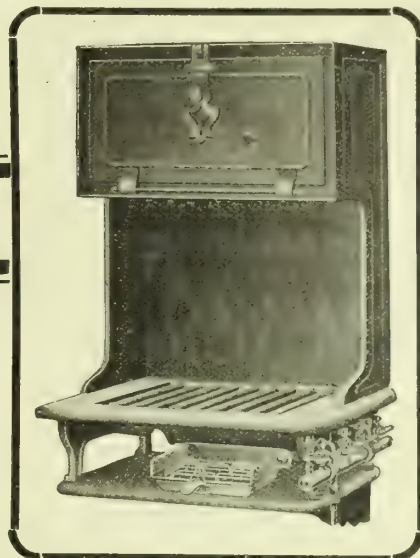
NEW DESIGNS

IN

HOT CLOSETS

and Enamelled

BACK PLATES AND PLATE RACKS.

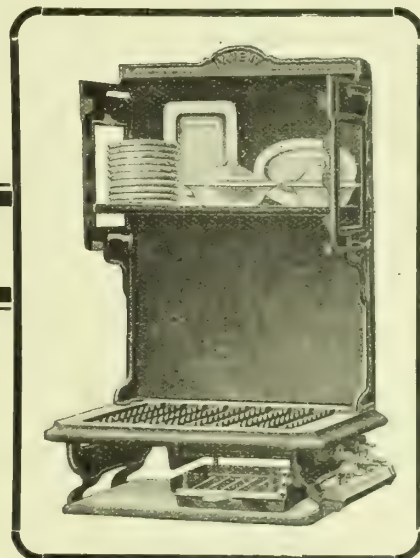


HOT CLOSET and PLATE WARMER

FOR FITTING ABOVE COOKER.

Substantially Constructed Throughout.

Heated by Heat after being used in Oven and also by the Hot Plate Burners.



ENAMELLED BACK PLATE & PLATE RACK,

See Special Lists for other designs.

In the above Design the Rack can be used Horizontally (as shown) or Vertically.

INEXPENSIVE,
CLEANLY and CONVENIENT.

Invaluable adjuncts to the Cooker.

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent
Geyser Co.),

STOUR STREET, SPRING HILL, BIRMINGHAM,

&

129, HIGH HOLBORN, LONDON.

We have received from Messrs. James Milne and Son, Limited, of Edinburgh, one of the metal-mounted and varnished wall sheets which they are sending out to plumbers, showing designs of coronas, pendants, and brackets suitable for churches and halls, in inverted gas-fittings. The designs are all priced in various finishes.

Gas managers who are contemplating repairs to their retort-settings in view of the coming winter may be interested to learn that George K. Harrison, Limited, of Stourbridge, have just issued a new illustrated catalogue of gas-retorts, fire-bricks, lumps, tiles, &c., the contents of which occupy 68 oblong pages. A few useful notes on

ordering gas-retorts will be found on p. 20, and some remarks on regenerative retort settings, by Winstanley and Co., on pp. 22-24.

In the last number of the "JOURNAL" (p. 452), attention was called to a new collapsible mantle, the "Sirrah," which has been introduced by Messrs. J. W. May and Co., of No. 34, Cock Lane, Snow Hill, E.C. The prices of these mantles and of the others sold by the firm will be found in their general catalogue and price list for the season 1910-11, which contains a great variety of burners and burner accessories, glassware, stoves, &c. A special feature of the catalogue is that all the prices quoted are net.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER SECRETARY AND MANAGER. Tynemouth Water Department. Applications by Aug. 31.
ASSISTANT-MANAGER. Coatbridge Gas Company. Applications by Sept. 1.
DRAUGHTSMEN. West's Gas Improvement Company, Manchester.
DRAUGHTSMEN. No. 5168.
REPRESENTATIVE. "Gas-Works," c/o Streets, Cornhill.
MAINTENANCE INSPECTOR. Grantham Gas Company.

Situations Wanted.

GAS ENGINEER AND MANAGER. (Abroad). No. 5275.
ENGINEER, MANAGER, OR HEAD DRAUGHTSMAN. No. 5277.

Patent Licences, &c.

"MANUFACTURE OF COKE AND GAS." Marks and Clerk, Lincoln's Inn Fields, W.C.

TENDERS FOR

Coal.

OSWALDTWISTLE URBAN DISTRICT COUNCIL. Tenders by Sept. 1.

Lime.

STAINES AND EGHAM GAS COMPANY. Tenders by Sept. 9.

Retort Setting, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by Sept. 2.

Station Meter, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by Sept. 2.

Tar and Liquor.

STAINES AND EGHAM GAS COMPANY. Tenders by Sept. 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. What is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on First White Page.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

READ HOLLIDAY AND SONS, LTD.,

HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.

ENQUIRIES SOLICITED.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.

Telegraphic Address: "Carburine, London."

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

M.H. (Methane Hydrogen) GAS PLANT, LTD.,

19, GREAT WINCHESTER STREET, LONDON, E.C.

The M.H. GAS PLANT produces at will:—
METHANE HYDROGEN GAS from Coke, Tar, Steam,
and either Benzol or Tar enrichment.

BLUE WATER GAS from Coke and Steam.
CARBURETTED WATER GAS from Coke, Steam,
and any Crude Oil.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKEFIELD.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated Wm. PEARCE & SONS, LTD.,
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

JOHN W. LEITCH AND COMPANY,

MILNSBRIDGE CHEMICAL WORKS,
near HUDDERSFIELD.

The Manufacture of
PURE BENZOL FOR GAS ENRICHMENT
a speciality.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-
pairs.
JOSEPH TAYLOR and Co., CENTRAL PLUMBING WORKS,
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 6848.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSS
MOUNT IRON-WORKS, ELLAND.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

Communications should be addressed to
UNDERWOOD HOUSE, PAISLEY.

TAR WANTED.

Telephone: Central Manchester, 7009.
Telegrams: "UPRIGHT."

Apply, **THOMAS HORROCKS,**
Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Carbolic, Sulphate of Ammonia.

AMMONIA Waste Liquor Disposal.

Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

AMMONIA.

Consumers in any form are invited to correspond
with **CHANCE AND HUNT, LTD.,** Chemical Manufac-
turers, OLDBURY, WORCS.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND
CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON," Telephone: 2836 HOLBORN.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

GAS-WORKS requiring Extensions

should Communicate with **FIRTH BLAKELEY,
SONS, AND CO., LIMITED,** Dewsbury, who make a
Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satis-
faction Guaranteed.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

GAS OILS.

MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

IT is Worth Your While to Buy Direct.

The **RELANCE LUBRICATING OIL COMPANY**
supply the best value in NON-CORROSIVE LUBRI-
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,
10d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;
650 T. Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;
Renown Engine Oil, 11d.; and Astral Disinfectant,
2s. 6d. per gallon. Barrels free, carriage paid. Solidified
Oil, 25s. cwt.

The **RELANCE LUBRICATING OIL COMPANY,** 19 & 20,
Water Lane, Tower Street, LONDON, E.C.

KRAMERS AND AARTS WATER- GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

89, VICTORIA STREET, S.W.

GAS TAR wanted.

BROTHERTON AND Co., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
SUNDERLAND, AND WAKEFIELD.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS, Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

GAS Engineer and Manager (Age 32),

Experience over 17 Years in Erecting and
Managing Gas-Works, desires APPOINTMENT
Abroad. Would go out Erecting or Managing.

First-Class References, and any further Particulars
from No. 5275, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

WANTED, a Position as Engineer,

MANAGER, or HEAD DRAUGHTSMAN to Gas
or Water Works or Contracting Engineers. Thoroughly
Competent. Energetic. Good References. Age 35
Years. Moderate Salary. No objection to going Abroad.
Address No. 5277, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, Draughtsmen accustomed

to Constructional and Mechanical Engineering.
Apply, by letter, stating Age, Experience and Salary
required, to WEST'S GAS IMPROVEMENT COMPANY, LTD.,
Albion Iron-Works, Miles Platting, MANCHESTER.

THE Coatbridge Gas Company require

an ASSISTANT-MANAGER.
Applications, stating Experience, References, and
Salary expected, to be in the hands of the Secretary not
later than the 1st of September current.

WANTED, immediately, Two or Three

DRAUGHTSMEN, fully Experienced in the
Design of Modern Gas Plant.

Apply, by letter, Stating Age, Qualifications, and
Salary required, to No. 5268, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

REPRESENTATIVE required to intro-

duce and push important article used in all Gas-
Works. Must have Good Connections and be good
Salesman.

Please write, stating Qualifications, District, and
References, to: "GAS-WORKS," care of STREETS, 30,
CORNHILL, E.C.

WANTED by a Firm of Ironfounders

and Chemical Engineers, with Established Trade
among Chemical Manufacturers, to undertake the Sole
Rights of Making and Selling Chemical Specialities in
Great Britain.

Apply No. 5262, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE Grantham Gas Company Require

the Services of a Smart, Capable, young fellow
as MAINTENANCE INSPECTOR, to devote the
Whole of his Time to the Maintenance of Incandescent
Burners, Fittings, &c. None need Apply save those who
have had similar Experience.

Applications, stating Age, Experience, and Wages
required, to R. G. SHADBOLT, Gas Office, GRANTHAM.

COUNTY BOROUGH OF TYNEMOUTH.

(WATER DEPARTMENT.)

THE Corporation require a Water

SECRETARY and MANAGER possessing Ex-
perience in the Office of a Water Department and
having Engineering Qualifications as well as a Com-
mercial Training.

Salary, £250 per Annum, for Two Years, rising there-
after by Two Annual increments of £25 to a maximum
of £300 per Annum.

Canvassing prohibited.

Applications, stating Age, Experience, and Qualifica-
tions, to be delivered to the undersigned before noon
on the 31st of August, 1910.

A List of Duties may be obtained from the under-
signed.

E. B. SHARPLEY,

Town Clerk.

Town Hall Tynemouth,
August, 1910.

GASHOLDERS—16 ft., 24 ft., 26 ft., and

45 ft. Diameter GASHOLDERS, Cheap for im-
mediate Sale. Re-erected in either Brick or New Steel
Tanks Complete to Plan and Specification. Can be
seen Temporarily Erected at our Works.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

FOR DISPOSAL—Brick Plant com-

plete, Including 400,000 Place and Hard Stock
BRICKS, 15s. to 25s. per Thousand f.o.r., Maidstone.
12-H.P. Portable STEAM-ENGINE by Marshall, of
Gainsborough, insured 90 lbs. Steam by National,
nearly as good as when delivered from Workshops, £140.
High-Pressure BOILER, new, insured 200 lbs. Steam.
Suitable for 2-Ton Lorry, £20. 4-H.P. Horizontal
STEAM-ENGINE, £5. 5-H.P. ditto, £6. Cheap 8-H.P.
Portable STEAM-ENGINE £25. Offers solicited.

Full Particulars on Application to WM. JOHNSON,
JUNR., New Hythe, Larkfield, KENT.

URBAN DISTRICT COUNCIL OF OSWALDTWISTLE.

TENDERS FOR GAS COAL.

THE above Council invite Tenders for
the Supply of the whole or part of 5000 Tons of
NUTS or UNSCREENED COAL, to be delivered
during the Year ending Sept. 30, 1911.

Conditions and Form of Tender may be obtained on
Application to the Manager, Mr. J. H. DAVIES, Gas-
Works, Church, Lancashire.

Sealed Tenders, endorsed "Tender for Coal," must
be delivered to the undersigned not later than Twelve
o'clock noon on Thursday, the 1st prox.

The Council do not bind themselves to accept the
lowest or any Tender, and reserve to themselves the
right to divide the Contract in any manner they may
think fit.

B. T. WESTWELL,

Clerk to the Council.

Town Hall, Oswaldtwistle,
Aug. 15, 1910.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

LIME.

THE Directors of the above Company

are prepared to receive TENDERS for the Supply
of about 130 Tons of LIME, suitable for Gas Purifica-
tion, during the Twelve Months ending Sept. 30, 1911.

Forms of Tender may be had on Application.

TAR AND AMMONIACAL LIQUOR.

TENDERS are invited also for the Purchase of the
Surplus COAL TAR, CARBURETTED WATER-GAS
TAR, AND AMMONIACAL LIQUOR, for One Year
commencing on the 1st of October next.

Coal Tar, at per Gallon, pumped into Buyer's Tank-
Barges alongside the Company's Thames-side
Wharf at Egham.

Carburetted Water-Gas Tar, at per Gallon, pumped
into Buyer's Casks and loaded on to Buyer's
Barge alongside Wharf.

Ammoniacal Liquor, at per 1000 Gallons, at 8-oz.,
9-oz., and 10-oz. Twaddle, pumped into Buyer's
Barge, as before stated.

The Directors reserve the right to accept any Tender
for Tar and Liquor separately.

The highest or any Tender not necessarily accepted.
Tenders, endorsed "Lime," "Tar," and "Liquor,"
respectively, and addressed to the Directors, must be
delivered not later than Friday, the 9th of September
next.

GEO. H. SAYERS,

Secretary.

The Causeway, Staines,
Aug. 20, 1910.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive

TENDERS for the following:

CONTRACT No. 50.—FOR ONE GAS STATION
METER to pass 60,000 Cubic Feet of Gas per
Hour at the Porth Gas-Works.

CONTRACT No. 51.—FOR Building ONE BED AND
SETTING WITH EIGHT INCLINED RE-
TORTS on the Tubular Regenerator System in
existing House at the Porth Gas-Works.

Specification and Form of Tender for Contract No.
50 can be obtained; while Specification and Plans for
Contract No. 51 must be inspected at the Office of the
Engineer and Manager, Mr. Octavius Thomas, Gas and
Water Offices, Pentre, Rhondda, upon the payment of
One Guinea in each case, which will, after the Council
have entered into a Contract upon the Tenders received,
be returned to the Tenderer, provided that he shall
have sent in a *bona-fide* Tender, and shall not have
withdrawn same.

The Contractor will be required to pay the Standard
Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas
and Water Committee, endorsed "Contract No. 50 or
51," as the case may be, and delivered at my Office not
later than Ten a.m. on Friday, Sept. 2 next.

The Council do not bind themselves to accept the
lowest or any Tender.

WALTER P. NICHOLAS,

Clerk of the Council.

Public Offices, Pentre,
Rhondda, Aug. 17, 1910.

THE Owner of British Patent No. 21,808,

of 1907, entitled "IMPROVEMENTS IN COKING,
OR DISTILLING, COAL FOR THE MANUFACTURE
OF COKE AND PRODUCTION OF GAS," granted to
S. B. Sheldon, is desirous of DISPOSING of the Patent
or Entering into a WORKING ARRANGEMENT,
under LICENCE, with Firms likely to be interested in
the same. In the alternative, the Owner would be open
to consider Proposals to MANUFACTURE THE
APPARATUS, and to carry out the process to fill any
requirements of the Market in Great Britain, on Terms
to be arranged.

The Patent covers an Invention interesting to Manu-
facturers of Gas and Coke and Gas Producers.

Detailed Information as to the invention will be
found in the Patent Specification, of which a copy will
be supplied to any interested party on request.

Full Particulars can be obtained from, and Offers
made (for transmission to the Owner) to, MARKS AND
CLEEK, 57 & 58, Lincoln's Inn Fields, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER

STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION OF NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to MESSRS.
A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of

FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,

AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

MIRFIELD GAS COAL.
UNEQUALLED.

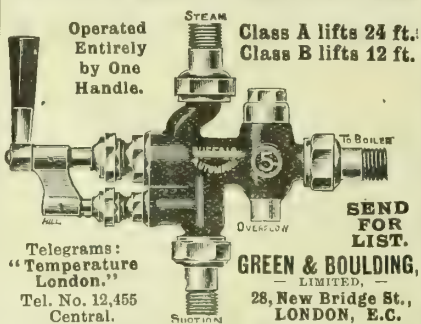
Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

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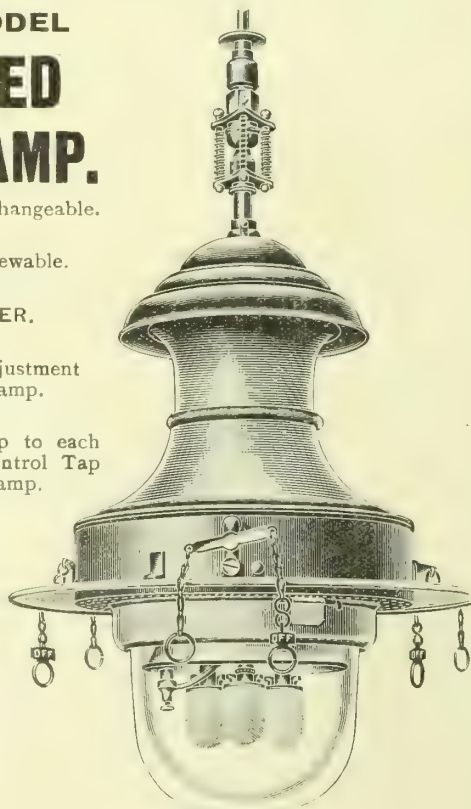
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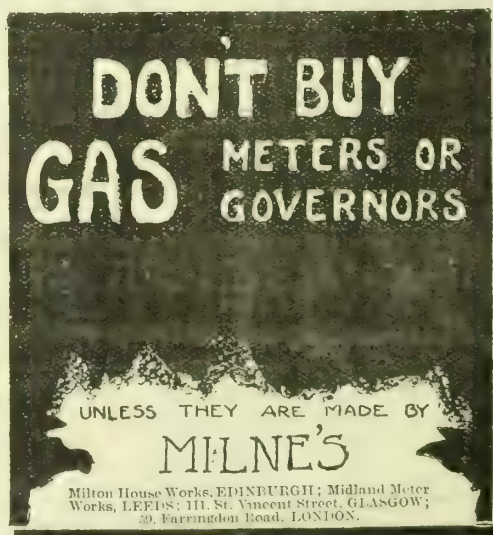
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3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

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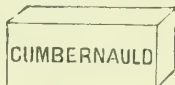
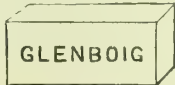
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

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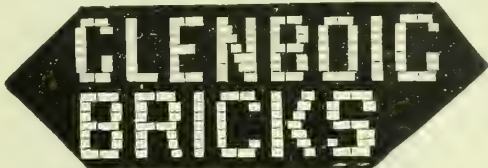
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Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



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ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET, LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4%
Linear shrinkage at 100° C.	3.70%
" " " 1050° C.	4.76%
" " " Total	8.46%
Volume shrinkage at 100° C.	10.7%
" " " 1050° C.	12.6%
" " " Total	23.3%
Plasticity	20.0%
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. — I am, yours faithfully,
JOHN T. NORMAN.

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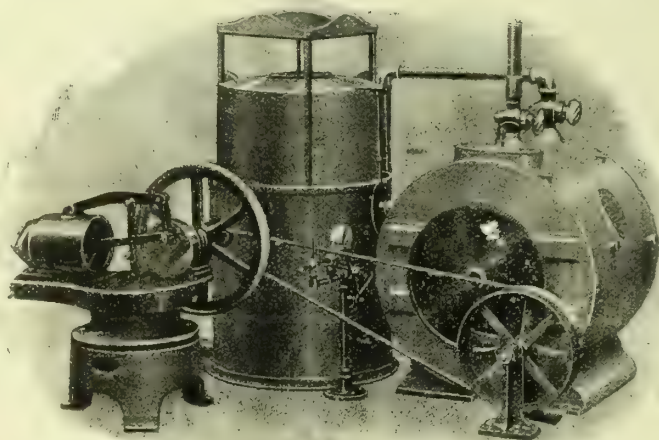
Plants from 100 cub. ft. per hour up to 50,000 cub. ft. per hour for Gas Works.

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WILLIAM KEY, Engineer.

109, HOPE STREET,
GLASGOW.

11, QUEEN VICTORIA STREET,
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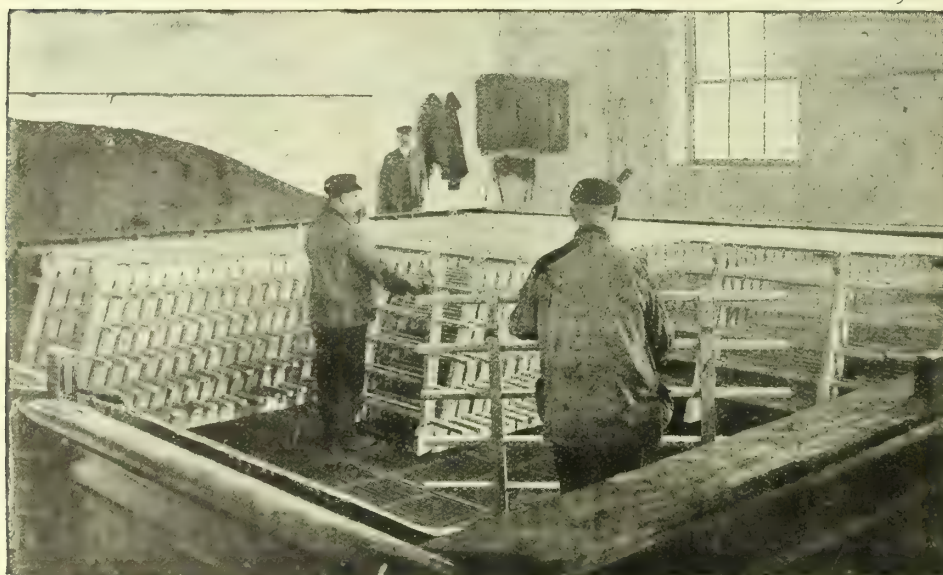
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The First Deep Grid invented, and the only one that holds Purifying Material in a light, porous condition.

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LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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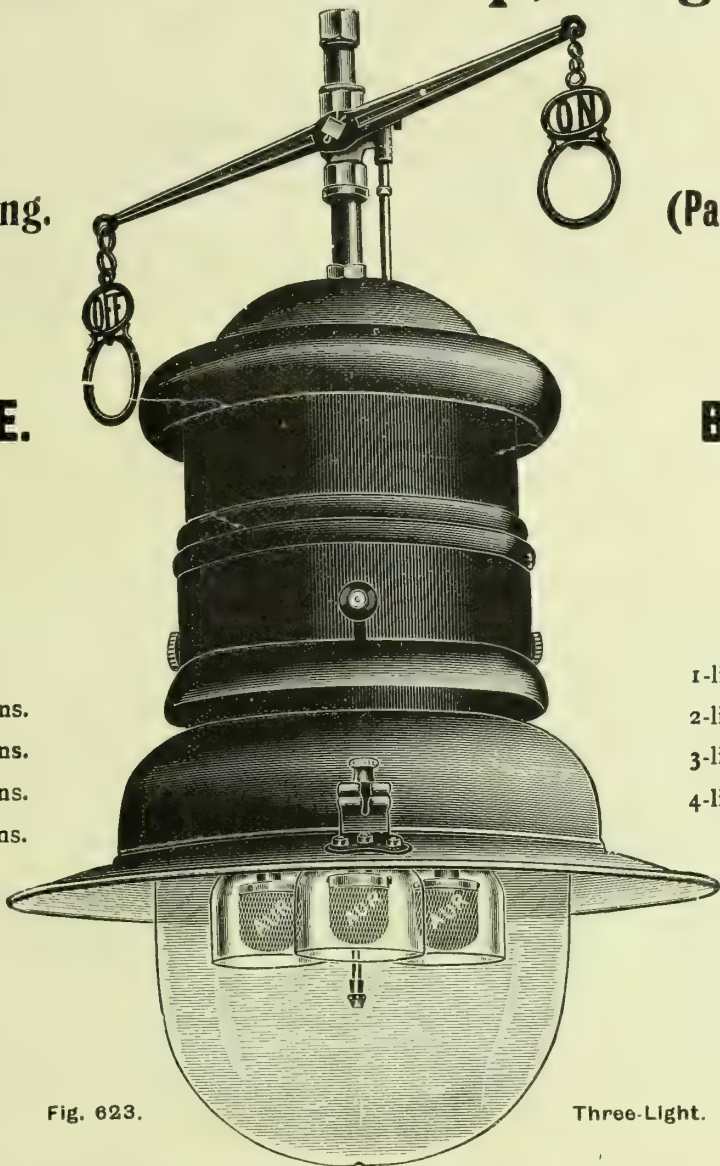


Fig. 623.

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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BUNDLES
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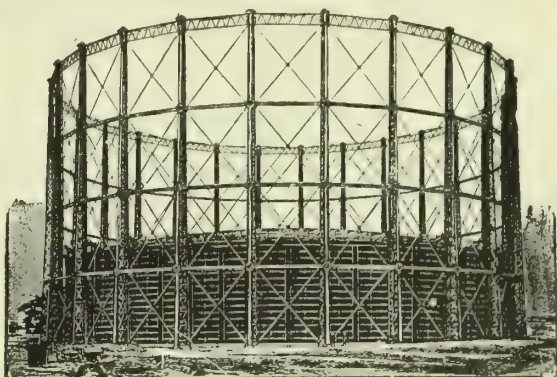
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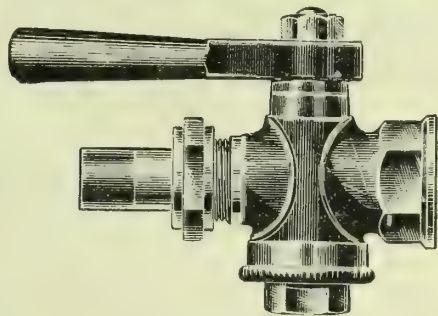
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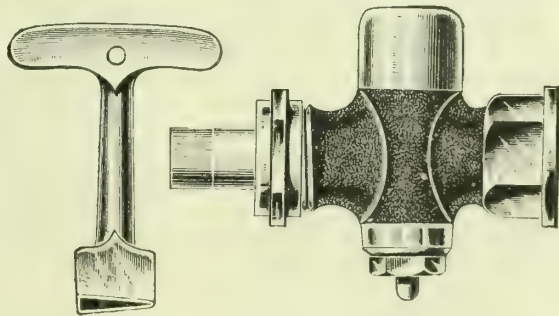
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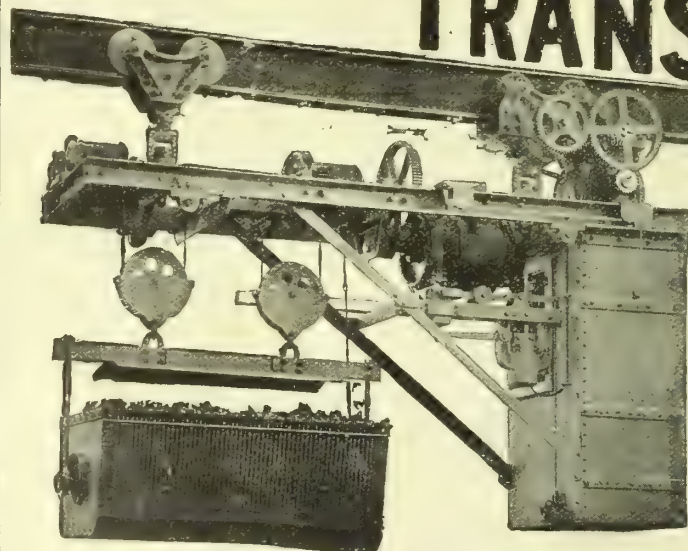
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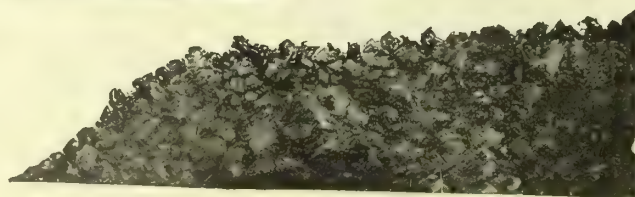
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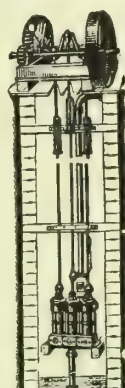
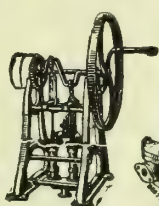
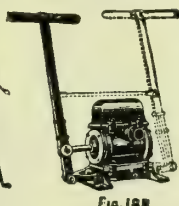
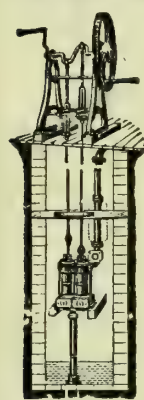
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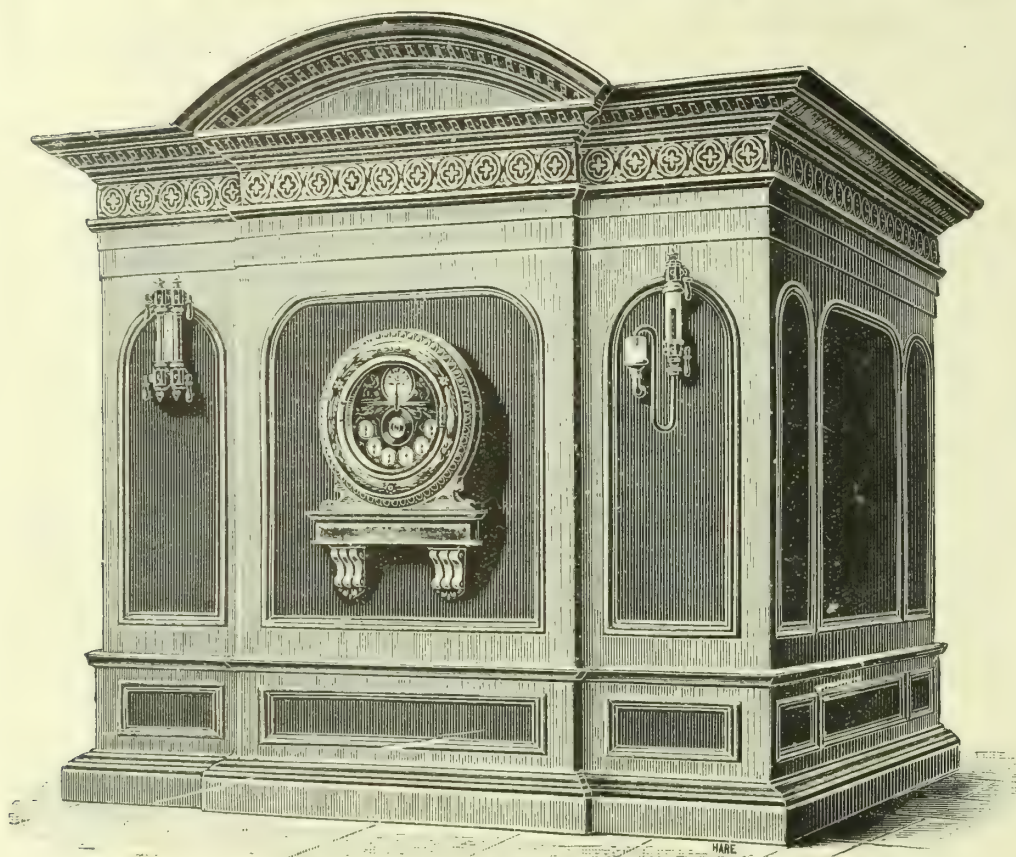
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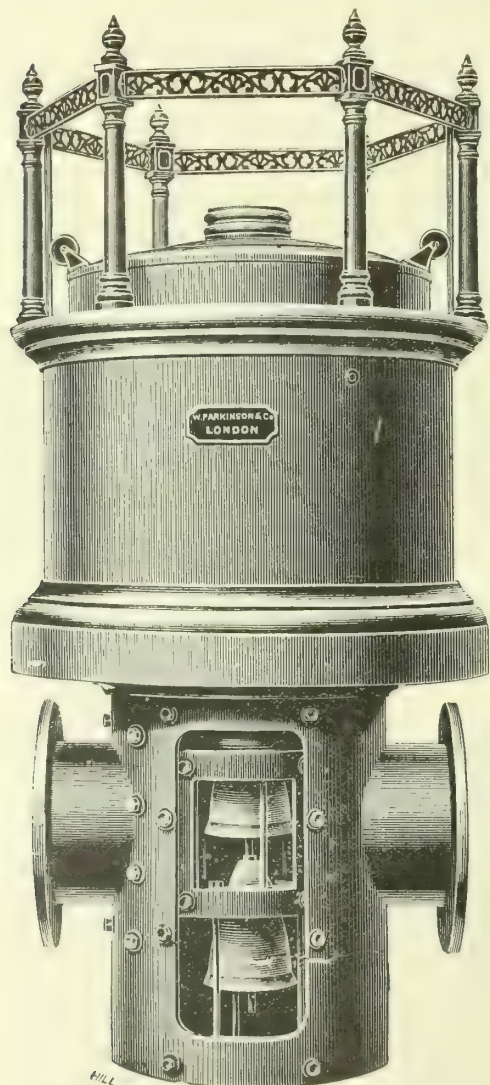
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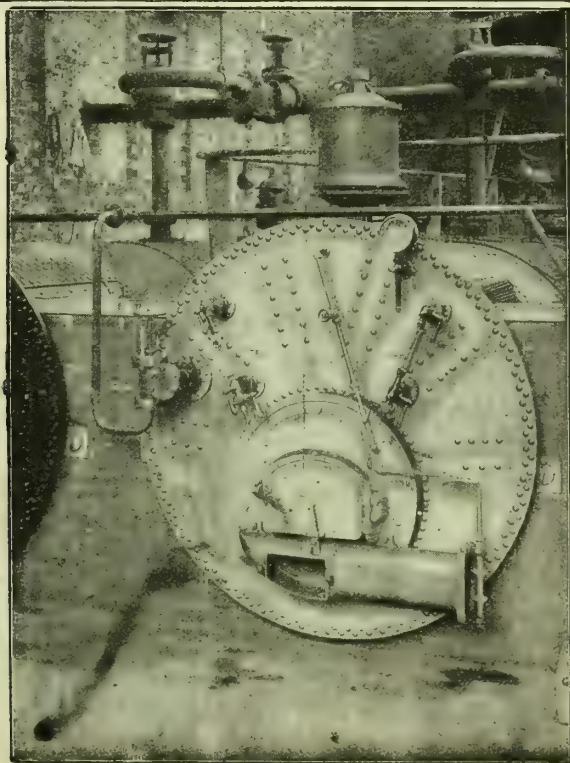
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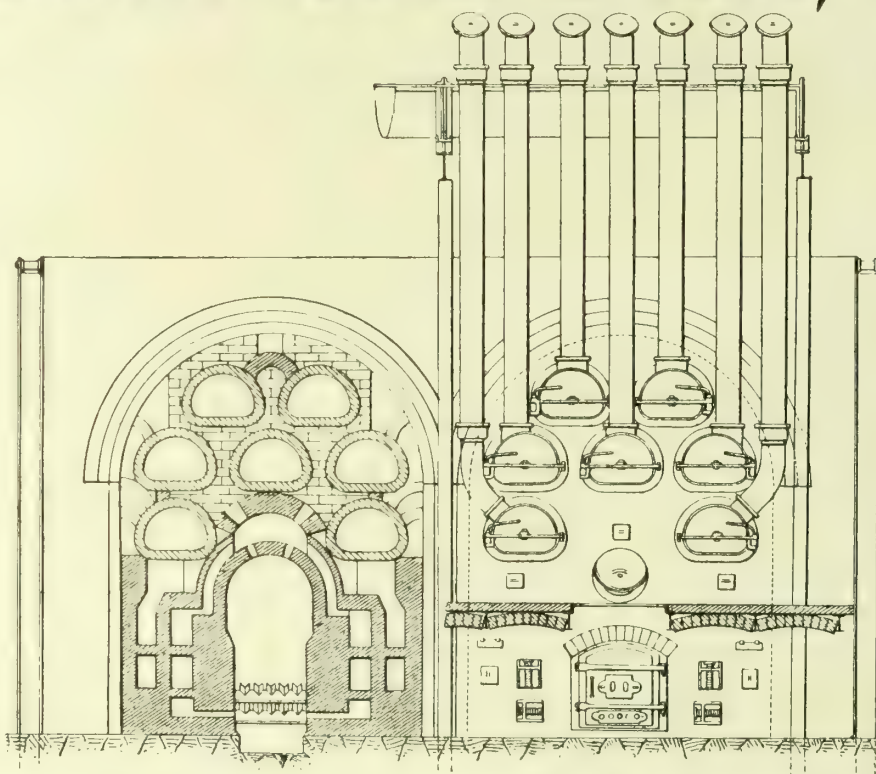
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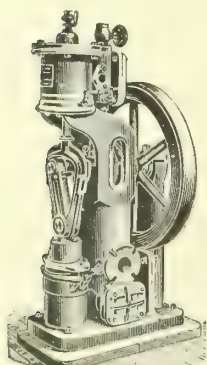


Fig. 705. "SINGLE RAM" STEAM-PUMP.

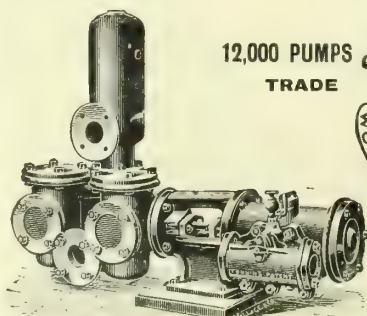


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

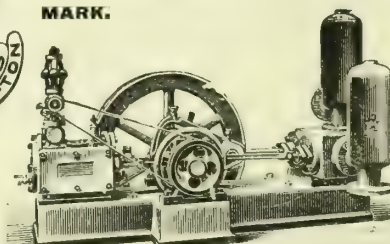


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

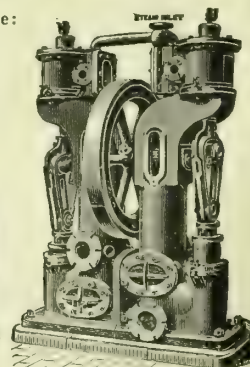


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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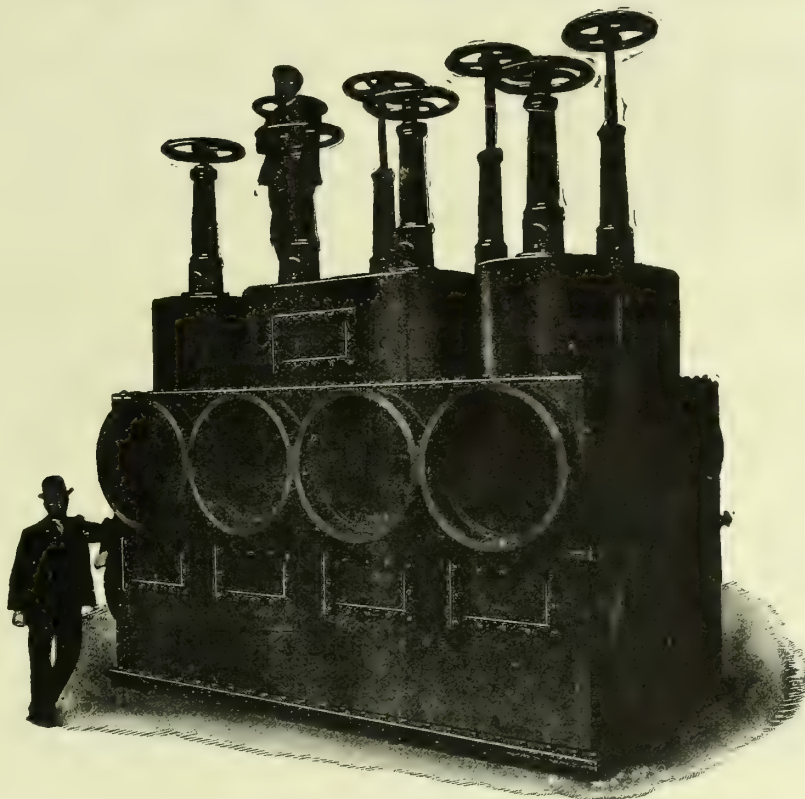
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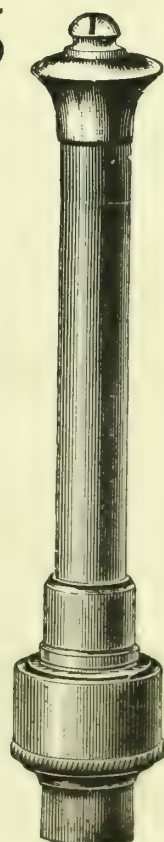
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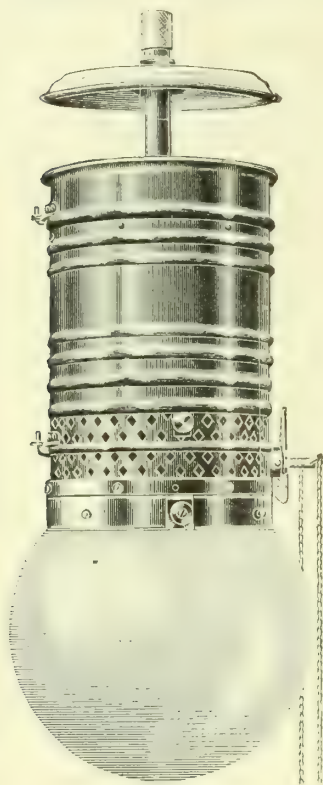


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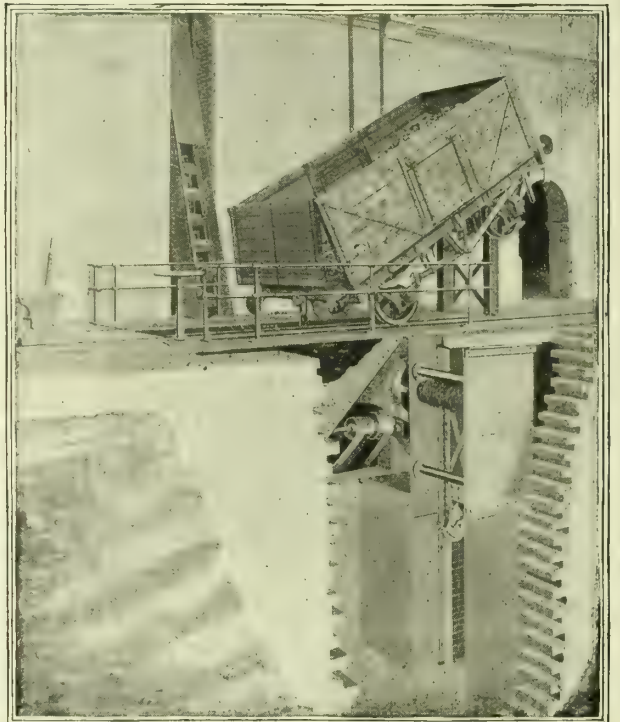
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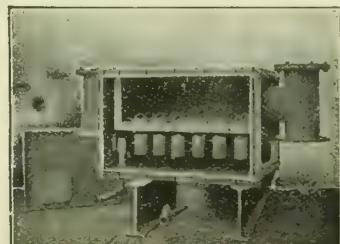
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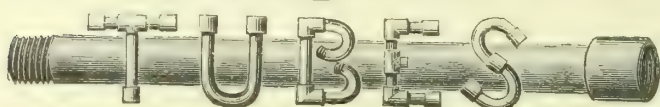


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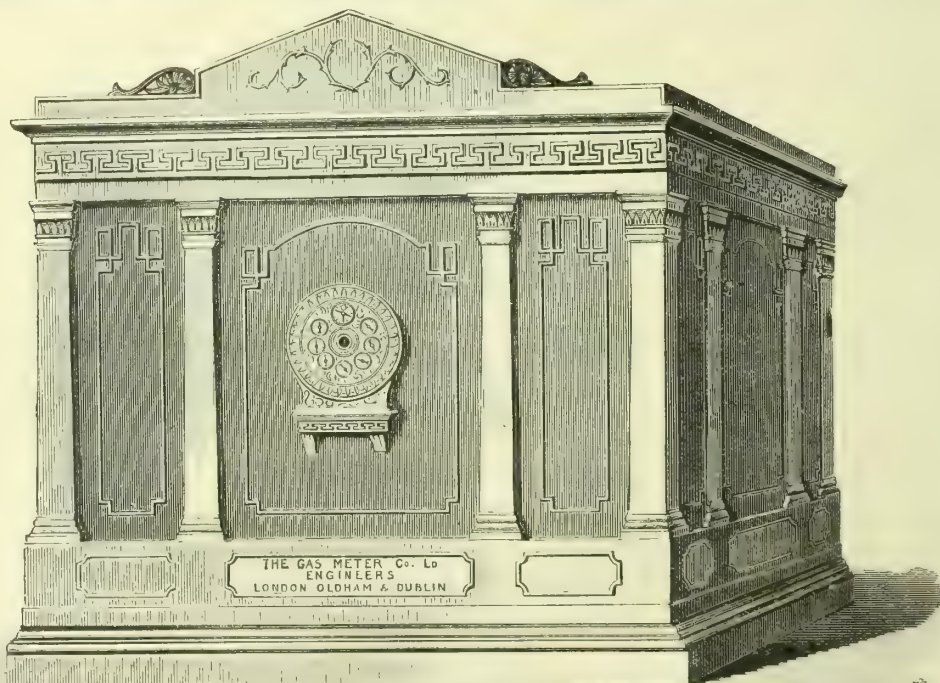
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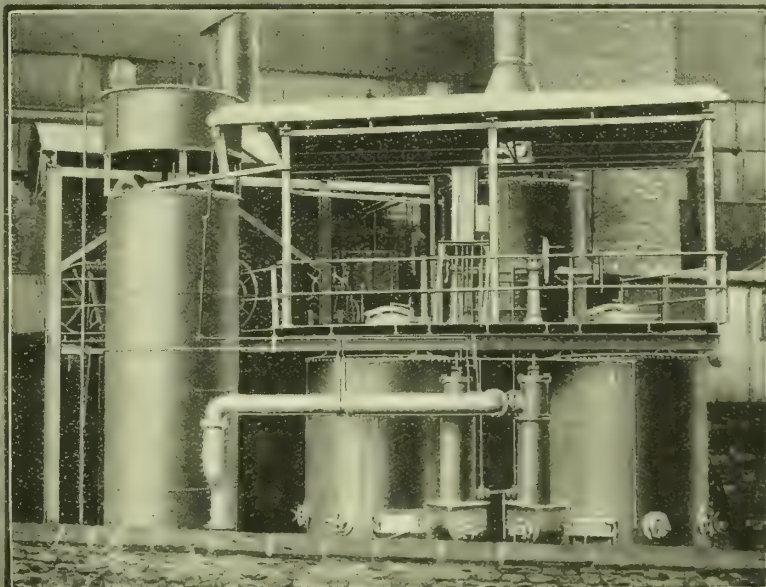
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| Croydon (4th)             | 550,000           | Namur, Belgium              | 175,000           | Waltham               | 400,000           |
| Debreczin, Hungary        | 100,000           | Nelson                      | 400,000           | Wandsworth & Putney   | 1,800,000         |
| Deventer, Holland         | 150,000           | Newburgh, N.Y.              | 600,000           | Watford               | 300,000           |
| Deventer (2nd)            | 200,000           | New York                    | 5,200,000         | Watford (2nd)         | 350,000           |
| Dorking                   | 150,000           | Nichteroy, Brazil           | 250,000           | Wellington, N.Z.      | 350,000           |
| Dublin                    | 2,000,000         | North Middlesex             | 150,000           | West Bromwich         | 550,000           |
| Dublin (2nd)              | 2,000,000         | North Middlesex (2nd)       | 200,000           | West Ham              | 1,500,000         |
| Dublin (3rd)              | 650,000           | North Middlesex (3rd)       | 75,000            | West Ham (2nd)        | 800,000           |
| Dundee                    | 1,500,000         | Norwich                     | 1,000,000         | Weston-super-Mare     | 350,000           |
| Dunedin, N.Z.             | 150,000           | Norwich (2nd)               | 300,000           | Weston (2nd)          | 350,000           |
| Dunedin, N.Z. (2nd)       | 275,000           | Norwich (3rd)               | 500,000           | Wexford, Ireland      | 100,000           |
| Durham                    | 200,000           | Nottingham                  | 1,000,000         | Wiesbaden, Germany    | 850,000           |
| Düsseldorf, Germany       | 1,000,000         | Nottingham (2nd)            | 1,000,000         | Winchester            | 225,000           |
| Eastbourne                | 1,250,000         | Nuneaton                    | 125,000           | Winchester (2nd)      | 125,000           |
| Edinburgh                 | 2,000,000         | Oberhausen, Germany         | 175,000           | Wolverhampton         | 1,500,000         |
| Epsom                     | 225,000           | Oldenburg, Germany          | 200,000           | Zwolle, Holland       | 200,000           |
| Epsom (2nd)               | 300,000           | Ostend, Belgium             | 100,000           | Zwolle (2nd)          | 200,000           |
| Essen                     | 1,400,000         | Ostend (2nd)                | 200,000           |                       |                   |

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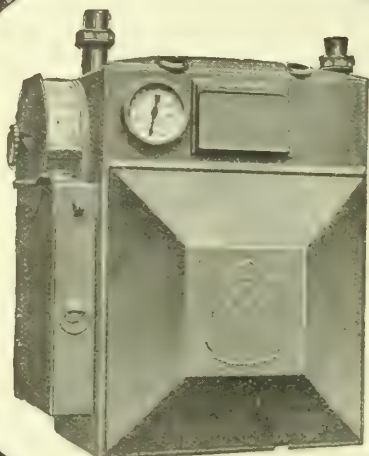
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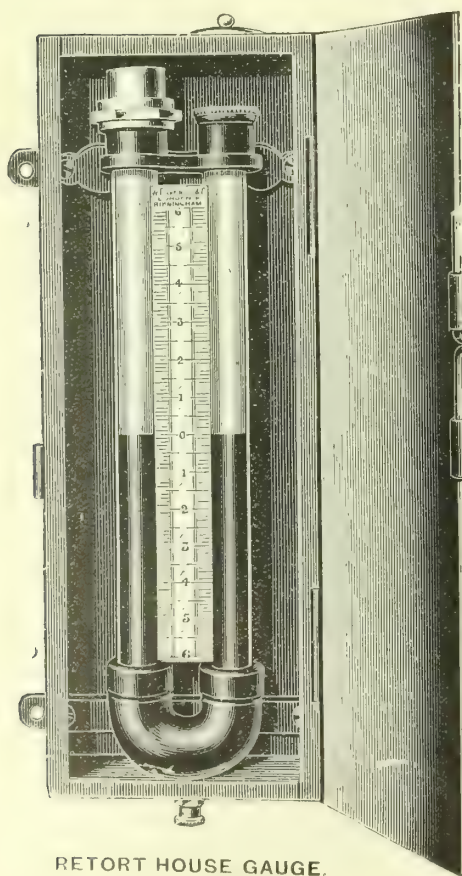
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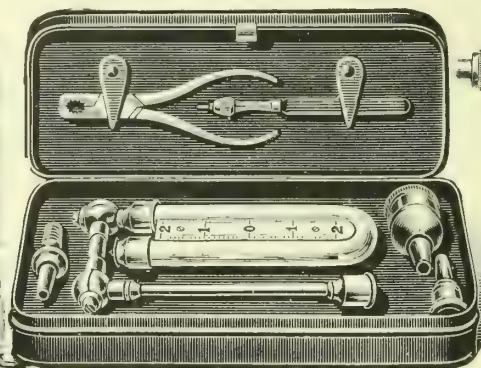
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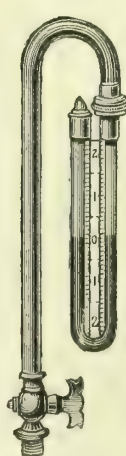
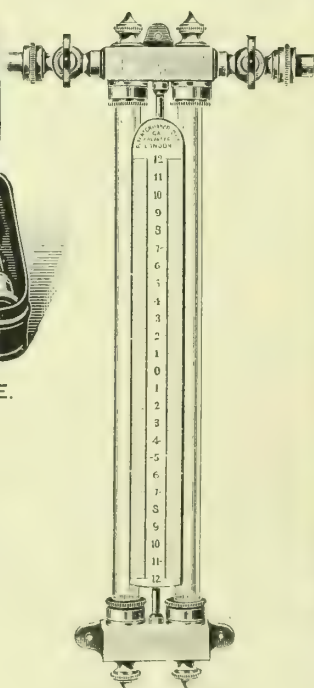


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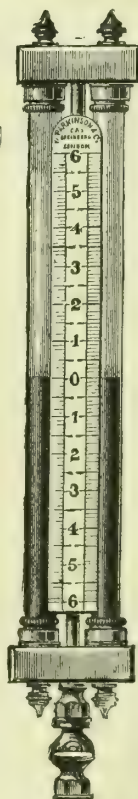


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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES—GAS, &c.

### The March of the Inverted Burner in Public Lighting.

ONE of the notable features in the change of our conditions in the gas industry is the fierce competition that now exists with electricity for the lighting of the public thoroughfares. The change has become more pronounced with the advent of the metallic filament lamp; but just as the gas industry was able, in the days when the carbon filament lamp represented the only small unit of the electrical industry, to maintain precedence far ahead in economy and efficiency by the aid of the vertical incandescent burner, so now it is in a position to well maintain the lead in both respects with the rival that is more effective than the carbon filament lamp, by the aid of the improved inverted burner. But with the economies introduced by the metallic filament lamps on the side of the electrical industry, and with the favour extended to public lighting by electricity suppliers in the matter of price per unit, it has to be recognized that—though inverted gas-burners have introduced material economies in the matter of consumption and mantle maintenance, the attendance required is rather more costly to keep them to a high standard of efficiency—the profit obtained per point of lighting cannot be continued on the old scale. In calculating the balance of financial advantage from the public lights, things must be taken not as they once were, but as they are. Some provincial quotations we have seen for new gas-lighting contracts in competition with electricity, do not suggest that the change in circumstances has had sufficient consideration; but they do suggest that an attempt is being made to secure the same amount of ultimate profit as heretofore. This is a pity and a mistake. Electricity suppliers are anxious to possess the public lighting. That is plain on all hands. The gas industry cannot dictate to the electrical industry how they shall conduct their business in this direction, any more than the gas industry will brook interference from the electrical industry regarding the way they shall conduct their business in the same direction. The standard set by the attacking force must therefore be accepted—however little it is liked—as the one below which the gas industry must show an appreciable margin of economy, in addition to some higher efficiency; otherwise, if there is a close approximation of prices for even a rather lower candle power, there is no doubt the craving for change, combined with the influences brought to bear, will produce a good many votes in local council chambers in favour of electric light.

The inverted gas-burner has given us a grand instrument for satisfying the craving for change; and there is no question as to the enhanced attractiveness produced by such change in the streets. The public have all along been accustomed to seeing the street gas-lamps fitted with vertical burners. Formerly, there was the flat-flame burner shooting straight up from the central stand-pipe of the street lamp. When the incandescent burner came along, the only change in fitting was the replacing of the flat-flame burner by the vertical incandescent one. The light was more brilliant, of a different colour, and the illumination of the thoroughfares was substantially improved. But the inverted burner makes a complete change in the appearance of the lamp head; and there is no question as to the great enhancement of the illuminating effect in the streets. We have turned from many main streets in South London in which the South Metropolitan Company have converted the lamps from vertical to inverted burners into side streets illuminated by the upright form, similar to those that formerly did duty in the main thoroughfares; and the difference between the illuminating effect in the main streets and those still lighted by upright burners is very marked. The public know nothing of photometers, nor do they care for the angles at which illumination may be measured, nor have they any respect for candle-feet; but the public can judge of illuminating effect. And the illuminating effect to be obtained by the

inverted gas-burner far and away exceeds that to be realized by upright incandescent gas-burners, or the electric metallic filament lamp. The local public were some time since (as the "JOURNAL" at the time showed) allowed to judge of this in a main thoroughfare at Beckenham; and the public voice was distinctly in favour of the inverted gas-burner. A long contract for street lighting consequently went to the Gas Company. The public (if not under a despotic local authority) has to be pleased; the illuminating effects in the streets must be improved; the local authority (if a conscientious one) wants to show that the improvement is being obtained economically—it may be at even a reduced cost per mile of thoroughfare. And all this has to be accomplished, keeping in mind that the competitor at the heels of the gas industry is in a more favoured position than ever before for making attacks upon the superior advantages of gas. We have the whip hand; and it has to be retained. This can only be done by keeping a well-defined space between the competitor and ourselves.

The march in favour of the inverted incandescent burner for public lighting has been magnificent. Before the Metropolis took it up to any extent, the Provinces led the way. Edinburgh was a notable example; and many other places followed, but rather in a tentative fashion. The work that has been done in London during the last two or three years, however, and more especially the recent eminent successes in competition, have given a fillip to the use of the inverted burner as an effective weapon with which to fight the latest that the electrical industry can do, in both high-power and low-power units. The march in favour of the inverted gas-burner is really something of which the industry may well be proud. In the Metropolis, we have had in recent times, in the Gaslight and Coke area, the report of the deputation of the City Corporation in favour of high and low pressure inverted burners; the victory by these means in the competition for the Westminster lighting contract; the successes in retaining for a series of years the gas-lighting contracts at Hackney, Bethnal Green, and Finsbury; the happy results of the voluntary offers of the South Metropolitan Gas Company towards improved lighting in South London. In Fleet Street and New Bridge Street, the high-pressure demonstration, at a price per lamp incomparable by anything yet done by the electricians in competitive experimental work, has been effective in procuring conviction in favour of gas when flame arcs were making a bold bid for municipal favour. Let the gas industry throughout the country make use of these successes, and strike while the iron is hot. We have to recognize the improved position of the competitor; and ward gas interests by not going about the public lighting business in any half-hearted manner. The "bull" must be taken "by the horns," especially in those cities and towns where the electricity supply is controlled by the local authority. This touches a big subject that has been discussed on many occasions, and must be bye-passed on this.

The Gaslight and Coke Company and the South Metropolitan Gas Company are notable examples of concerns that have already taken the "bull by the horns." The former Company established a gas-compressing station in Essex Street (Strand), and leading from there is now a network of high-pressure mains covering an important area. They are also establishing, for the high-pressure lighting in the West-end, a compressing-station in Horseferry Road, and, with the least possible inconvenience to the public, are carrying steel tubes for the conveyance of the high-pressure gas therefrom through Victoria Street, Parliament Square, on to Piccadilly Circus, Regent Street, St. James's Street, and other arteries of the West-end. There is recognition in this that a gas company must lay themselves out for the supply of the higher power sources of light to satisfy the favour among local authorities that has been created for high-power sources by the flame arc lamp. We may preach to local authorities about the propriety of low-power sources of light at frequent intervals for the gaining of uniformity in illumination; and the breath and trouble expended in so



doing might just as well be expended in trying to impress the same views on a brick wall. Local authorities have their own notions. They are the customers; and the shopmen must meet their views if they want to do the business. Both the Gaslight and the South Metropolitan Companies have made, and are making, offers, too, by which the initial expense of conversion from vertical burners to the inverted type does not fall onerously on the local governing body. And this initial expense is much lighter than is that of the conversion of the vertical incandescent gas-burned lamp to the use of the electric metallic filament. If the news columns of the "JOURNAL" are looked through for the past few months, the inclusive terms on which lighting and maintenance is being done north and south of London—per lamp of different powers—will be found in the several recorded successes of the inverted burner in public lighting. With the savings in gas consumption and in upkeep of mantles, though attendance costs a trifle more, reductions in annual running expense, with additional illuminating power, can be offered. But in regard to attendance, care must be exercised in selecting types of inverted burners that are appropriate for street lighting in the matters of reliability, easy regulation, and maintenance. Just anything that is called an inverted gas-burner will not do for the purpose. If attention be paid to this, it will be found that lamps can be supplied, as in the cases north and south of the Thames quoted in our columns of late, at a lower cost than using the vertical form of burner, with a large gain in illuminating power and pleasing effect. And not only can this be shown, but it can be proved to local authorities that the cost per mile of lighting is considerably below anything that can be done, on a commercial basis, by electricity. In Hackney, for example, the cost of lighting 20.94 miles of streets by electricity works out to £377 per mile; while under the new contract with the Gaslight and Coke Company, for lighting 85.56 miles of streets with inverted gas-burners, the cost will be the very moderate one of £74 per mile.

The march to success of the inverted burner in public lighting is already most remarkable; and we look to receive reports in the near future from all over the country of success upon success. We know that an effort is to be made in the autumn to stimulate the energy of our electrical competitors in their efforts to obtain possession of fresh public lighting territory. To be forewarned, is to be forearmed.

### External Labour Influences.

DURING the past week, labour questions have had a large share of attention in the public press owing to a meeting of the Joint Board (representing the Parliamentary Committee of the Trades Union Congress, the Labour Party, and the General Federation of Trades Unions) who have been considering the action to be taken in connection with the judgment of the House of Lords in the Osborne case, and through the issue of the *agenda* for the forthcoming Trades Union Congress, as well as the publication of the Board of Trade returns relating to the hours of labour worked, and the rates of pay to labour, during the year 1909. Being so largely dependent upon labour, the gas industry cannot, as having part in the conditions of which there should be administrative cognizance, afford to ignore the trend of questions affecting labour. There are few industries that are so self-contained that external labour eruptions have no adverse effect upon them; and the gas industry is not by any means, at any time, immune from the effects of current external labour circumstances. In the gas industry, on the whole, we may rejoice in contented labour; but beyond its pale, for some time past, there has been an almost constant manifestation of seething discontent in the ranks of labour generally, and particularly in those branches upon which there has to be reliance for the maintenance of supplies. Disorganization in industries that are contributory to the success or otherwise of the gas industry naturally leads, in more ways than one, to greatly increased expense and anxiety; and this, in turn, has an evil influence upon the prosperity of the industry in its relations with its patrons for the prime commodity. The troubles produced by the Coal Mines (Eight Hours) Act, for example, occasioned increased expense through the provident laying-in of extra stores of raw material as some protection against any protracted rupture between the coal owners and the miners. The working of the Act has likewise resulted in a tangible advance in the cost of coal; and there is no certainty that the end in this respect is yet in sight. This is one

instance only of the mischievous results to the gas industry (among others) of labour unrest, of labour legislation, and of agitation beyond its own borders.

It cannot have failed to have struck the observers of labour events that the manifestations of labour discontent in the industrial world outside the gas industry have been more frequent and poignant since the labour unions gave themselves up body and soul to the socialistic faction; and industry and the country generally have grave cause to regret this alliance, with its intolerable pernicious suasion upon the mind of labour. We are asked to believe that the Labour Party "is an honest and honourable alliance between trade unionism and socialists; and as such it has its advantages" and its disadvantages." From the points of view of industry and the common weal, we see much more of the disadvantages than the advantages; and some of the first-fruits of the introduction of the more militant spirit imparted by socialism have been the illustrations northward, among railway employees and coal miners, of defiance by the rank-and-file of the authority of their Union leaders. The men appear to have reached a stage in militant action when they are ready to violate contracts on the slightest provocation, and to abuse the authority of those whom they have put in administrative command over them. It is one of the grave industrial signs of the times; and therefore in this alliance between the labour unions and the socialistic element, we cannot see anything that can be constructive of good, but rather can we see much that will be destructive. A statement that was issued last week by a majority of the Council of the Independent Labour Party said, among much else, that one of their desires "is to make socialism a constructive thing that expresses and embodies itself in every extension of public ownership, in every wise extension by the State of the regulation of industry, in every law that curtails the greed of vested interests, and increases human happiness and freedom." It is a route without end that these socialistic fanatics have selected by which to increase the sum of human happiness and freedom; and all their colossal castles in the air, all their strenuous effort, all their verbiage designed to appeal to the untutored mind, and with no vestige of sense in it, can only end without constructive value. And the communities are tiring of public ownership, which has proved its limits and its susceptibility to dangerous abuse; therefore there is no call on the part of majorities in the communities for any extension of municipal activities or for the nationalization of large undertakings that have been built up by private enterprise.

But the great thing for the moment before the labour-socialist alliance is the recommendations published last week by the Joint Board, referred to in the opening of this article, that heaven and earth should be moved to annihilate the judgment of the House of Lords in what is known as the Osborne case, which has made void the assumed power of the trades unions to call for a compulsory levy upon their members to support parliamentary and municipal electoral activity and for the maintenance of representative members in Parliament. The decision has already weakened trades unions to such a degree, and has so immeasurably loosened the hold of the leaders over the members, that there is a desire among those who sit in the high places of trades unionism and socialism to effect legislation to invalidate the judgment of the House of Lords, and to "restore" to the unions something that they at one time exercised but never possessed the legal right to so exercise. We need not enter here into the methods by which it is proposed to stimulate agitation on the subject and (may we also say?) coerce the Government into compliance with their wishes. All this has been set out fully in the daily press; but in this question, there is the seat of a possible great labour disturbance with the object of bringing pressure to gain the end that is being sought. The matter is to be agitated and discussed throughout the country and at the forthcoming Trades Union Congress. But the agitators have before them a sheer-faced obstacle in the reluctance of the Government to do anything to invalidate the judgment of the House of Lords, though prepared to consider some alternative proposal, such as the payment of members. But the Government have this on their side, that since the judgment the Trades Unions have tried the effect of a voluntary contribution in place of a compulsory one, and it has ignominiously failed. This is conclusive proof that the rank-and-file of unionism are not in complete accord with their leaders in this matter; and only compulsion will effect the end. The leaders are talking about the "freedom" of labour! It is freedom in chains for the



men! The Government, on the other hand, cannot afford to lose the prop of the Labour Party; and their dilemma is not a light one. Already the Labour Party have a grievance against the Government. They are crying out against the Labour Exchanges created by the latter—not because they have been the means of finding employment (at large expense) for thousands of unemployed, but because they are antagonistic to the interests of Trades Unionism by supplying “blackleg” labour when trades unionists are in disagreement with their masters. Is it possible to bring about composure from this fearful labour discord and chaos? We fear not by the ordinarily accepted methods. All these are matters that, through the unrest generated by them, have indirectly malign effect upon industries in which labour is satisfied and contented.

### Consumption, Prices, and Capital.

THERE is before us an analysis of the accounts for the past half year of the three London Gas Companies, and five of the largest of the Suburban Gas Companies; and the figures are peculiarly interesting, in more ways than one. In the first place, it is noticed how very similar, in the majority of the districts, is the half-year's tale as to the consumption of gas (having regard only to the figures showing increase and decrease percentages). In them the consumption made comparatively small advance, or it even remained practically stationary, during the whole six months, accountable by the mildness of the first three months of the year (which affected the consumption for heating purposes), and by, it is beyond all question, the extending use of the inverted burner and the employment of the smaller units—such as the medium and the bijou types—which are causes affecting the amount consumed for lighting purposes. There are no other explanations, in view of the constant growth of connections and the diverse uses of gas, with business scope expanding in each of the latter. The increased consumption of the Commercial Company was 0.4 per cent.; Croydon had the slight decrease of 0.03 per cent.; the South Metropolitan Company marked an advance of only 0.06 per cent.; the South Suburban Company had a decline of 0.8 per cent.; while the Wandsworth and Putney Gas Company showed an increase of 0.5 per cent. But regarding the decreases shown, the substantial influence of current circumstances is shown by the fact that, though Croydon had the decline of 0.03 per cent. in the half year, the weeks that have passed since June have marked progress in consumption at the rate of  $8\frac{1}{2}$  per cent. At one time of day, there would have been almost consternation had business at any time presented an actual decline in a half year; but now gas consumption shows such subservience to atmospheric and trade conditions that to the fickleness of consumption ascensions and declensions the gas engineer and manager who is responsible for meeting current demands has become quite accustomed.

In the extent of the risings and fallings of a gas undertaking's business barometer, local conditions play an important part. Districts cannot be found where electrical competition is keener than in those of the Brentford and the Gas-light and Coke Companies. Yet there we have the respective percentage increases of 4.2 and 1.7; and these companies are neighbours of those showing fractional percentage advances or declines. In the half year these two Companies were charging 2s. 9d. and 2s. 8d. respectively for gas, which were, with the 2s. 8d. of Croydon, the highest charges of the Companies whose accounts are analyzed. But these charges are under notice of change. It has been previously remarked that the price of gas, so long as it is kept a reasonable one, does not alone control consumption accession or otherwise, though the lower the price the more stable the foundation of the business. Then there is the Tottenham and Edmonton Company, who had a growth of consumption amounting to 5.5 per cent. In this instance, local development has been the main highway to the extraordinary growth the concern has experienced during recent years.

There is another point that is notable; and it is that, in the list before us, the Company with the smallest total consumption in the half year is the Wandsworth and Putney—viz., 547,322,000 cubic feet—and that is the Company too that was charging the lowest ordinary price during the half year (1s. 10d.), and there is now an announcement of a further decrease. But the reason for this is shown by the figures under “Fixed Capital per 1000 Cubic Feet on Half-Year's Figures.” In the case of the Wandsworth Company, the amount was down to 6s. 8 $\frac{1}{2}$ d.; and this is 1s. 4 $\frac{1}{2}$ d. below the

next lowest—8s. 0 $\frac{1}{2}$ d. in the case of the South Metropolitan Gas Company, whose price was 2s. 2d. It is only fair to the Brentford Company, whose capital on the half-year's figures is only 1d. more per 1000 cubic feet than that of the South Metropolitan Gas Company, to say that the reason for the charge for gas being maintained at 2s. 9d. up to last half year is due entirely to the large scheme of works re-organization and renewal that the Engineer (Mr. Alex. A. Johnston) felt it incumbent upon him to advise soon after his appointment as Engineer and Manager of the Company. However, in the record (for the district) price of gas and capital costs quoted for Wandsworth, having regard to the total consumption, there are material facts over which to reflect, and which material facts give abundant gratification to the Chairman, Directors, and officers of the concern.

It has been mentioned above that local conditions have a considerable effect on the gas business of the Suburban Gas Companies, most of whose territories are the residential areas of the Metropolis. These districts have separately their periods of active growth, and then there is a slowing-down for a period; the scene of active growth being transferred elsewhere. In other words, they have in turn fat and lean years. Taking the county of Middlesex, during the past decade there has been a general growth of the population; but in some areas it was at a much greater rate than in others. The recently issued report of the Medical Officer of Health for the County shows that between 1901 and June last year, the population of Middlesex increased from 792,314 to 1,123,328. This indicates rapid migration from within to beyond the Metropolitan radius; and it also indicates the considerable expansion of the opportunity for business that has been enjoyed by the Gas Companies. But when we analyze the figures, it is found that there has not been a *pari passu* extension of the population throughout the county. Some areas in the nine years covered by the return enjoyed a 50 per cent. and more increase in population; in others, the percentage is relatively small. In the Tottenham and Edmonton, the Brentford, and the Harrow Gas Companies' districts, for example, there has been quite a luxuriant growth in population; and these Companies have been, with others, particularly fortunate in their growth of business during this period of quick extension of population. As a matter of interest in connection with the subjects dealt with in this article, we reproduce, in our “Miscellaneous “News” columns, some illustrating figures from the report referred to here. The diversity represented by them in the rates of growth of neighbouring districts presents one reason for the varied experiences of companies whose districts have quite close geographical relationship.

### The British Association.

TO-MORROW and for a week after, the British Association will be meeting in Sheffield, which city has not been visited by this body since 1879. Sheffield to-day is not the Sheffield that it was then. It has meanwhile attained to an industrial splendour that the most hopeful of its citizens of thirty and odd years ago could not have anticipated. In this progress, the Sheffield Gas Company have taken part, and in a manner that has placed the Company in a position of pre-eminence in the matter of charges to their customers that can be challenged by only one undertaking in the United Kingdom. There should be opportunity during the proceedings at the meeting of the Association for bringing before the members the facts as to what the Company have done in serving the city; for truly we do not believe that, under municipal control, the undertaking would, during the period of the mania of municipal bodies for trading profits in aid of rates, have rendered service to the citizens in the handsome manner that the Company have succeeded in doing. While admittedly this is not a matter that directly hinges upon the proceedings at the meeting of the British Association, we do feel that, when the engineering and industrial features of the city are being talked of by the daily press, a feature that has a particular attraction for us, and that has had considerable influence upon the city's welfare, must not be pushed altogether out of sight.

The forecast of the proceedings at the meeting, as presented by the programme and other information, does not suggest that there will be much that will have direct claim to the notice of the gas industry. We should like to see the industry better represented at the meetings of a body whose proceedings are popularly followed as are those of the British Association. The electricity industry has found it a



good platform in their publicity campaign; and there is no reason whatever why the gas industry should not use it for making known its advances. However, it will be useless to look for much of immediate attraction in the Presidential Address of Professor Bonney, who is one of the greatest living authorities on geology, though geology has an important bearing on an industry which goes into the bowels of the earth for the greater part of the raw material that it requires. The engineering section will meet under the presidency of Professor W. E. Dalby. We are hoping in this connection to receive a further instructive report from the Committee who are collectively trying to place order where chaos has existed in connection with the study of the phenomena associated with internal combustion engines. In the chemistry section, users—such as the gas industry—of cast iron should derive from the President (Mr. J. E. Stead) some instruction on the chemical phenomena associated with the effect of sulphur and silicon on the carbon condition in commercial cast iron. We also look for Professor H. E. Armstrong's paper on the provident use of coal to be both interesting and didactic, and hope he has made note of what the gas industry is doing in this respect. In these days when the industry has so much selfish interest in taking a part in advancing the sanitary conditions of the air of our urban areas, we may find some indirect interest in the agricultural section, seeing that Dr. Crowther contemplates discoursing on the effect of the atmosphere of a town on vegetation. In the same section, Professor W. B. Bottomley and Mr. J. Golding will dilate on recent work on the fixation of nitrogen by bacteria. Sulphate of ammonia makers, with increased competition about them, and rumours of further growth ringing in their ears, will look with interest to the lines of this last-mentioned communication, but not with any alarm. Taken on the whole, however, the prospects are that there will be but a sparse harvest of educational matter for the gas industry in the proceedings of the British Association during the succeeding seven days.

### Management of the Gas Supply of Paris.

It will be within the recollection of readers of the "JOURNAL" that a few years ago its columns were from time to time occupied with reports of proceedings in the Municipal Council of Paris on the subject of the supply of gas in the city. The conditions under which the service was then carried on were in striking contrast to those obtaining this side of the Channel, inasmuch as their effect was to keep the price of gas at a very high figure, while here it was just the reverse. Under the old Gas Company's concession, it was for some years thought that no change was possible. But a short time before its expiration a way out of the difficulty was found, and consumers were granted some measure of relief. When the concession came to an end, the question arose as to the best way of continuing the important public service which for half-a-century had been in private hands. Opinions were divided between direct control by the Municipality and ownership of the works by them and control by a company, subject to an annual payment. After much discussion, the latter arrangement was carried out; and it was thought the gas question would be set at rest for some time, especially as the contract entered into with the new Company—the Société du Gaz de Paris—was for 25 years. But no. One little clause in it specified that it could be terminated at any five-year period, on two years' notice being given to the Company to this effect. As they commenced operations on Sept. 1, 1907, the notice had to be given before the end of the present month. Here was an opportunity for the out-and-out municipalizers; and they found a representative in the person of a Labour member of the Municipality, who, we believe, was at one time a gas stoker. He put a long series of questions to the Prefect of the Seine with the view of obtaining information and papers on the subject of the gas supply of the city; and the report presented to the Municipality by this functionary was discussed at a special meeting. The outcome was that by a majority of 24 (47 against 23) continued confidence in the present management was voted. The decision was fully justified; for since the supply of gas has been in the hands of the Company, the make has gone up from 13,100 million to nearly 14,400 million cubic feet, and the profits from £902,840 to £960,000. Surely it is not too much to attribute this result to a combination of high technical ability with business capacity and skilful management. And yet in the course of the discussion to which reference has been made there were heard

expressions to the effect that the gas supply of the city would never be perfect until it was entirely in the hands of the Council, and controlled by one of its Committees—a body consisting doubtless of worthy and well-meaning men, but absolutely unfitted, we venture to think, to undertake the duties now discharged by the Board of Directors of the Gas Company. This seems to have been the opinion of the majority of the councillors.

### Some Coal Figures.

Speculation as to the possible or probable date of the exhaustion of the world's coal supply has often proved a fascinating subject for people possessed of a taste for figures; and anything more likely to excite such speculation than the annual "Coal Tables," dealing with the production and consumption of the principal countries of the world, it would be difficult to imagine. The latest issue of these tables—particulars from which will be found on another page of this number—shows that the aggregate output in 1909 of the five chief producing countries was about 860 million tons—a truly stupendous output for a period of only twelve months. Large as it is, however, and showing as it does an increase of some 23 million tons on 1908, it is still less by 36 million tons than the quantity that was raised in 1907. In the year 1908, we learn, the total known coal production of the world, exclusive of brown coal or lignite (the figures just given, of course, are only for the five principal countries), was about 950 million tons. Of this huge total, our own country contributed more than one-fourth—an achievement which, it may be mentioned, is, in the matter of amount, dwarfed by the output of the United States. When, however, the output is considered in relation to population, the United Kingdom occupies first place, with a production of coal amounting to 6 tons per head, as against the  $4\frac{1}{2}$  tons of the United States. In the cases of the other three of the five principal producing countries, the figures are: For Belgium  $3\frac{1}{2}$  tons, for Germany about  $2\frac{1}{4}$  tons, and for France under 1 ton per head. When, on the other hand, consumption per head is considered, it is seen that the use of coal in the United States is greater in proportion to the population, as well as absolutely, than in the United Kingdom—4·14 tons per head, as against 3·96 tons, in 1908. In Germany and in France the production of coal in 1909 was greater than in any previous year; the falling off as compared with 1907 having been experienced in the cases of the United Kingdom, Belgium, and the United States. But whereas the output of this country was only 4 million tons less in the year 1909 than in 1907, that of the United States exhibits a shrinkage of something like 38 million tons. Turning to another aspect of the tables, it will be noticed that there is a wide difference in the prices for coal realized in the different countries, though, as is pointed out, the average values shown are not for coal of the same quality. The large production of 1907 was accompanied by a general increase in the price of coal at the pit's mouth; the rise in the case of the United Kingdom being from 7s.  $3\frac{1}{2}$ d. per ton in 1906 to 9s. the year following. In 1908, only 1d. per ton of this increase was lost; the average for that year being stated as 8s. 11d. per ton. The variations were not in the same proportion in the case of the other countries; the figures for the three years for Germany being respectively 8s. 11d., 9s.  $8\frac{1}{4}$ d., and 10s.  $3\frac{1}{2}$ d., while for the United States they were 5s.  $9\frac{1}{2}$ d., 5s. 11 $\frac{1}{2}$ d., and 5s. 11 $\frac{3}{4}$ d. per ton.

### The Trades Union Congress.

As indicated elsewhere, the resolutions to be considered at the Trades Union Congress, to take place next month in Sheffield, have been published; and they are as usual of a widely varied, and often highly contentious, character. The administration of the Labour Exchanges will be considered by the delegates; and acquiescence will be asked in a proposal that the Parliamentary Committee should be instructed to frame a Bill for the purpose of legalizing the payment of salaries to members of Parliament from the National Exchequer. One resolution suggests the establishment of a central legal defence fund, to which affiliated Unions should contribute *pro rata*, with the object of meeting the legal costs incurred by any of the affiliated Unions in carrying to the highest legal Court any test case affecting the fundamental principles of organized labour. The question of State Insurance against accidents will be raised, on a motion that the Parliamentary Committee be instructed to press forward legislation with the object of insurance of workmen against accidents, "to take the place of the present inhuman system of insurance by private



companies." Compulsory insurance against unemployment is another matter to be dealt with. A resolution in favour of a general eight-hour day will be proposed by the National Union of Gas Workers and General Labourers. The Labour Protection League will demand a minimum wage for Government workers; and the London Society of Compositors will press for an amendment of the fair-wages clause in Government contracts, so as to provide against the employment of women on what is commonly accepted as men's work unless engaged under the same conditions and paid the same wages as men for similar work; the employment of boy labour in excess of the recognized requirements of the trade; and excessive and systematic overtime. The subject of education will be introduced in connection with several motions; and an old friend will be seen in the shape of a suggestion in favour of the adoption of a policy of nationalization of railways and canals. There are many other propositions to be submitted which need not be referred to here; but perhaps the last resolution on the list may be noted. The motion is headed "Administration of Justice," and is drawn up by the Parliamentary Committee of the Congress. It is as follows: "This Congress is of opinion that the present constitution of juries in connection with the Courts of Justice is unfair and partial, and declares that a reorganization of the system is desirable in order to ensure that all classes of the community are fairly included on jury lists; and that the system of common and special juries, based on different qualifications, be abolished; and that the matter be referred to the Parliamentary Committee to take whatever action may be deemed necessary." Altogether the delegates should have sufficient to occupy their attention during the week over which the sittings of the Congress will extend.

#### Personal.

Mr. SAMUEL CUTLER has been appointed a Director of the Harrow and Stanmore Gas Company, in succession to Mr. Horace J. Rydon, deceased. Mr. Cutler was an original shareholder of the Company.

Mr. PERCY BROWNE, son of Mr. A. F. Browne, of the Vauxhall Gas-Works, has been appointed Manager of the Sales Department of the Brighton and Hove General Gas Company. Mr. Browne has been in charge, under Mr. A. Stokes, the Chief Inspector, of the show-rooms and canvassing staff of the south-eastern section of the South Metropolitan Gas Company's area. There were about 300 applicants for the position, which was advertised in the "JOURNAL" for the 16th inst.

#### Obituary.

Mr. JOHN MARSHALL, who till about eight years ago was Gas Manager at Largs, died at the gas-works there on Sunday, the 21st inst., at the age of 65.

Messrs. Falk, Stadelmann, and Co., Limited, announce the death of Mr. A. C. TAYLOR, who had been Manager of their Glasgow branch since its opening, and was previously for a number of years associated with the Company in London.

We regret to learn of the death last Sunday of Mr. THOMAS VALE, head of the firm of Messrs. Thomas Vale and Sons, Limited, of Stourport. Deceased was known to many of our readers, not only in his business capacity, but as a Freemason. The funeral will take place at 3.45 to-morrow afternoon, at St. Mary's Church, Bishopswood, Hartlebury.

The death took place at Newport (Mon.), on Saturday, the 20th inst., at the age of 48, of Mr. ROBERT HENRY HAYNES, M.Inst.C.E., Borough and Water-Works Engineer. He studied under the late Mr. Conyers Kirby, formerly Borough Engineer of Newport, and was appointed Deputy Borough Engineer in 1883. He served the town in this position till 1893, when he was appointed Borough Engineer. Ten years later he became Water-Works Engineer. He was associated with some important municipal undertakings, including the construction of the Wentwood Water-Works. He was a member of the South Wales Institute of Engineers, the Association of Municipal and County Engineers, and the Association of Water Engineers.

**Gas Committees and Free Fitting.**—In the abstract of the accounts of the Stockton-on-Tees Corporation for the past municipal year, lately issued by the Borough Accountant (Mr. J. Reay), attention is drawn by the professional Auditors to an interesting point conveyed in a recent decision of Mr. Justice Neville, that corporations having statutory powers to supply electricity are not entitled to do wiring and supply fittings on customers' premises. It has been the custom for some time past for the Stockton Corporation to do certain repairs to these fittings; and the Auditors recommend that this should be discontinued, in view of the decision mentioned. They presume the decision will also embrace the gas fund of the Corporation; and if this is so, it will considerably hamper the work of the Gas Committee, who for a long time have been installing gas-stoves free.

## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 599.)

THE past week on the Stock Exchange—mid-week of a long account at the end of August—has not unnaturally been something like a record for its paucity of business. In the face of this, and of the hardening of the Money Market, where there was a marked scarcity of supply, the firmness with which Consols and other choice lines have borne up was remarkable. Speculative securities, of course, have oscillated. The opening day was very slack. There were many absentees, and business was featureless and uninteresting. But Consols were rather better on buying orders; and Rails, though neglected, were fairly steady. Things were just as quiet on Tuesday, but the tone was cheerful. Consols were firm, and Foreign rather good, while some speculative lines were in favour; but Americans were weak. On Wednesday, the tendency was hardly as good; but movements were inconsiderable. The weakest spot was Americans. All markets were very idle on Thursday; there being hardly enough doing to produce any shift in prices. Consols held their own, and closed firm on the Bank rate remaining unchanged. Americans swayed about uncertainly. On Friday, the mining settlement began—apparently presenting no difficulty. Almost everything was pretty good, including Americans. Thunderstorms impeded Foreign business. Saturday was very quiet; but the tendency was quite fair in almost every department. The Money Market tightened considerably, and rates for loans and for discount rose; but the tension was relaxing at the close. In the Gas Market, business was a fair average for the time of year. The tendency was quite good, and several issues (some being aided by increased dividends) advanced in quotation. In Gas-light and Coke, the ordinary was strong at from 105 to 105½—a rise of ½. In the secured issues, the preference made from 102¼ to 104, and the debenture 80½. South Metropolitan was quiet at from 120½ to 122. In Commercial, the 4 per cent. was dealt in at 105½ free and 106½, and the debenture at 81. Among the Suburban and Provincial group, Alliance and Dublin debenture realized 98½, Bromley "B" 89½, British 44½ and 45½, and South Suburban at from 120 to 121½—a rise of 1. On the local Exchange, Sheffield "C" marked 235, and rose a point. In the Continental companies, Imperial, after changing hands specially at 177, jumped up to 185½ on the announcement of a higher dividend. Union improved a couple of points, with business at 94½ and 95½, European fully-paid realized 23½, ditto part-paid 17½ and 17½, and Tuscan 9½. Among the undertakings of the remoter world, Bombay changed hands at 6½, Cape Town preference at 5½, Oriental at from 139 to 140, Primitiva at 7½ and 7½, ditto preference at from 5½ to 5½, and ditto debenture at 97½.

## ELECTRICITY SUPPLY MEMORANDA.

**Pitiful Continuation of Irritation—Half-Hearted Support—Views from Maidstone—Municipal Canvassing for Work for the Contractors—Conscience and Safety.**

OUR electrical friends are sadly in need of something very strong to alleviate the irritation which continues among them over the street-lighting successes in London. They cannot forget the shocking rebuff they have sustained in the public eyes after all their vain-glorious pretensions; and they cannot bring themselves to make the formal recantation. Whether they do so or not, the material proofs of Westminster, Hackney, Bethnal Green, and Finsbury will require some wiping out on their part. By the inverted gas-lamp—high and low pressure types—economy on the part of gas has been hoisted up far too securely to be knocked over by platitudes and erroneous statements of contemporaries, or by letter-writing to the papers by secretaries and engineers of electricity supply undertakings. It is not only in London but elsewhere that gas is scoring through economy and efficiency. The extensive high-pressure lighting contract at the Brighton station is a case in point. Gas does not need to support its victories by falsehood. No one, to the best of our knowledge, has suggested that gas is being substituted for street lighting throughout the City of Westminster; but what is said is that gas has knocked electricity out of a choice centre piece of the city, has retained all the gas lighting, and has beaten electricity in the Victoria Street demonstration. We are also quite unprepared to say that gas would not have superseded electricity practically throughout Westminster at this time, had not that deplorable and senseless contract for electric lighting (which, tied as they now are for an unreasonable period, the authorities greatly rue) been entered into in its expiring hours by the St. George's Vestry. There is nothing to boast about in the contract being still in existence, to the great annual loss and detriment of ratepayers. Again, Mr. Edward Searle, the Secretary of the Charing Cross Electric Supply Company, cannot, by all his prolix "explanations" as to why electricity lost the Westminster lighting contract recently the subject of competitive tender, "explain" away the whole of the difference of what the lighting will cost for gas (£13,800) and what it would have cost by electricity (£21,800). Such a difference cannot be made away with by words. His own statement in "The Times" and other papers is a confession that the Electric Supply Companies did not enter into the competition on a basis to secure them the contract, but saddled the public



lighting with capital costs that they must have known would have put them out of court.

But as to the difference in annual costs, we have said it cannot be explained away by words. We apologize to the "Electrician." That sentient paper worked the whole thing out, and came to the conclusion that the Gas Company were only charging 5½d. per 1000 cubic feet for the gas that will be consumed in Westminster! We dealt with this absurd statement on a previous occasion; but the "Electrician" does not mind how silly it looks, and now repeats the assertion, and adds testimony to its foolishness and ignorance in this matter by referring to the 5½d. as being "about one-fifth of the Company's standard price." The "standard" is italicized in the original, which makes the ignorance doubly assured, because the standard price of the Gaslight and Coke Company is not represented by about five times 5½d. We will not waste space by dealing with the extraordinary absurdity again. But the "Electrician" has presumed to know all about this question from the beginning; so we will let it continue to live in the transient enjoyment of the stupid declaration, also of such dogmatism as is expressed in the statement that the contract was taken "at a wholly unremunerative price, purely for the sake of advertisement," and of the harmless little pettish gibe at the "ghastly mantles which, unfortunately, we shall soon see in Regent Street." Our contemporary will completely lose its head if it does not take things a little more calmly and (may we add without offence?) sensibly.

So far as we can judge from the information before us, the municipal electricity trading authorities who have not authority to indulge in business in electric wiring and fittings are not entering whole-heartedly into the question of the joint promotion of a Bill for the power that was snatched from their grasp when Parliament was lately engaged in emending and extending the General Electricity Supply Acts. They all want the power who have not yet got it; and some of those who have it already wish they had not. This is one of those cases in which the want of possession is looked upon by some authorities as a drawback; while the actual possession in the case of other authorities has been a deplorably costly matter. Parliament and the Local Government Board have seen this; and where wiring and fitting powers are now allowed to municipal traders, Parliament in its wisdom ordains that the business shall be conducted so that income shall be at least the equal of the expenses incurred, and in most cases it is also stipulated that the work shall be done through a contractor. This last stipulation is as gall and wormwood to many municipal electricity departments. It, however, is one of the penalties of wanting to enter into the business when local government has attracted to itself so many opposing elements in its conduct. Some members of local authorities are all for municipal trading, whether at a loss or not; many others (some local tradesmen) are for municipal trading so long as it does not come within the sacred provinces of the private traders. We have considerable sympathy for the latter, though they never deserved it in connection with gas supply. But between these opposing forces in municipal administration, the current question is whether or not there shall be support and participation in the promotion of the Joint Bill for wiring and fittings powers, with the result that some authorities are declining to have anything to do with the projected measure, and others are proposing to contribute a very mean sum apiece in furthering the scheme. Unless there are a very large number of authorities joining in the promotion, the sums that we have seen named will, we fear, prove altogether inadequate for carrying a contested Bill through Parliament—contested as this one will be tooth and nail by the Electrical Contractors' Association, the Ironmongers' Federated Association, and by large ratepayers such as gas companies. The last-named have no serious intention of sitting quietly while municipal authorities are contemplating further business (and of a kind that has proved so unremunerative in several places) that may call upon them for contribution to fill the shortages occasioned by its ill-luck. The large ratepayers are forced to look after themselves. When the private tradesmen's interests are being touched in the local administrative chamber, the municipal authority are at once as a house divided against itself; but when the interests of the private trading concern, distinguished by the title of the gas company, are in question, or are being attacked, then the cry is "no quarter." Well, well! it's no use brooding over the injustice inflicted by the modern development of municipal trading, which connotes development of municipal antagonism to private enterprise. It has come to a question of sharp fighting; and when there is an opportunity for defence, it must not be allowed to slip by.

If we mistake not, the Maidstone Corporation is one of those authorities who have been engaging in the wiring and fitting business without legal authority; and they are now hoping to get the removal of the disability and illegality, and things set right again, by the munificent (!) contribution of £25 to the expenses of the joint promotion. It has gone forth from the Liverpool Corporation and other well-known local authorities—in connection with the Standard Gas-Burner Bills—that it is a wicked, monstrous, and indefensible thing, and subversive of all local interests, that there should be joint promotions for parliamentary powers on the part of private interests; and we are wondering whether Maidstone and the other authorities who are joining in the promotion of the wiring and fittings Bill subscribe to the dictum in this matter of Liverpool and other prominent municipal bodies. If they do not, then it shows there is a distinct division of opinion among municipal authorities over the point that was raised as a

side-issue to, and was designed to be the death-blow of, the Standard Burner Bills. But let that pass; it will be remembered at the proper time. Local authorities on this matter of joint promotions should, however, range themselves one side of the hedge or the other. We recommend the subject as a fit one for discussion at a meeting of the Municipal Corporations Association, with (say) the Town Clerk of Liverpool opening the debate on the side against joint promotion, and the Town Clerk of Maidstone leading off in favour. At the recent meeting of the Maidstone Town Council at which was discussed the recommendation of the Electricity Committee to take part in the effort to get wiring, biring, and fittings powers, there was a good deal of inquiry as to why the Council should not have the powers just as the Gas Company have piping and fittings powers. There is a simple, and though simple yet a strong, reply to the interrogation. This is an extension of municipal speculation in a branch of business that has proved itself to be more speculative, taking the country through, than any business in which municipalities have hitherto been engaged. If the Gas Company speculate, they are doing so with their own money; if they lose, so much the worse for them and their business. If the Council speculate, they are doing it not with their own money, but with borrowed money; and if they cannot make good their obligations with respect to that money, then they have recourse to the simple expedient of wringing the deficits out of the ratepayers *volens volens*. That is one difference that makes an important distinction between the Gas Company and the Electricity Department. Then Mr. Alderman Vaughan, the Chairman of the Electricity Committee, thinks it is right the department should be placed on the same footing as the Gas Company. Now Alderman Vaughan must know that, for the reason already stated, and others, the department can never be placed on the same footing as the Gas Company. Among the other reasons is this: That the scope for custom for electricity is relatively narrow. Loud are the complaints in the electrical papers of the inefficiency and expensiveness of all articles for household use for cooking, heating, and so forth; and there is a bowing of the knee to the inevitable, and a confession that the economy of gas for these purposes is, so far as can be seen at present, entirely beyond the reach of electricity. This limits the use in the domestic service of electricity to lighting; and there again the metallic filament lamp has made the outlay of capital a more precarious thing than aforesaid when a larger revenue per service could be depended upon. The speculative element in the proposal has therefore increased by events, and has not diminished. There is another mistake that Alderman Vaughan makes. He seems to think that the introduction of electricity in the town has been a good thing for the ratepayers, and insinuates that, due to the introduction, there have been a couple of reductions in the price of gas during the period. As a matter of fact, the price of gas in the town is now 2s. 6d.; it has been 2s. 4d. And we have no hesitation in saying that had there been no electricity supply there, the Gas Company would have been supplying gas to-day at 2s.; and probably, with extended business, they would have been paying more than £1824 in the shape of rates. Certainly, the ratepayers would not have had to face any incapacity in times past of an electrical undertaking to pay its way, nor would there have been such high charges for public electric lighting as they have experienced. It would be interesting to hear Alderman Vaughan expatiate, in detail, upon the financial "advantage" that, during its seven or eight years' existence, the electricity concern has been to the town.

The recent Leicester decision has, of course, made this question of wiring and fitting powers more acute. There are many authorities who, like Leicester, have been engaging in this business without express powers, and have thus been acting *ultra vires*. Leicester's little plea that their authority in the matter of electricity generation, distribution, and sale included the business of wiring and supplying fittings, inasmuch as service must include the provision of means to use the commodity supplied, did not appeal to the Court. The local water authority might just as well say that its duty extends to the provision of cisterns, water-taps, baths, kettles, and so forth, as service must comprise use. If the plea had held good, the blessing of every municipal electricity authority in the United Kingdom would have been extended to Leicester, as there would have been no further occasion to go to Parliament, the trading local authorities could have snapped their fingers at the Electrical Contractors' and the Ironmongers' Associations, and there would have been no need for the promotion of the Joint Bill. But there is already talk in several places as to what can be done in view of the Leicester judgment, as an alternative to bringing contractors and their many supporters buzzing in a most uncomfortable manner about the heads of town councillors. The only alternative that can be discovered is to engage a number of canvassers for new installations and business extensions—no Act of Parliament is required for this; and then to pass on to the contractors the work gathered in. To this, the contractors could have no objection; but there are ratepayers, who, if the local authority financed the business, would desire to ensure that no loss would fall upon the community, and that the business would always be conducted on paying lines. It must, however, be admitted that it is not an economical way of doing the business to have so many engaged in it. But, on the other hand, municipal trading speculation has imposed so much hardship on innocent ratepayers that there must be greater control, and assurance that a limit is put to this sort of thing. It is absurd that people who have no lot or part in creating a trading deficit



should be called upon to help to make it good. However, the employment, at the expense of municipal electricity undertakings, of canvassers to procure business for the electrical contractors ought surely to keep these watchful dogs quiet, though there is always the danger of preferential treatment of certain contractors, which may upset the happy scheme, and create much envy and uncharitableness.

The repeated fires from short-circuits or wire fusings—fires that break out in most unsuspected places without the slightest warning, and rapidly involve persons and property in their relentless destructive progress—are causing consternation among the private and municipal owners of electricity undertakings and their customers; and many a shopkeeper who has adopted this capricious mode of lighting his establishment is asking, "Whose premises next?" There is an awesome feeling about it all for the users of electric current. The former confidence of the easily gullible public in the bold advertisements of the electricity generators and salesmen, as to electricity being the safest illuminant, is being rapidly undermined; and the public will soon be writing down those who are responsible for such advertisements as the most unmitigated—never mind what—that they have ever met. But, in places, the conscience pricks. We saw recently that, at a meeting of the Burnley Town Council, a member called attention to the huge fire that claimed both life and property at Accrington. This member wanted to know several things—whether there was not some sort of safeguard that could be fixed to hanging wires—especially in shop windows where there was flimsy drapery; whether the Electricity Committee had any power to compel the use of such safeguards if they existed; or if they had no compulsory powers, whether they could do something in the way of moral suasion. Though the Mayor is the Chairman of the Electricity Committee, he could not say whether they had any power in the directions indicated; but the "moral suasion" idea rather appealed to him as a good one. The difficulty is that advertising safeguards, and using moral suasion, rather gives away the "safest illuminant" fraud.

## MODERN COKING PRACTICE.

IN previous issues of the "JOURNAL," notice has been taken of the series of pamphlets on matters connected with the coal trade which are being published by the "Colliery Guardian." They are reprints, in a convenient form, of articles that have appeared in that paper; and the last issued contains one by Mr. Ernest Bury, M.Sc., F.C.S., on "The Tendencies of Modern Coking Practice."

The subject is certainly one on which the author is specially qualified to speak; he having, as readers may remember, read a paper on "The Carbonization of Coal, with Special Reference to the Bye-Product Coking Process," before the Institution of Gas Engineers three years ago. In the article now under notice, he cannot, of course, go very fully into the subject; but in the space at his disposal he has brought together some interesting particulars. He opens with a few remarks on the conservation of our coal supplies, and then refers to the attempts which have been made of late years to produce a low temperature coke—coalite, for example—which would be readily combustible in a household grate, and at the same time effect the recovery of the gas and bye-products. He thinks that this is a mistake, and considers the aim should be to seek new methods for the ready combustion in household grates, boiler furnaces, &c., of coke, however hard, made by high-temperature carbonization; and he suggests that this is the true solution of the smokeless firing problem.

Turning to the subject of coke-oven gas as an illuminant, Mr. Bury remarks that, with few exceptions, managers of these plants have been apathetic in regard to the production of a gas suitable for town use in conjunction with the manufacture of a good coke. He points out, however, that the conditions under which gas may now be supplied have undergone a revolution. We have arrived at a time when the calorific value of gas is of the first moment; and as a consequence "the fetish of candle power is going to the wall." This change has opened up possibilities for the utilization for gas-making purposes of coal which would otherwise go to the spoil heap, and the gas from sister carbonization processes need no longer be considered only fit for boiler fuel, but can come within the scope of town's requirements.

On the subject of the design of carbonizing plant, Mr. Bury states that up to the last few years, inventors of coke-ovens principally confined their attention to the construction of the heating flues and to the methods of preheating the air necessary for the combustion of the gas within them; and but little attempt was made on the large scale to simplify the treatment of the gas and the recovery of the bye-products. The plant was both bulky and complicated; and the method of operating it wasteful from a thermal standpoint. He refers to the efforts at improvement made by Brunck in 1903, and to the sulphate-recovery processes of Otto-Hilgenstock and Koppers—illustrating his remarks by diagrams of these systems. Comparing the three processes, he shows that with the old process, where the whole of the liquor is condensed and reheated, 8 tons of steam were required per ton of sulphate made, whereas in the Koppers process, where only the liquor from the condensers is reheated, the quantity is 5 tons, and in the Otto process, where no condensers are employed, it is

1 ton only, and in some cases *nil*. Mr. Bury says the new Otto process, though only about a year old, is making rapid headway in Westphalia.

The article closes with a reference to the efforts of Burkheiser to effect economy in the manufacture of sulphate of ammonia simultaneously with the purification of gas from sulphuretted hydrogen. This invention, which has been fully described in the "JOURNAL" [see Vol. CVIII., pp. 311, 326, 477], aims at the utilization of the volatile sulphur in the coal for the production of an acid; thus obviating the need of purchasing sulphuric acid for sulphate manufacture. Mr. Bury thinks that the treatment of coal or coke-oven gas for the recovery of tar and sulphate would reach its zenith by a combination of the simplified Otto system with another such as that of Burkheiser.

## COAL PRODUCTION OF THE WORLD.

### Quantity Used for Gas-Making in the United Kingdom.

FOR some time past, we have been looking in vain for a fresh issue of the "Coal Tables" which it has been customary to print annually as a parliamentary paper, as those dealing with the year 1907 were noticed in the "JOURNAL" as long ago as March of last year. Now, however, the Board of Trade have rewarded an expectant public by the issue (over the signature of Mr. G. R. Askwith) of tables covering (in some instances) the period 1908-9, and giving, as usual, particulars of the production, consumption, and imports and exports of coal in the British Empire and principal foreign countries, together with statements showing the production of lignite and petroleum in the principal producing countries. There are more than twenty tables dealing with ordinary coal, and four more which have reference to lignite and petroleum; and the figures, in addition to detailing production and consumption, furnish much information with regard to prices, the number of persons employed, &c. Quantities are expressed throughout in terms of the English ton of 2240 lbs.; but it has to be borne in mind that most of the figures for 1909 (as well as some of those for 1908) are provisional, and therefore subject to correction, though no doubt they may be accepted as being sufficiently accurate for practical purposes. As was the case with the tables last noticed, there are included on the present occasion particulars with regard to the quantities of coal used in gas manufacture and in the production of pig iron in the United Kingdom.

The total known coal production of the world in 1908 (exclusive of brown coal or lignite) was about 950,000,000 tons, of which the United Kingdom was responsible for more than one-fourth. For the previous year, the figure was given as 1,000,000,000 tons; and for 1906, as 905,000,000 tons. The five principal coal-producing countries are the United States, the United Kingdom, Germany, France, and Belgium. In Germany and in France the production of coal increased throughout the period covered by the present tables, and was in 1909 greater than in any previous year. In the United Kingdom, Belgium, and the United States, the production in 1909, though greater than in 1908, fell short of the year 1907. The excess of the output of 1909 over that of 1908 was small in all cases except the United States. The aggregate output in 1909 of the five countries named was 860,000,000 tons, or an increase of 23,000,000 tons on 1908, but less by 36,000,000 tons than the output of 1907. The figures for the past three years are as follows: United Kingdom—1907, 267,831,000 tons; 1908, 261,529,000 tons; 1909, 263,774,000 tons. Germany—1907, 140,885,000 tons; 1908, 145,298,000 tons; 1909, 146,507,000 tons. France—1907, 35,411,000 tons; 1908, 36,044,000 tons; 1909, 36,654,000 tons. Belgium—1907, 23,324,000 tons; 1908, 23,179,000 tons; 1909, 23,182,000 tons. United States—1907, 428,896,000 tons; 1908, 371,288,000 tons; 1909, 390,336,000 tons. Of the remaining countries included in the tables, Russia alone has a production exceeding 20,000,000 tons. Though last year the output of the United States was about half as much again as that of the United Kingdom, the United Kingdom is still ahead when the production of coal is compared with the population; the output amounting to 6 tons per head, as against the  $4\frac{1}{2}$  tons of the United States. The figure for Belgium is  $3\frac{1}{2}$  tons, Germany about  $2\frac{1}{2}$  tons, and France less than 1 ton per head. With regard to the number of persons employed in the coal-mining industry, also, the United Kingdom is a long way in front of any other country. In 1908, the number of persons employed in coal mining above and below ground in the several principal producing countries was as follows: United Kingdom, 966,300; United States, 690,400; Germany, 591,000; France, 191,100; and Belgium, 145,300. In drawing any conclusions from the comparison of these figures with one another and with the output of the several countries, however, the report points out that it must be borne in mind that they include varying proportions of persons engaged in the actual work of getting coal and in other work connected with the mines, and that the regularity of employment of those included in the totals of employed is not the same in all countries. In the matter of the output per person employed, the United States in 1908 took the first place with 541 tons, then came the United Kingdom with 271 tons, afterwards Germany with 246 tons, France with 189 tons, and Belgium with 160 tons.

In 1907, the largely increased output was accompanied by an increase in the price of coal in all the five largest producing countries. In Germany, France, and the United States, the



average value per ton of coal at the pit's mouth was greater in 1908 (which is again the latest year for which the figures are available) than in 1907; while in the United Kingdom and Belgium the value was less. In Belgium the average value per ton at the pit's mouth was 7d. lower in 1908 than in 1907; while in the United Kingdom the average reduction was 1d. only. In Germany the average value per ton at the mines was higher than in 1907 by 6½d. per ton, in France by 8½d. per ton, and in the United States by ¼d. per ton. Of course, when comparing the figures for different countries, or for different years in the same country, it has to be remembered that the average values shown are not for coal of the same quality. Thus the figures for the United States are affected by the variations of the proportions of anthracite and bituminous coal in the total output, as well as by the changes in the value of each variety of coal. The average values, too, are influenced, not only by differences of quality, but by differences in the accessibility of the seams, in methods of operation, in the cost of labour, &c. The values per ton at the collieries for the five leading countries for the three latest years for which statistics are yet available are given as follows: United Kingdom—1906, 7s. 3½d.; 1907, 9s.; 1908, 8s. 11d. Germany—1906, 8s. 11d.; 1907, 9s. 8½d.; 1908, 10s. 3½d. France—1906, 11s. 2½d.; 1907, 12s. 3d.; 1908, 12s. 11½d. Belgium—1906, 12s. 2½d.; 1907, 13s. 8½d.; 1908, 13s. 1½d. United States—1906, 5s. 9½d.; 1907, 5s. 11½d.; 1908, 5s. 11½d.

The outputs of coal in the principal parts of the British Empire are, of course, not in any case on a very large scale—in only two instances do they exceed 10,000,000 tons. But all the figures, it will be seen, exhibit an increase for 1908 when compared with the preceding year. The production in British India was 12,770,000 tons in 1908, and 11,147,000 tons in 1907; in the Commonwealth of Australia, 10,194,000 tons in 1908, and 9,681,000 tons in 1907; in New Zealand, 1,861,000 tons in 1908, and 1,831,000 tons in 1907; in Canada, 9,720,000 tons in 1908, and 9,385,000 tons in 1907; and in the self-governing Colonies of South Africa, 4,938,000 tons in 1908, and 4,679,000 tons in 1907. In Australia the output during 1908 amounted to about 2½ tons per head of the population, in New Zealand to rather less than 2 tons, in Canada to nearly 1½ tons, and in the self-governing Colonies of South Africa to about ¾ ton. The average value per ton at the pit's mouth of the coal produced in the different parts of the Empire varies greatly, as will be perceived from the following figures: British India—1906, 3s. 11d.; 1907, 4s. 8d.; 1908, 5s. 3d. Commonwealth of Australia—1906, 6s. 3d.; 1907, 6s. 10d.; 1908, 7s. 4½d. New Zealand—1906, 10s. 7d.; 1907, 10s. 7d.; 1908, 10s. 4½d. Canada—1906, 9s. 4d.; 1907, 10s. 8½d.; 1908, 10s. 8d. Self-governing Colonies of South Africa—1906, 7s. 5½d.; 1907, 7s. 4½d.; 1908, 7s. 2d. Thus in British India, South Africa, and Australia the average value of coal produced was lower, and in New Zealand and Canada higher, in 1908 than in this country. Values in 1908 were higher than in 1907 in India by 7d. per ton, and in Australia by 6½d. per ton. In South Africa and New Zealand the value was lower by 2½d. per ton.

The foreign countries which export coal in excess of the amount they import are Germany, the United States, Japan, and Belgium; and of the divisions of the British Empire included in the tables, the United Kingdom, the Commonwealth of Australia, the group of self-governing Colonies in South Africa, and British India are in the same category. The excess of exports over imports in the years 1908 and 1909 in these cases was as follows: United Kingdom—1908, 85,301,000 tons; 1909, 86,029,000 tons. Germany—1908, 15,453,000 tons; 1909, 16,769,000 tons. United States—1908, 10,353,000 tons; 1909, 11,277,000 tons. Japan—1908, 2,832,000 tons; 1909, 2,729,000 tons. Belgium—1908, 664,000 tons; 1909, 727,000 tons. Commonwealth of Australia—1908, 4,091,000 tons; 1909, figures not yet available. Self-governing Colonies of South Africa—1908, 804,000 tons; 1909, 1,003,000 tons. British India—1908, 98,000 tons; 1909, 304,000 tons. Both the gross and net exports of the United Kingdom and of Germany in 1909 were the greatest recorded. In the United States, while the gross exports were somewhat smaller than in 1907, the net exports were greater than in any previous year. The total quantity of coal exported (excluding coke, patent fuel, and bunker coal) from the United Kingdom during 1909 was 63,077,000 tons, as compared with 62,547,000 tons in 1908, and 63,601,000 tons in 1907. The comparative steadiness shown by the figures for these three years, it is remarked in the report, is in striking contrast with the large increases in the years immediately preceding them. The exports of German coal in 1909 were greater than in 1908 by about 2,000,000 tons.

The imports of coal into the United Kingdom (always a negligible quantity) amounted in 1909 to only 8000 tons. The foremost place in this respect is, as usual, taken by Germany, whose imports were in 1908 12,589,000 tons, and in 1909 13,294,000 tons, about two-thirds of which was obtained from the United Kingdom. In fact, the imports of British coal into Germany during the past three years have been on a scale more than twice as large as ten years earlier. The principal coal-producing foreign countries which in 1908 and 1909 imported coal in excess of the amount they exported were Russia (excess amount of coal imported in 1908, 4,453,000 tons), Sweden (1909, 4,426,000 tons), France (1909, 17,673,000 tons), Spain (1909, 2,423,000 tons), Italy (1909, 9,064,000 tons), and Austria-Hungary (1909, 10,460,000 tons); while of the divisions of the British Empire, Canada (1909, 7,449,000 tons) and New Zealand (1908, 187,000 tons) occupy the same position. The gross imports into all these countries for

which last year's figures are available were somewhat greater in 1909 than in 1908. With regard to all these figures, a complication is, however, introduced by the fact that the published returns of exports from the different countries do not in every case show the procedure adopted in connection with bunker coal, which is included in some instances, but not in others.

The consumption of coal in each country is arrived at for the purposes of the tables by adding the imports to the home production, and deducting the exports. The total consumption of coal in the United States is more than twice as great as that in any other country, and, in fact, is nearly equal to the combined consumption of the United Kingdom, Germany, France, and Belgium. In the matter of consumption per head, the United States also occupies first place, although the United Kingdom is not so very far behind. The consumption *per capita* in most of the other countries seems very small. But in this connection the use of other fuels than coal, particularly in France and Germany, must be taken into account. The largest coal-consuming countries in 1908 and 1909 were: United States—1908, 360,935,000 tons; 1909, 379,059,000 tons. United Kingdom—1908, 176,228,000 tons; 1909, 177,745,000 tons. Germany—1908, 129,845,000 tons; 1909, 129,738,000 tons. France—1908, 52,995,000 tons; and 1909, 54,327,000 tons. The consumption of coal per head of the population in some of the principal countries in the year 1908 was: United States, 4¼ tons; United Kingdom, 3¼ tons; Belgium, 3¼ tons; Germany, 2¼ tons; France, 1¾ tons; Austria-Hungary, 0½ ton; and Russia, 0¼ ton. As to the Colonies, the consumption of coal per head of the population is greatest in Canada, with 2¼ tons. In the United Kingdom in 1909, 100 per cent. of the coal consumed was of native production; and in the United States 99·67 per cent. In Germany, 89·75 per cent. was native, 8·04 per cent. was British, 2·21 per cent. came from other countries. In France, 64·57 per cent. was native, 17·23 per cent. was British, and 18·2 per cent. was from other countries. In Belgium, 71·37 per cent. was native, 7·53 per cent. British, and 21·1 per cent. from other countries. The quantity of British coal imported into Germany for consumption in 1909 amounted to 10,400,000 tons. The average quantity of British coal consumed in Germany in the five years 1905-1909 was 9,430,000 tons; while during the five years 1900-1904 it was only 5,485,000 tons. In the case of France the imports of British coal last year amounted to 9,362,000 tons.

In 1908, the production of lignite in Germany was 66,529,000 tons, in Austria 26,299,000 tons, and in Hungary 7,037,000 tons. The provisional figures for 1909 show a production of 67,432,000 tons for Germany, and 25,503,000 tons for Austria. The quantity of lignite produced in the United States is included in the figures of coal produced. In no other country does the output reach 1,000,000 tons a year. With regard to petroleum, the total production of the United States in 1908 was 6,282,000,000 gallons, compared with 5,811,000,000 gallons in 1907, or an increase of 8 per cent. The Baku and Grozny oilfields of Russia yielded 2,176,000,000 gallons in 1908, which, though larger than the output in 1905, 1906, or 1907, was still considerably less than in 1903, when it reached 2,955,000,000 gallons. The combined output of petroleum in Germany, Austria, Roumania, Japan, Canada, British India, and Dutch East Indies in 1908 was, according to the present statistics, 1,339,000,000 gallons.

Below is the statement given of the total quantity of coal carbonized by gas undertakings in the United Kingdom in each year from 1904 to 1908 inclusive.

#### COAL USED BY GAS UNDERTAKINGS IN THE UNITED KINGDOM.

|                     | 1904.      | 1905.      | 1906.      | 1907.      | 1908.      |
|---------------------|------------|------------|------------|------------|------------|
|                     | Tons.      | Tons.      | Tons.      | Tons.      | Tons.      |
| Companies . . .     | 8,673,343  | 8,722,145  | 8,922,781  | 9,240,280  | 9,281,738  |
| Local authorities*. | 5,622,259  | 5,758,180  | 5,923,476  | 6,166,473  | 6,112,569  |
| Total. . .          | 14,295,602 | 14,480,325 | 14,846,257 | 15,406,753 | 15,394,307 |

\* Twelve months ended March of the years following those stated.

**The "Pitometer" as a Leak Detector.**—Underground leaks discovered and stopped by the "Pitometer" division of the Water Department at Washington, for the financial year ended June 30, are said to have saved more than 6 million gallons of water per day, or one-tenth of the total daily consumption. Most of this waste, or an average of 5 million gallons daily, was due to defective service-pipes leading into residences and business houses. The instrument named was described and illustrated in the "JOURNAL" for Jan. 28, 1908 (p. 238).

**Commercial Rust-Proofing.**—According to some particulars in "Iron Age," the Bradley process of rust-proofing is a hydrogen gas treatment. The article to be rust-proofed is placed in a muffle, where it comes in contact with hydrogen gas and other materials necessary to the process, and is then subjected to heat. This changes the surface, forming an alloy which resists the action of oxygen in air or water. The process can be used on bolts, nuts, or other threaded articles, as it does not cause any interference with the threads, as plating does. In addition to the rust-proofing, the treated articles are benefited by the careful cooling, which anneals them. The process cannot be used on hardened or tempered pieces. The colour obtained is a dark, rich, blue-black, well adapted for highly-finished articles,



## WAGES AND HOURS OF LABOUR IN 1909.

As an index to trade conditions, the statistics of the Labour Department of the Board of Trade dealing with changes in rates of wages and hours of labour are worth consideration.

The seventeenth annual report (over the signature of Mr. G. R. Askwith) was issued some days ago; and it sets forth the changes, during the year 1909, in the rates of wages and recognized hours of labour of workpeople in the United Kingdom for a full week's work, exclusive of overtime. A "change in wages," it may be pointed out, is defined, for the purposes of the report, as a change in the weekly or hourly rate of remuneration of a certain class of workpeople, apart from any change in the nature of the work performed. Notice is not taken of changes in average earnings arising out of variations in the extent of employment obtainable by workpeople. The value of statistics prepared on the basis indicated is emphasized by Mr. Askwith in the remark that "in this country, where the system of collective agreements between organizations of employers and workpeople has become more general than in any other, the recorded changes are so important and so definite as to yield an excellent indication of the rise and fall in the market rate for labour." In view of the fact that changes in rates of wages are intimately connected with the demand for labour, and as there are periods of improving and of declining employment so also there are periods of rising and of falling wages, the necessity is impressed upon students of the report of not, when considering the course of wages, selecting arbitrarily a few years, but of looking at the whole cycle, so as to include both the good and the bad years. Regarding the matter in this light, it is seen that since 1896 there have been two periods of rising wages (1896-1900 and 1906-7), and two periods of falling wages (1901-5 and 1908-9). Thus, last year—or, at any rate, the first three-quarters of it—as well as the twelve months preceding, was an unfavourable time for workpeople; but it is gratifying to note that the preliminary figures for the first half of 1910, which are now available, indicate that the fall in wages has been arrested, and that "the market rate for labour is beginning to feel the usual effect of improving trade and employment." However, in spite of the considerable amount of the total reductions taking effect in 1908 and 1909, the general level of wages at the end of the latter year was, with the exception of four occasions, higher than at the end of any year since 1893, when the statistics of changes in wages were first systematically collected.

The number of workpeople reported to the department as affected by changes in rates of wages during the year 1909 was 1,154,800 (exclusive of agricultural labourers, seamen, and railway servants). Of these, 18,400 received increases amounting to £1000 per week, and 1,131,500 sustained decreases amounting to £69,900 per week; while the remaining 4900 workpeople had upward and downward changes which left their wages at the same level at the end as at the beginning of the year. Thus the net result of all the changes was a decrease of £68,900 per week. This compares with a net decrease of £59,200 per week in 1908. The report states that, if the effect of the changes in rates of wages be calculated from the date of each change to the end of the year, the aggregate decrease in wages due to these changes is computed at £2,757,400 in 1909, as compared with a decrease of £873,800 in 1908, and increases of £5,821,000 and £1,419,000 in 1907 and 1906 respectively. Of the 1,131,500 workpeople who were unfortunate enough to have their wages reduced last year, 870,000, or nearly 77 per cent. of the total, were employed in coal mining; other sufferers being persons working in iron mining, pig iron and steel manufacture, engineering and shipbuilding, and the building and cotton trades. The relatively small number (18,400) of workpeople whose wages were increased included 3500 in the building trades, 2000 engaged in the manufacture of pig iron, and 4000 in the employment of public authorities.

Though the past two years were, as already shown, periods of falling wages, the net result in the changes of the last fourteen years proves that at the end of 1909 wages were nearly £339,500 per week higher than at the end of 1895; while at the end of 1908 they were £408,400 higher. At the end of the year 1907 they were £467,000 per week higher, and in 1906 £267,000 higher, than at the end of 1895. In fact, the changes in the fourteen years from 1896 to 1909 resulted in a net increase of wages in each group of trades, except quarrying, which exhibits a very trifling decrease. Of the total gain in this period of £339,500, no less a sum than £162,500 appears to the credit of coal mining; while the engineering and shipbuilding trades come high up in the list with a gain of £33,000.

The proportion of the industrial population (11·9 per cent.) affected by ascertained changes in rates of wages in 1909, was as usual largest in the coal-mining industry; the figure on this occasion being 89·5 per cent. Miners in every coalfield, with the exception of the Forest of Dean, had their wages reduced; the net amount of the decrease being over £56,000 per week, for the 870,000 persons affected. During the past thirteen years there have been both rises and falls; but the aggregate amount of the increases largely exceeds that of the decreases. In all districts wages stood at a higher level at the end of 1909 than at the end of 1896.

In the iron mining branch 9500 workpeople had their wages changed, the net result being a very small decrease; while in the quarrying industry 3100 persons received a trifling net increase. The result of all the changes in the rates of wages in the metal,

engineering, and shipbuilding trades was a decrease of £4325 per week, affecting 93,484 workpeople, compared with one of £13,913 per week, affecting 175,908 persons, in 1908. Employment in the engineering and shipbuilding trades in the first half of 1909, says the report, was worse than in the corresponding period of 1908; but from the end of July onwards, the position steadily improved, and, though employment in these industries was still slack, the percentage of Trade Union members unemployed at the end of 1909 was lower than at the close of the previous year. The mean percentage of Trade Unionists unemployed in the engineering industry in 1909 was 11·6; and in the shipbuilding industry, 22·1. The corresponding figures for 1908 were 10·3 per cent. and 22·2 per cent. respectively. The changes in rates of wages in the textile trades in 1909 affected 156,200 workers. Of these, 1762 received advances amounting to £93 per week, and 154,438 sustained a decrease of £8113 per week. In the trades other than cotton, employment was reported to be fair or fairly good.

As already remarked, there were a number of cases of advances to employees of local authorities. These include increases of 9d. and 1s. 3d. per week to the coke-handling men at the Brighthouse Corporation Gas-Works, making the wages 28s. 3d. and 29s. 4d. per week; while the labourers also received an advance of from 1s. to 24s. per week. In the Leeds Water Department, turncocks secured a rise of 1s. a week, to 29s.; and ferrulers and pipe-layers one of 2d. per day, to 5s., 5s. 4d., and 5s. 10d. Gas and water works carters at Bolton were paid from 3d. to 1s. more weekly, making a wage of 25s.; and Mansfield lamplighters benefited to the extent of 2s., which brought a week's pay up to 24s. and 26s. Seemingly the report does not contain any record of increases in wages paid to men in the employ of gas companies having taken place within the period now under review.

As to the methods by which changes in wages were arranged last year, 3·3 per cent. were under sliding-scales, against 6·5 per cent. in 1908; 68·2 per cent. were by conciliation boards, mediation, arbitration, &c., against 62·4 per cent. in 1908; and 28·5 per cent. were by other methods (direct arrangement, negotiation, &c.), against 31·1 per cent. in 1908. The diminution shown in the last seven years in the number of persons whose wages were regulated by sliding-scales is, it is pointed out, almost entirely accounted for by the alteration in the method of arranging the changes in rates of wages of the South Wales coal-miners. The increase in the numbers included under conciliation, arbitration, &c., in the last three years, was mainly due to the fact that coal-miners in the Federated Districts (Lancashire, Yorkshire, the Midlands, North Wales, &c.) had changes in wages in those years. The number of workpeople whose lessening of wages was preceded by a stoppage of work (153,865, or 13·3 per cent.) was considerably larger in 1909 than in any of the previous nine years. But this was accounted for by a dispute in the cotton trade. In this calculation, it should be noted, no account is taken of strikes or lock-outs that failed to produce some change in wages, or of threatened strikes and lock-outs that may have influenced the changes in wages made.

Consequent on the operation of the Coal Mines Regulation Act of 1908, the number of workpeople whose hours of labour were changed during the past year was considerably in excess of the number affected in previous years. The changes reported (which do not include temporary alterations in working hours owing to fluctuations in the state of trade) affected 562,891 workpeople, of whom 3212 had their aggregate working hours increased by 6399 hours per week, and 559,679 had reductions amounting to 2,398,721 hours per week. The net effect of all the changes was thus a reduction of 2,392,322 hours in the weekly working time of the people affected. It is estimated that 500,000 under ground workers in the coal-mining industry had their hours reduced by an aggregate of 2,290,000 per week as the result of the 1908 Act. Going back ten years, it is seen that every year there has been a net reduction in the working hours per week of the people affected by such changes. With regard to gas workers in the employ of local authorities, it may be remarked that during 1909 the stokers at Leek, Mansfield, and Sutton-in-Ashfield had their working time reduced to eight hours per day—equivalent to a reduction of 28 hours per week. At Leeds, the labourers in the Water Department had their time reduced to 50 hours per week.

**Standard Portland Cement.**—The Engineering Standards Committee have prepared a revised British standard specification for portland cement, and it has just been published. Since the issue of the first revision of the specification, the Committee have continued their investigations into the question of the determination of the initial setting-time of cement. It was found that while the final setting-times determined by the British Standard and Vicat needles approximated very closely, the initial setting-time as determined by the former differed considerably from that given by the latter, and also from that obtained by the rough-and-ready test of the finger-nail. It was considered preferable that one instrument should be specified for determining initial and final setting-times; and the Vicat needle has been adopted. The Committee further recommend that no expansion test of the plunging type should be inserted in the standard specification. A minimum lime content, and the total loss on ignition are now specified, and provision is made for limiting the total amount of sulphur present, whether as sulphides or sulphates. The instructions for gauging cement have also been modified. The foregoing are the principal points where the specification differs from its predecessor.



## THE FORWARD MOVEMENT IN GAS HEATING.

ANYONE whose experience covers the last half-dozen years (or even less) of the gas-heating industry must be struck—not once, but ever and again—by the vast change that has come over the spirit of—we dare not complete the tag and say “its dream,” for no word could be more inappropriate. Dreaming suggests, at least, lethargy, if not always sleep; but the gas-stove trade has become broad awake, and grows more preternaturally wakeful every day. In the old days that seem already so very old, though they were really only the day before yesterday, the gas-fire of one season was the gas-fire of the next. A new design or two might come out; but these only differed from their predecessors in some pattern of ornament. Year in year out the working part was on the old lines; and so gas-heating languished, and, instead of progressing, merely marked time. These last few years all this is changed. Improvement after improvement, development after development, succeed each other with a rapidity that would take away the breath of the good people of the older school. The limit reached in one season only marks the point of departure for the fresh advance of the next; and gas-heating has to-day a place in the public eye, and a hold on the public favour, which every friend of the industry must find as welcome as they are surprising, considering how very short has been the period in which this new movement has been brought about.

A movement so broad could hardly be traced to any one source exclusively; and Messrs. John Wright and Co. would doubtless be the first in generous and friendly recognition of the good work being done in the various other centres of gas-stove manufacture. Yet it would be difficult to exaggerate the degree in which the Essex Works have been identified throughout with this rapid forward movement in gas-heating. The association of science with practice, the laboratory with the pattern shop, in the gas-stove industry, speaks much for the initiative and the example of the Birmingham firm; and no one can blame them for reminding the public, as they frequently do, of the splendid list of new inventions and new methods that stands to-day to their credit, and grows greater each season. No one who has had the opportunity, as we have had, of becoming acquainted with their programme for the coming winter, will complain of their having asked the industry to “wait and see” that programme before placing their orders; and we may be sure that no one who took the advice to wait will regret it when once he sees.

In the many-sided activities of the Essex Works, three particular features have been outstanding. First of all, is their early grasp of the supreme importance of radiation in gas-fires, and their persistent spade work in developing it and carrying it to the high point they have done. Next is their advocacy of standardization and interchangeability of parts. And, third, is their insistence on certain well-defined lines of progress in the science of water-heating by gas.

These features are once more well to the front in their new winter budget; and where the last word might well have been thought to have been said in their results of a year ago, fresh advances are still the order of the day. Indeed, we do not hesitate to say that this new programme of Messrs. Wright and Co. is by far the biggest and most impressive we have ever had placed before

been entirely reconstructed, so as to give properly proportioned aëration under varying pressures and consumptions—such as, it is claimed, removes a hitherto unsolved difficulty as regards meeting pressure fluctuations. The firebrick construction is also new; and the “radiants” (as these makers describe what used to be miscalled the “fuel”) are constructed on novel lines “to promote perfect combustion and radiation.”

This new type of “radiant” has been evolved by Messrs. Wright and Co. after testing and rejecting many methods and many materials for years past. In combination with fire-clay, they have tried the rare earths and also various metals. The first give disappointing results; the latter—such as iron, whether as an admixture or as a framework—neutralize any improvement in appearance by rapidly disintegrating the fire-clay, through the

inequality between the various rates of expansion and contraction, as well as oxidation troubles. The advance as regards the “radiants” is, therefore, concerned largely with their construction; and there is a new patent self-locking clip for keeping them in position. Every fire can now be connected up from either right or left without any adjustment whatever. The gas and air adjustment is new; and while quite concealed from view, it is within ready reach of a turn-screw.

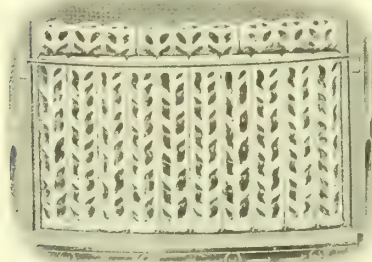


Adjustable Flue Outlet.

Nothing has more largely hampered the growth of gas-fire heating than the difficulty met with as regards flues; and sundry bends and other contrivances have been devised to suit varying shapes and measurements of chimneys. Yet the difficulty has remained as serious as ever. An adjustable flue-outlet to the stove is the ideal remedy; and this season it is made real by Messrs. Wright and Co. The flue troubles, and not infrequently flue-elbows, too, are done away with; up-draught is facilitated; good combustion and ventilation are promoted; and gas authorities are every way relieved of a constant source of worry and expense. Had this been its makers' only contribution to gas-heating this year, they would have deserved well of the industry.

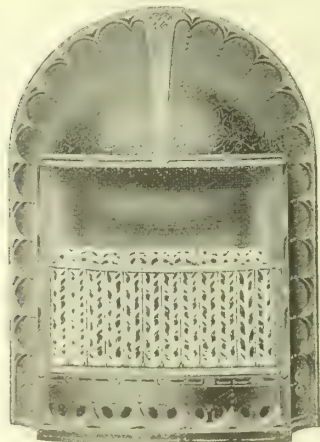
The wide-fire principle which was established some years ago by Messrs. Wright and Co., is this season applied on a much more general scale than before. Quite a number of their stoves are now offered with fires 17 inches and 21 inches wide; and this development is facilitated by a new duplex burner. This is utility. But with the addition of the new patent “Unitap,” utility becomes luxury and beauty as well. No longer have two taps to be manipulated, and the eyesore of a Y-shaped gas-fitting tolerated. One quarter-turn at a time of the “Unitap” gives half fire, full fire, or none at all; and there is no piping in sight—nothing but the neat-looking tap itself.

So much for the gas-fire mechanism. There is at least as much that is new in gas-fire design itself. The “Wizard,” “Mascot,” and “Druid” (the trinity of interchangeables) have made such a mark on the record of gas-fire progress that one could scarcely have thought even the Essex Works itself could improve them. But improved they are, none the less—remodelled indeed; so that, while the distinctive lines of the originals are preserved, it is entirely new fires that are this year offered under the familiar, not to say famous, titles. The object of the metamorphosis has been to render these fires available for every conceivable kind of fireplace, and particularly to help the porcelain enameller to make them even more a thing of beauty than ever. A fourth star—the “Arch-Druid”—now adds itself to the constellation. Its object is to embody the makers' strong conviction that the conventional “Nursery” stove, with its boiling burner in the top, is open to grave objection on hygienic grounds. It harbours dirt and the overflowings of boiling food; but the new side-boiling-trivet in its improved form is a happier and a healthier idea. Intermediate in cost between the “Wizard” type on the one hand and the most expensive class on the other, the “Stadium,” so marked a success these two years past, is joined by the “Warlock”—a very handsome piece of apparatus, thermo-fronted, fitted with all the firm's

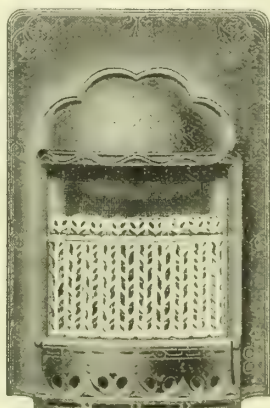


“Thermo” Fire Front.

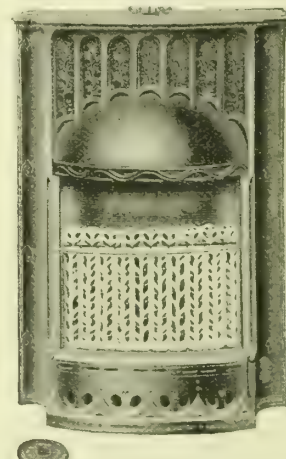
us. The “Thermo,” with its last year's success still fresh, already “pales its ineffectual fire” before the even greater radiance of the new “Thermo X,” which we learn as far excels the “Thermo” as that invention surpassed the previous best. Not one but several new patents contribute to this result. The burner has



“Wizard” Fire.

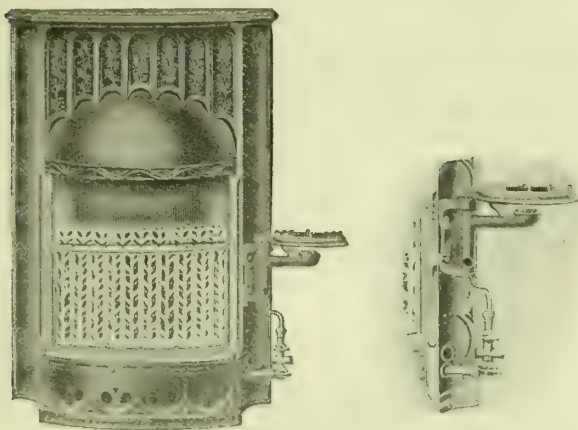


“Mascot” Fire.



“Druid” Fire.

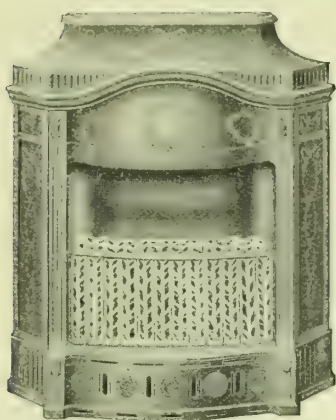




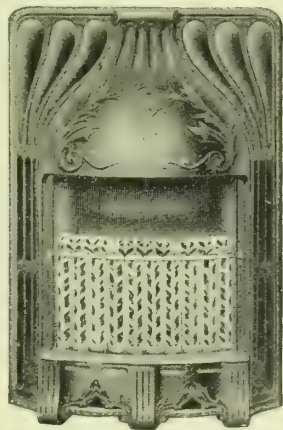
"Arch-Druid" Fire, with Trivet Arrangement.

newest refinements, and ornamented expressly with a view to porcelain-enamelling.

Yet another fire presents itself, of a design quite away from anything in Messrs. Wright's range of styles, or elsewhere. The "Armoric," which is only made in their armour-bright finish, is large, imposing, and artistic in the best sense. It should find a place in many an apartment where the owner's love for his antiquities and art treasures has hitherto made him look on even the best-designed gas-stove as somewhat incongruous.



"Stadium" Fire.



"Warlock" Fire.

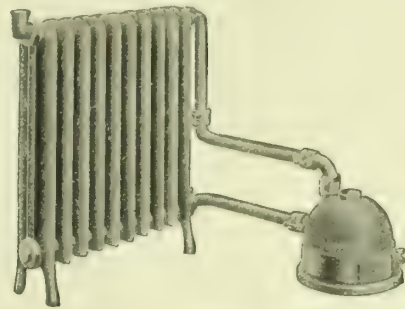
Now we come to the "Autophyre," which is one of several *bonnes bouches* in a feast of good things. This is one of the inventions regarding which one wonders why they have not come before, so obvious seems the call for them, and so great (almost staggering) the possibilities opened up. And, indeed, this is not the first time the idea has been taken up. Several attempts to solve the difficulty have been made public; but the province remains virgin soil. Messrs. Wright and Co., determined to avoid any false starts, have "hastened slowly;" and after devising and testing for many months—extending almost to years—they have at length produced this patent contrivance by which every bedroom in every hotel and boarding-house in the country can have a gas-fire available to the visitor at any time on his placing the "nimble sixpence" in the convenient slot. It can be prepaid by one sixpence or a number, as desired; and every weak spot has been foreseen and assurance made doubly sure against the tamperer, whether he be dishonest or only stupid. No wonder the makers build high hopes on their patent "Autophyre." If only half their anticipations are realized, it should multiply the output of gas-fires (and of gas) by a very large factor indeed.



The "Autophyre."

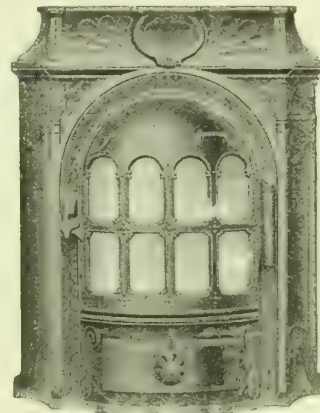
The apostolate of the interchangeability doctrine carries its duties no less than its honours; and that Messrs. Wright have realized these duties is sufficiently shown by the length to which they continue to carry their principle. An object-lesson in this is the instance of four stoves which have every one of their parts in common except one—the front casting. Yet when we mention that these are the "Wizard," "Mascot," "Druid," and "Arch-Druid," it is superfluous to say how distinct each stove is, although all can be built from the one set of parts, with one single casting added to effect the change from "Wizard" to "Mascot" or from "Mascot" to "Druid." This interchangeability, however, began years before these stoves; and it is very far from ending with them, because not only these four, but every pattern of "Thermo" fronted fire is interchangeable in all its parts with corresponding parts of all the other patterns; while as regards the individual patterns, the careful machine-fitting which is universal throughout the Essex Works enables every part to be

replaced from stock, with unerring accuracy of fit and without file or chisel. Such a state of things speaks volumes under the all-important heading of maintenance.



Patent "Garajo" Boiler.

From direct gas-heating to gas-heating by hot water is an easy transition; and once more an apparatus of great promise presents itself, in the patent "Garajo" boiler. It is light, yet it is not of copper, but of the cheaper and more durable cast-iron. It is small; yet it has no internal parts or interspaces, where deposit might gather. It has a fixed consumption of a surprisingly low figure; and it costs so little, burns so little, and is so entirely free from need of cleaning, and free from parts to replace, that for the owners of either large or small motor houses, greenhouses, and workrooms, and for many domestic and other uses as well, it promises to be so long a leap ahead as to warrant its makers in calling it the "Wizard" of gas water-heating. This is at once the highest praise and most sanguine prophecy; and the industry should hear great things of the "Garajo" before very long.



The "Ko-Ko" Stove.

This programme is so wide in its extent, and so forward in its reach, that its authors might well have been entitled to rest on their laurels within the sphere of gas-heating proper; but this year they break ground in yet another direction, in the hope of creating a new movement in the gas-coke side of the gas authorities' business, by designing a coke-stove of a degree of effectiveness, and a reasonableness of cost, such as has hitherto been quite wanting. The "Ko-Ko" is the name that has been given to this new apparatus.

#### M. Bonet's Curved Gasholder Tank.

The following remarks on this tank, which was described in the "JOURNAL" for the 5th ult. (p. 37), appear in the current number of "Engineering Record," in conjunction with some extracts taken, with due acknowledgment, from our translation of M. Bonet's paper at the Société Technique: "This gasholder tank is a marked departure from the form so commonly used in the United States. It illustrates the advantage of thorough analysis of stresses in steel construction; for if a great saving can be made in the thickness of the shell, it is only a question of time when this new design will compete with the older type. While the side plates in bulging tanks are of more irregular shape than those in cylindrical tanks, it is doubtful whether, after the construction becomes standardized, the cost of the bulging tank will be greater than that of the cylindrical form. Plates of from 1 to 2 inches in thickness, as required in some cylindrical tanks, are very difficult to shape and to rivet; and much of the work must be done in the field, where conditions are not conducive to efficiency. A tank which has plates of a maximum thickness of not more than (say)  $\frac{3}{8}$  or  $\frac{1}{2}$  inch can be more easily riveted; thus resulting in a saving of expense, even though the peculiar bulging form makes the side plates more difficult to cut. Water-tanks on towers are frequently built with hemispherical bottoms, notwithstanding the fact that the cost of cutting and bending the plates to conform to the spherical outline is more than would be the case if the bottom were flat. The advantages gained by connecting the supporting columns directly to the cylindrical sides and by eliminating practically all floor framing are great; so that tanks with spherical bottoms are often used in water-supply systems, in handling and storing ores, and for similar purposes."



## PRODUCTION OF TARLESS FUEL.

SOME time ago, a Syndicate was formed to work a process for the treatment of coal and other substances for the production of tarless fuel and the recovery of gas and residuals. A communication addressed to the Chairman of the Syndicate (Mr. O. J. Parker) brought the information that the process referred to is the subject of two patents taken out by Mr. W. Speirs Simpson—one being for the "purification and calcination of peat, brown coal, or lignite, and like substances," and the other for the "manufacture and purification of coke." The specification of the first patent has been published, and we give below an abstract of it. The application for the second patent was made on Sept. 3, 1909; but the specification is not yet ready. A meeting of the Syndicate was held a short time ago, at which the Chairman laid before the proprietors a statement on the progress made and on the general position of affairs; and the following particulars are taken from the reports which were published in the financial papers.

It appears that plant to work the process was completed at Battersea about the middle of July, and operations were commenced at once. There was no doubt about the success of the process in the treatment of coal; but, with the view of adding to the assets of the concern, the Directors turned their attention to the distillation of shale for the production of mineral oil and bye-products. They arranged for a supply of shale from Scotland and Australia, submitted both samples to a series of tests under the supervision of their Consulting Chemists, and obtained highly satisfactory results. With regard to the production of tarless fuel and coke, the Chairman stated that the trials were equally gratifying from a technical standpoint, and promised great results from the commercial side. The Directors began operations with the tarless fuel by fitting up a small experimental and development plant in the centre of the Derbyshire coal and iron district; and it proved all the principles claimed for the invention. But they saw that many improvements were required to enable them to get a full return from the process. These it was decided to proceed with, and it was arranged to fit up a complete installation at Battersea, where it could be under the constant supervision of the Directors. This decision has, it was stated, been justified to the fullest degree; and they are now turning out the finished product from coal in two hours, of a quality fit in every way to fulfil all the objects claimed for it, together with a yield of bye-products such as, for quantity and quality, was not considered obtainable a short time ago.

The success of the process on what might be regarded as the experimental scale having been assured, it was considered that the time had arrived for its development upon a commercial basis; and steps were taken to form a Company with this object. In dealing with this matter at the meeting referred to, Mr. Parker submitted the following estimate for working a plant to treat 750 tons of coal per day: Cost of coal, at 7s. 6d. per ton, £281 5s.; works expenses, at 3s. per ton, £112 10s.—total, £393 15s. This would, he said, produce 500 tons of tarless fuel at the works, to sell at 22s. 6d. per ton, amounting to £562 10s., and gas and bye-products at 10s. per ton, valued at £375—a total of £937 10s. Deducting the £393 15s., the result was £543 15s. per day. Reckoning 300 working days a year, a profit was shown of £163,125 per annum. He added that the Directors considered this a fair estimate; and it had been framed irrespective of the question of royalties and the other branch of manufacture to which attention had been given—viz., the distillation of shale for the production of oil. The Directors thought, however, they were justified in anticipating royalties, as it would be obvious to people interested in the production of coke that a process which would give a tarless coke in the short space of two hours was one that commanded very serious attention. To carry out work on the scale indicated, plant to treat 750 tons of coal daily would, it was stated, cost £100,000; but the Directors suggested that the first plant should be installed to deal with 150 tons. It was estimated that this would cost £20,000, and it would easily enable the Company to pay 10 per cent. on the whole capitalization (a nominal capital of £300,000 was proposed), extend the plant, or erect other plants in different localities, as required. Mr. Parker was asked whether, instead of producing three different qualities of coke, it would not pay better to carry the process to finality, and recover all the residuals. He replied that the difference in the time the coal was in the furnace was only a few minutes; and no doubt the Company and those who worked the process would ultimately settle down to produce whatever proved to be the most profitable variety of coke.

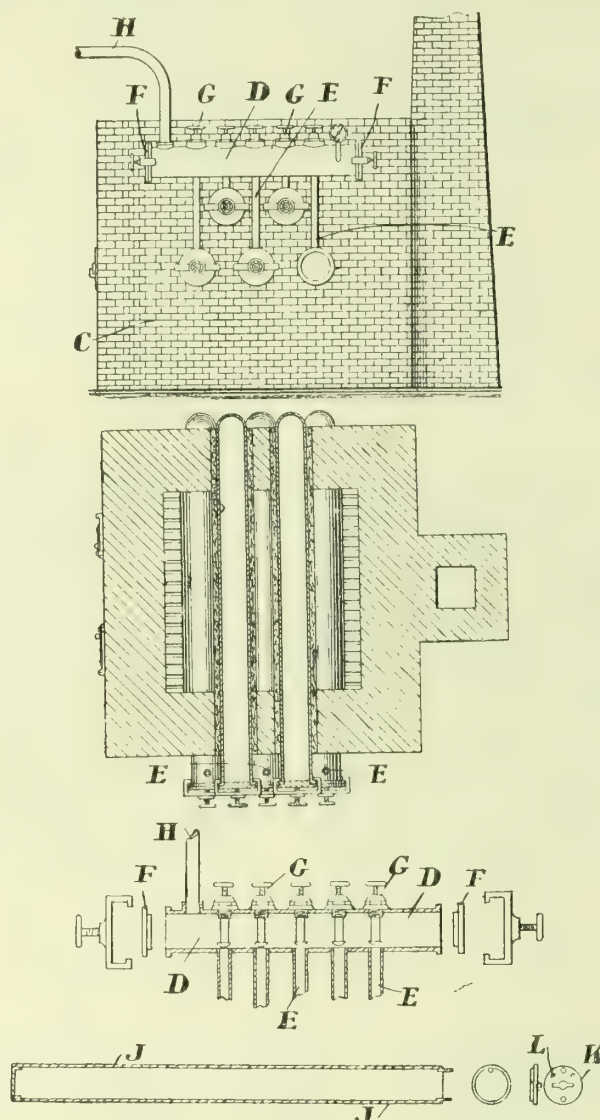
### Abstract of Mr. Simpson's Specification.

The most important features of the process are: 1. The treatment of various substances or raw materials in such a manner that the amount of fixed carbon originally contained in them shall not be appreciably diminished during treatment. 2. The elimination of impurities from the substances treated and the conservation of such products of distillation as may be useful. 3. By means of the heat employed during treatment, the complete calcination of the substances treated and the final product or charcoal so produced being "rendered porous and of a highly absorptive character."

In carrying out the invention, the patentee proposes to enclose the substance to be treated in a metallic vessel or other retort or receptacle, preferably cylindrical in form, and so constructed that a vacuum is created and maintained inside the receptacle during a part or the whole of the time of the treatment of the substance. The retort is also pro-

vided with means for applying external heat at temperatures suited to the elimination of moisture and of certain gaseous and volatile products of distillation and finally to the application of the high heat necessary to the calcination of the carbonaceous substance under treatment. Means are provided for facilitating the passage of the heat through the substances placed in the retort, also for cooling (by water jacket or otherwise) such parts of the retort as may contain movable doors or covers, where the high heat employed might warp the parts, so as to admit air or impair the vacuum to be maintained.

The illustration shows the apparatus by which the process can be carried into effect—a front elevation of a furnace with five retorts (one being discharged) and a sectional plan.



Each retort consists of an outer fire-clay case lined with an iron inner tube closed at one end or open at both ends; the whole being set in brickwork so as to leave both ends of the iron tube protruding. D is a vacuum chamber and receiver, the details of which are shown. It is connected to each retort by pipes E; and its object is to collect any solid matter and bye-products that may come through with the gases. It is provided at each end with a door F for cleaning purposes. The stop-cocks G are also removable, so that in the event of any of the pipes being stopped they may be easily cleared. The pipe H is carried to an exhaust pump.

The lignite in the form of a powder is moistened with water until it is wet enough to bind together when pressed in the hands. It is then packed into sheet-iron cases J sufficient to fill three parts of their diameter. This, it is said, allows the gases to pass off more readily than if they were filled. The end of the case (fixed in position by studs and fly nuts) should have one or more vent holes L in such a position that, when the cover K is on, the vent holes are opposite the blank space. An eye should be fixed to this end to enable the case to be withdrawn from the retort. The case is slid into the retort; the retort connected to its pipe E; and the retort closed, and the vacuum cock opened. The calcining should take place at a good red heat. The object of enclosing the case J is that when calcining is complete, it may be withdrawn from the retort and allowed to cool before being removed from the case. The lignite is thus never exposed to the air while in a hot state.

These cases would, of course, be used in large numbers, so that as soon as one is withdrawn another would be immediately introduced—thus making the process continuous. That is to say, when the case J is to be removed, the valve of the case connecting the pipe will be closed, and the pipe disconnected. The valve G is then screwed down to close the end of the pipe; and the case J can be removed without destroying the vacuum in the chamber D, and a fresh case placed in position for a repeat.

By this invention, it is claimed that there is "produced pure fuel containing a high percentage of carbon and free from coal tar, and other objectionable impurities, and thus rendered peculiarly adaptable for the manufacture of producer gas."



## HIGH-PRESSURE GAS LIGHTING IN THE ARGENTINE CENTENARY INTERNATIONAL EXHIBITIONS.



Part Front View of the International Health Exhibition, Buenos Aires—Argentine Centenary, 1910.



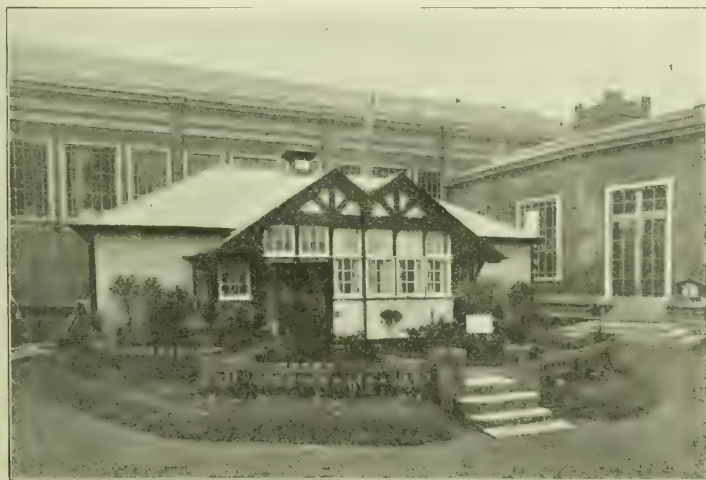
A Similar View by Night—Showing the High-Pressure Gas Lighting by the Primitiva Company.

THE Argentine Republic is this year celebrating the centenary of its independence; and the Government decided to include in these celebrations a number of international exhibitions, of which the chief were to be Fine Arts, Railway and Transport, Health, Agriculture, and Industry, to be held in the city of Buenos Aires. These separate and independent exhibitions have now all been constructed and installed in special buildings (the majority of considerable elegance and magnitude), and opened to the public in less than twelve months from the time their construction was decided upon and the respective Executive Committees appointed by the Government to take charge of the projects. In the consequent rush and hurry, it was perhaps only natural that lighting questions, in the exhibitions which it was intended to open at night, should be shelved till the last moment. It therefore fell to the lot of the Primitiva Gas Company of Buenos Aires to be given just six weeks in which to order their material from Europe by cable, and carry out their installation of two complete high-pressure lighting systems for the grounds of the Health and Railway and Transport Exhibitions respectively. The following are some particulars of the work.

Each plant aggregates 110,000-candle power, consisting chiefly of three-burner Graetzin improved inverted lamps



One of the Gardens (approaching completion) in the Interior of the Argentine Centenary Exhibition, and containing the Primitiva Gas Company's Bungalow.



Primitiva Gas Company's Bungalow at the Argentine Centenary Exhibition.

of 1500-candle power, supplied with high-pressure gas at the customary 56 inches of water, erected at approximate distances of 25 metres (82 feet) from column to column. Each compressor is of the rotary type (without duplicate), belt-driven either by an electric motor or a gas-engine as desired. Each plant is installed in an underground ventilated chamber having water-tight manholes. This particular mode of installation was adopted with the idea of showing the Buenos Aires Municipality the facility with which isolated installations can be made in avenues altogether remote from distributing centres.

In the grounds of the Health Exhibition, the Primitiva Company also erected and fitted up a model gas bungalow similar to that shown last year by the Gaslight and Coke Company at the Imperial International Exhibition at Shepherd's Bush. This bungalow was erected, fitted, and furnished entirely in five weeks, in spite of difficulties encountered by the late arrival of material from England owing to congestion in the port of Buenos Aires, and the consequent necessity of making substitutes on the spot, at the last moment. In the principal restaurant of the exhibition, the Company are showing, under working conditions, a steam



tea, coffee, chocolate, milk, and egg boiler, also a steam cooker, all being connected to one of Still's boilers, which has been found to be entirely automatic as regards constant pressure, water feed, and controlled gas supply.

Referring to the accompanying illustrations, they comprise a partial front view of the Health Exhibition by day and the same by night, the Primitiva Company's bungalow in the Health Exhibition and the garden in which it is situated, still in an unfinished condition, but showing the type of lamp and column employed for the high-pressure lighting. It will be noticed that the garden patch in front of the bungalow is bounded by a dwarf wall constructed in retort-setting blocks (actually sight-hole frames and stoppers). It may be mentioned that the Primitiva Gas Company manufacture in Buenos Aires all their own fire-goods specials. The Company also showed in the Health Exhibition an extensive exhibit of chemical products, including their own make of sheep and cattle dips, disinfectants, and ammonia products. In connection with this, they installed complete working plant producing artificial ice, and automatic refrigerated chambers, employing pure anhydrous ammonia of their own manufacture.

Mr. Bernard F. Browne, formerly the Chief Engineer to the Company, who, as already announced in the "JOURNAL," has just returned to England, was responsible for carrying out all the exhibition work, employing exclusively local labour, which, it is interesting to note, was entirely Italian.

## THE ALTERATION OF ORDINARY TO CONSTANT-LEVEL GAS-METERS.

In a short paper read before the Société Technique du Gaz en France at their recent annual meeting in Paris, M. Dupoy described a method of converting ordinary wet meters into those having a constant water-level. The author is associated with the Société Industrielle des Compteurs, of Paris, which is an amalgamation of firms of which he and MM. Maldant, Vanderpol, and Carnelli

were the heads; and their "Duplex" meter, with injector, was awarded a silver medal by the Société Technique on the occasion of the meeting at Nancy in 1907.

Before describing his meter, the author remarked that, since the introduction of "Duplex" meters, those having ordinary drums had been gradually discarded in favour of others in which the water-level is kept constant. These had been adopted for new installations; but there were, of course, a large number of the old

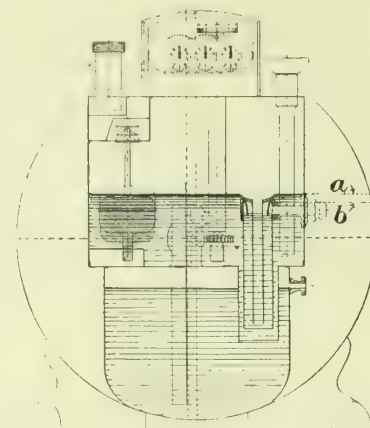


Fig. 1.

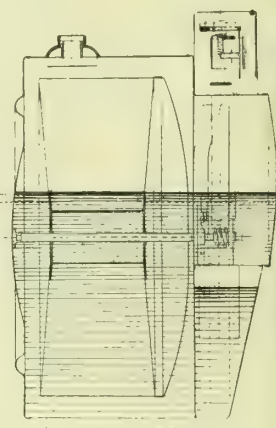


Fig. 2.

kind in service which could not well be taken out, "scrapped," and replaced by others of the improved type. M. Dupoy pointed out, however, that when meters were from time to time removed for repair, it was possible to modernize them, and, as far as maintaining the water-level is concerned, bring them into a condition quite equal to the "Duplex" meters, by furnishing them with the compensating arrangement employed in the construction of

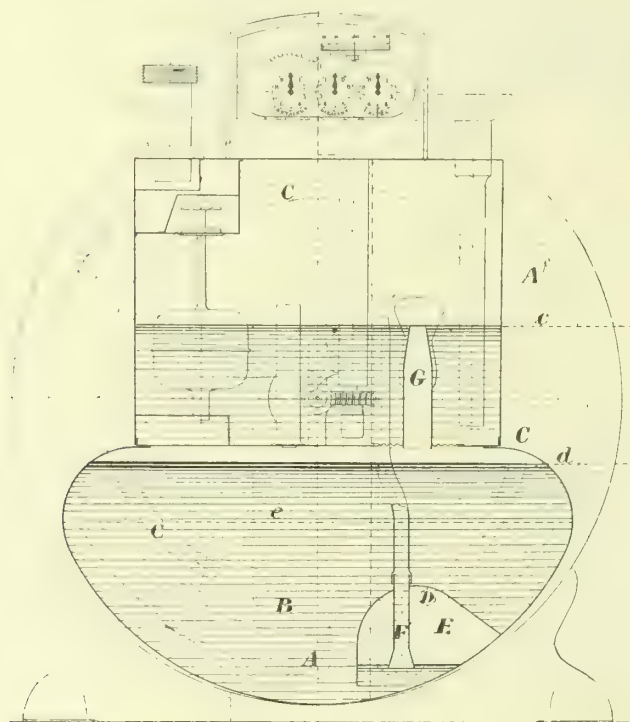


Fig. 3.

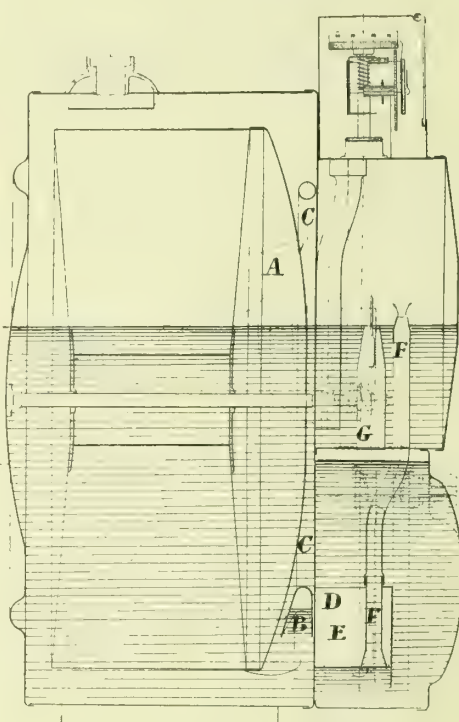


Fig. 4.

those meters, a description of which was given by him in a short communication made to the Société Technique at their meeting at Havre in 1905.

The method of transforming a meter is shown by the accompanying illustrations, in which figs. 1 and 2 represent a meter of the ordinary kind, and figs. 3 and 4 the same meter converted into one with constant water-level. In fig. 1, the normal water-level is shown at *a*, and the level lowered after evaporation at *b*. In fig. 3, the constant water-level is shown at *c*, the level of the water in the reservoir at *d*, and the lowered water-level at *e*. It will be noticed that the hydraulic box of the syphon in figs. 1 and 2 is dispensed with, and replaced by a water reservoir of large dimensions, as shown in figs. 3 and 4. The water-level regulator in figs. 1 and 2 is displaced, and utilized for the reservoir. The drum is provided with three scoops *A*. A tube *C*, passing above the water-level, furnished with a hood *B*, is fixed on the circular front in the inside of the case; the scoops passing under the hood. A compression box *E*, containing the injector *F*, is placed in the water reservoir, and the overflow-pipe *G* limits the height to which the water will rise.

The action of the meter is as follows: During the revolution of the drum, the small scoops *A*, on coming in contact with the water in the meter, take up some bubbles of gas and convey them under the hood *B*. The tube *C*, which is a continuation of the hood, is in communication, by the opening *D*, with the compression box *E*. The gas bubbles accumulate in this box, and press upon the water at the bottom of the injector *F*; and when the meniscus is broken, a portion of the gas compressed in the box *E* escapes suddenly by the injector, and throws to the upper part of the meter all the water it contains. Following this action the tube *F* fills itself again up to the height of the water contained in the reservoir; and the same operations of accumulation of bubbles and projection of water are repeated continually during the working of the meter. All bubbles which make their way under the hood enter the box *E*, and escape by the injector, as already explained.

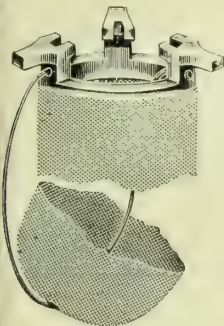
The meter described, having been tested and favourably reported upon, is accepted for official stamping; and the Paris Gas Company are having altered to the new style all their ordinary meters which are sent to the makers for repair.



SOME LIGHTING ACCESSORIES.

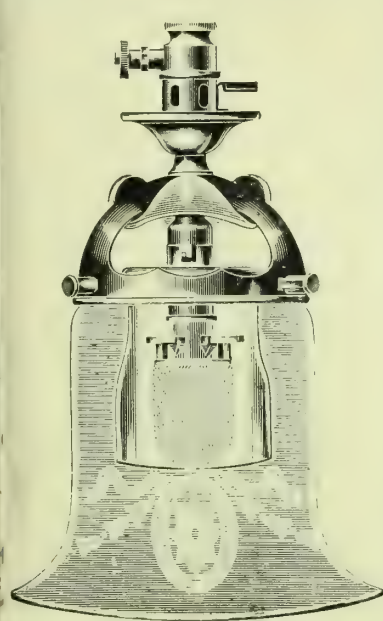
On making an inspection last week of the commodious show-rooms in Farringdon Road of Messrs. Falk, Stadelmann, and Co.—that is to say, of the portion which is devoted to catering for the wants of the gas industry, for there are also other departments equally well served—attention was directed to some of the fresh features which are included in the new issue of the Incandescent Light Catalogue.

The well-known "Veritas" inverted mantles, it was learnt, are now being supplied in a new and improved quality, and having an extra heavy impregnation, with the object of considerably increasing their durability. Then, in connection with the "Veritas" inverted mantles, mention may be made of an idea which has been put into practice, and is considered specially suitable for adoption with mantles used for lighting railway carriages, mills, billiard-tables, &c. As shown by the illustration, this consists of an asbestos cord passed through the bottom of the mantle, and fixed at each end to the ring. It is pointed out that, should the mantle become fractured or detached from the ring, the asbestos cord will prevent it from dropping, and hold it sufficiently together to be serviceable until it can be replaced. With regard to inverted burners, there is an "Improved



Fractured Mantle held together by Asbestos Cord.

Veritas" type, which is claimed to give 65-candle power with a consumption of only 3 cubic feet of gas per hour. These include the new patent spring globe holder, air-regulating cup with lever permitting of the adjustment of the burner while alight, and an improved gas-adjuster with thumbscrew of black non-heating material. Another pattern which should secure its



The "Veritas Self-Intensifying" Lamp.

two sizes, with brass or china casing; and the efficiency of the largest is stated to be 110 candles for a consumption of less than 4 cubic feet of gas per hour. Among the gas lighters, is noticed the "Climax," which is conveniently arranged. It consists of a tube with a gas-collecting cup at the top, partially surrounding the igniting substance; and it is provided with a rotary lever action.

LARGE GAS-MAIN UNDER THE HARLEM RIVER.

In order to guard against a possible shortage in the supply of gas in the borough of the Bronx, the Consolidated Gas Company of New York some time ago decided to lay a 48-inch main in the bed of the Harlem River; and the work was started in April. The main leaves the Manhattan shore at a point rather high up the river, and the length laid, at varying depths, in the bed is 550 feet. The following brief particulars of the work are taken from an illustrated article on the subject in the publication, bearing the title "Gas Logic," which is issued monthly under the auspices of the Company.

For carrying on the operations, some caissons were sunk on the banks of the river to a depth of 50 feet. In order to obviate the possibility of the main being injured by dropped anchors, it is laid on blocks with a reinforced concrete "decking" over it. It is made up of sections 12 feet in length; two being jointed together, lowered into the water, and placed on the blocks by divers.

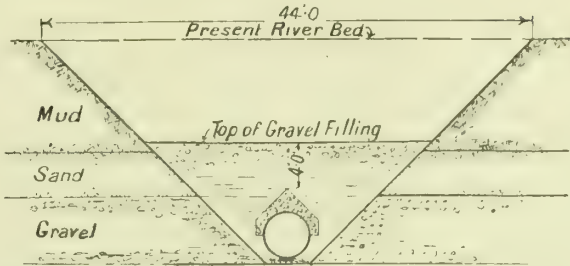


Diagram Showing the End of the Main Buried in Gravel under the Bed of the River.

The position of the main is shown in the above diagram. It will be seen that it lies at the bottom of a V-shaped excavation, the sides having a slope of 45°, which had to be made through mud, sand, and gravel, all below the present river bed. The main rests upon oak wedges and yellow pine blocking 3 feet in length, 12 inches wide, and 4 inches thick, so that it cannot shift its position; and the "decking" over it is cone-shaped, to protect it from injury.

CONDENSATION & NAPHTHALENE EXTRACTION.

The following is an abstract translation of an article on this subject in a recent number of the "Journal für Gasbeleuchtung," by Dr. E. Ott, the Chemist at the Schlieren Gas-Works of the Corporation of Zürich.

The author observes that views on the matter have recently undergone considerable change. It was formerly believed that gas must be kept at a high temperature (95° to 105° Fahr.) as far as the inlet of the naphthalene washer, in order that the washer might be worked with as small a consumption of oil as possible; and this view is widely held at the present time. But now the more correct view is gaining acceptance—viz., that only well-cooled gas should enter the washer. It is true that warm anthracene oil dissolves more naphthalene than cold; but, on the other hand, warm gas carries much more naphthalene than cold gas into the washer, and this is a far more important point. The tension of naphthalene vapour, and consequently the proportion in the gas, increases considerably with the temperature, as the following figures given by Bunte indicate.

| Temperature, Deg. Fahr. | Vapour Tension of Naphthalene, Millimetres of Mercury. | Grains of Naphthalene per 100 Cubic Feet of Gas. |
|-------------------------|--------------------------------------------------------|--------------------------------------------------|
| 32                      | 0.022                                                  | 5.99                                             |
| 50                      | 0.047                                                  | 9.75                                             |
| 68                      | 0.080                                                  | 24.60                                            |
| 86                      | 0.135                                                  | 39.50                                            |
| 104                     | 0.320                                                  | 83.47                                            |

[These figures may be compared with those obtained by independent investigation by R. W. Allen, vide "JOURNAL," Vol. LXXV., p. 673.]

If the gas is cooled only a little before it enters the naphthalene washer, it will carry more naphthalene into the latter than if it is thoroughly cooled, because the tar has been able in the latter case to dissolve considerably more naphthalene. This has been proved to be, in fact, the case by practical tests made at the Schlieren works. Up to February last, one stream of gas through the naphthalene washer amounted to about 6,707,000 cubic feet, at a temperature of about 95° Fahr.; and the consumption of oil corresponded to 5 oz. to 6 oz. (weight) per 1000 cubic feet of gas. The spent oil from the first chamber of the washer contained about 23 per cent. of naphthalene, and the oil from the fourth chamber, about 12 per cent. Later, the temperature of the ingoing gas was reduced, by the use of two condensers anterior to the washer, to about 68° Fahr., so that the temperature of the washer itself fell to 68° to 77° Fahr. It was then found that at least 14,120,000 cubic feet of gas could be passed through the washer with the same quantity of oil; so that there was effected an economy in oil consumption of over 50 per cent. The oil from the first chamber then contained 21 per cent. of naphthalene, and that from the fourth chamber about 11 per cent. On cooling a portion of the oil from the latter chamber to 14° Fahr., no naphthalene separated out—proving the oil had not been in use too long. Estimations by means of picric acid showed that the amounts of naphthalene left in the gas were practically negligible, whereas prior to the washer about 8.74 grains per 100 cubic feet were found.

There is no point, so far as naphthalene extraction is concerned, in cooling the gas below (say) 59° to 68° Fahr.; and lower temperatures would be difficult to maintain in summer. Neither can further cooling be recommended for works without naphthalene washers, as experiences in England have shown that at lower temperatures oils are extracted which otherwise would be retained in the gas and would first be condensed in the mains, where they would dissolve any naphthalene which might also have been condensed there. At some English gas-works, over-cooling of the gas has resulted in naphthalene obstructions; while at others working similarly in other respects, but not cooling the gas to such a low temperature, there have been no such obstructions. It appears advisable to cool the gas rapidly to the desired temperature, because when it is cooled slowly large quantities of tar separate at a comparatively high temperature, and are then capable of dissolving only a little



naphthalene, whereas, if gas is cooled rapidly to 59° to 68° Fabr., the greater part of the deposited tar takes this temperature and is in better case for dissolving naphthalene. Hence, the most powerfully acting washers are the best, with or without the by-passing of the atmospheric condenser. If there is a long train of apparatus between the condenser and the ammonia washer, as is often the case when naphthalene and cyanogen recovery washers are employed, the gas may in summer time again become hot before reaching the ammonia washer; and as the latter then fails to absorb well, it may be necessary to insert another rapid condenser immediately anterior to the ammonia washer. Figures are given for a "Standard" washer at the Zürich Gas-Works, showing that when the temperature at the inlet rose from about 66° to 79° Fabr., the quantity of water used was greatly increased, with a consequent diminution in the strength of the liquor produced while the effluent gas began to show traces of ammonia. On putting in an intermediate condenser, however, and thereby reducing the temperature of the ingoing gas to 66° Fabr., the consumption of water was again reduced, the strength of the liquor raised, and the outgoing gas rendered clean to test papers. Incidentally, also, the reduction of temperature improved the working of the cyanogen washer, by increasing the strength of the cyanogen sludge.

With the old method of working, sludge containing only about 8 per cent. of prussian blue could be obtained; and the requirements of the purchasers for a stronger sludge could not be met, while dealing with gas from the vertical retorts, till the special condenser was inserted in the train of apparatus, whereupon the sludge acquired a strength of 10 to 11 per cent. of prussian blue. The explanation most probably lies in the fact that the ammonia absorbed in larger quantities at the lower temperature renders the sludge more strongly alkaline, and consequently better capable of retaining the cyanogen which comes into the washer. The increased amount of ammonia in the sludge does not (as an example for which a calculation is made by the author shows) result in a financial loss, because the increased proportion of blue more than compensates for any loss due to the ammonia not being recovered in a concentrated state. Hence, thorough cooling of the gas at this stage must on this account be strongly recommended.

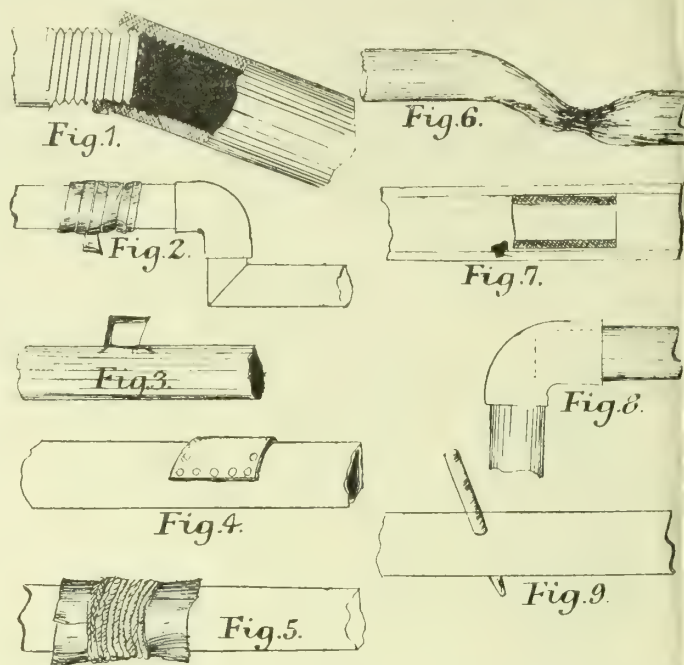
## DISQUALIFIED PIPES AND CONNECTIONS.

The following article, from a correspondent, appeared in a recent number of the "American Gaslight Journal."

In almost every house there lives someone who knows enough of mechanics to tinker with gas pipes and connections; but this tinkering is often disastrous to the piping system of the house or office building. Caretakers often injure pipes, meters, tanks, &c., in their efforts to make some changes in the pipes or to instal a new part. I have seen first-class pipes and adjoining apparatus sadly distorted by the careless handiwork of persons who had no right to interfere with them. Still, of course, there are often excuses for tinkering with the pipes. For instance, when a pipe begins to leak, and the man of the house detects the point of leakage with the dangerous light, he feels that he is competent to make a few adjustments, stop the leak, and save the cost of the repair by an experienced man, with the result that the gas companies have more or less trouble all the time. In some American cities and towns, there are numbers of the company's men always out among the users of the gas to closely watch things; and if there is anything wrong, they are quick to detect it and effect a remedy. No such precaution, however, is taken by the smaller concerns in the country towns; and, regardless of the care exercised by the suppliers of gas, there are always certain fractures in piping systems which are repaired or patched improperly.

Not long ago, I noticed a man tinkering at a gas-pipe joint. As the two ends of the pipe passed through partitions, and as one partition wall had settled a little, one section of the pipe drooped so as to prevent the joining of the threads correctly. But the man inserted the end into the joint of the corresponding pipe, and proceeded to screw it up, with the result that he had an adjustment like that shown in fig. 1. The threads were thrown out of line, as shown; but the man turned the joint as far as possible, and left it. Of course, leakage resulted, and a regular pipe fitter had to be sent for, as he should have been in the beginning. In order to restore this union to the proper shape, the threads of the pipe had to be recut.

Persons not accustomed to repairing leaks in pipes in houses or factories should not attempt to do so; but the precaution is not taken. There are always people who will strive to fix things for the sake of tinkering, or to save the expense of a gas-fitter's bill. Hence, in one house where a pipe leaked, I found that the fracture in the pipe was first filled up with soap, and then a strip of banding bound about the place, as in fig. 2. I have seen men express their delight because they may have stopped a leak for the time being by winding it in this way. It is a slipshod method of doing things, and should not be tolerated. Of course, the banding works free in time, leaking begins again, and then the gas company are usually notified, and a man who understands repair work appears on the scene to substitute a new section of pipe for the split one. I once saw a fracture in a pipe closed for a time by means of a slim wedge of steel driven in, as illustrated in fig. 3. Then some resin was plastered about the edges, and the leak was checked for a short time. However, soon there was



an odour of gas, and trained workmen had to come and remove the entire joint, and replace it with a new strip of pipe.

Sometimes persons will go to the trouble of piecing on a patch of sheet metal, as seen in fig. 4. This is another crude way of repairing a bad place in a gas-pipe; and it cannot be done unless the fracture is near the end of the pipe, for it is necessary to insert a mandrel so as to head-up the rivets. While a patch like this is strong, and usually effective, it is difficult to use it on account of the need of drilling rivet-holes. Some bad places in gas-pipes are covered with wrappings of leather or felt, as shown in fig. 5. The application of a gummy material closes the splits or holes; and the binding of cloth or other stuff with cords, raw hide, or wire makes a firm emergency fixture. It is not intended that a repair job of this character should be lasting. The idea is to bind up a leak, and then get to work and make it right with new parts when convenient.

There are not only leaks to contend with, but collapsed pipes and twisted sections are often encountered. Sometimes the walls of pipes are crushed by the action of the partitions or floors through which the pipes may pass. In this age of competition among building contractors, edifices are often put up before the timber is thoroughly seasoned, with the result that the woodwork is strained and warped in the finished structure. The piping which happens to extend through such work gets crushed, bent, and distorted. Fig. 6 shows the condition of a gas-pipe crushed in this way. The best—in fact, the only—way is to remove the section, and replace it with a new one. But I have seen such places restored by heating the pipe with a bunsen burner and straightening it, and then driving a rod of the size of the interior of the pipe through to expand the wall to the right proportions. Pipe plugs are a trouble. If inserted, as shown in fig. 7, to check a pinhole leak in the pipe, the passage-way of the pipe is cut off just this much, and the flow of gas hindered.

Concerning the checking of the flow of gas, the proprietor of a dining-room once reported that he was unable to get the usual supply of gas for his table lights. An examination revealed the condition shown in fig. 8. It seems that the joint had sprung a leak. One of the workmen of the place then turned the threaded section of pipe into the elbow until the section protruded into it to the extent of almost checking the flow of gas, as represented by the dotted lines. On the removal of this combination, the flow of gas was corrected. One often finds pins driven into leaking holes in pipes. I saw a wire nail used and driven with such force that the point passed entirely through the pipe, coming out below, as shown in fig. 9. Soldering is better than nailing up pin-holes, as everybody knows; but it is not possible for the gas-fitter to control the actions of the home artisans. About all he can do is to be ready to repair any damage done by the tinkerer.

**Extension of High-Pressure Gas Lighting in Berlin.**—It is reported in the "Journal für Gasbeleuchtung" of the 20th inst., that the Municipality of Berlin have ordered from the firm of Ehrlich and Graetz 450 high-pressure gas-lamps of 2000 hefners (1800-candle) power, and 60 of 1000 hefners (900-candle) power. This will increase the number of Graetzin high-pressure lamps in use in the streets of Berlin to about 1800, totalling nearly 4 million hefners in illuminating power.

**Death of Mr. A. H. Claypole.**—The death occurred recently at the age of 73, of Mr. Alfred H. Claypole, J.P., a resident at Camberley for about 45 years, during the greater part of which time he was in business as a chemist and druggist. He was one of the founders of the Yorktown and Blackwater Gas Company, and helped in great measure to promote the success of the concern. He had been a Director almost from the commencement; and for many years he was Chairman of the Board.



## REMOVAL OF SULPHUR BY REHEATING.

## The Hall Process at Portland (Oregon).

In the "JOURNAL" for the 1st of March last, an abstract was given of the specification of a patent taken out by Mr. E. L. Hall, of Portland, Oregon (U.S.A.), for a process "to remove from gas, after it has been purified as much as possible by hitherto known methods, the organic compounds of sulphur which remain therein, and which hitherto have been considered unremovable." The process has been in successful operation at the Portland Gas-Works for the last two years and more; and we have received from Mr. H. M. Papst, the General Manager of the Company (through Mr. Frederic Egner, who was recently in the city), the following particulars in regard to it.

The good results obtained from the use of this process have shown themselves not only in the laboratory, but also in the plainly expressed satisfaction of the public. Information as to the operating and maintenance cost of the plant can best be furnished by submitting the figures of the Company for 1909. The figures for the amount of sulphur remaining after reheating and secondary purification—being monthly averages of street gas, and including set-backs from various causes, such as small purifying capacity and poor purifying material of the secondary purifier and lack of blast pressure—hardly do the process full justice. The total amount of gas reheated was 817 million cubic feet, with a minimum of 4 million cubic feet per day.

| Month.        | Heating Oil,<br>Gallons per<br>1000 Cub. Ft. | Labour per<br>1000 Cub. Ft.<br>Dols. | Grains of Organic Sulphur<br>per 100 Cub. Ft. |                  | Removed. |
|---------------|----------------------------------------------|--------------------------------------|-----------------------------------------------|------------------|----------|
|               |                                              |                                      | Before.                                       | After Reheating. |          |
| Jan. . . .    | 0.35                                         | 0.0026                               | 58.8                                          | 16.9             | 41.9     |
| Feb. . . .    | 0.21                                         | 0.0025                               | 50.0                                          | 17.3             | 32.7     |
| March . . .   | 0.18                                         | 0.0030                               | 49.0                                          | 15.5             | 33.5     |
| April . . .   | 0.50                                         | 0.0042                               | 58.8                                          | 14.2             | 44.6     |
| May . . . .   | 0.49                                         | 0.0032                               | 53.9                                          | 15.3             | 38.6     |
| June . . . .  | 0.55                                         | 0.0031                               | 68.5                                          | 18.0             | 50.5     |
| July . . . .  | 0.56                                         | 0.0035                               | 68.9                                          | 20.8             | 48.1     |
| Aug. . . . .  | 0.48                                         | 0.0031                               | 66.7                                          | 18.2             | 48.5     |
| Sept. . . . . | 0.42                                         | 0.0026                               | 57.8                                          | 14.7             | 43.1     |
| Oct. . . . .  | 0.33                                         | 0.0024                               | 62.3                                          | 15.5             | 56.8     |
| Nov. . . . .  | 0.31                                         | 0.0020                               | 62.1                                          | 18.8             | 43.3     |
| Dec. . . . .  | 0.30                                         | 0.0018                               | 49.2                                          | 18.1             | 31.1     |
| Annual report | 0.35                                         | 0.0026                               | 58.8                                          | 16.9             | 42.9     |

I would consider the following a fair estimate of what the plant will do:

|      |        |      |      |      |
|------|--------|------|------|------|
| 0.50 | 0.0026 | 60.0 | 13.0 | 47.0 |
|------|--------|------|------|------|

This shows an average cost of reheated gas for the year, including labour and material, of \$0.075. Should producer gas be used instead of oil for heating, with coal at \$3.50 per ton of 2000 lbs., containing (say) 12,000 B.Th.U. per pound (Pacific Coast coals), it would require 67,500 B.Th.U. (the heat units in half-a-gallon of California crude oil), or 67,500 ÷ 12,000 of coal, or 5.6 lbs. If the producer efficiency were 75 per cent., this would amount to 7.5 lbs. at \$0.0022, or \$0.0165.

The operation of the process is extremely simple and readily understood, being merely an alternate reheating of the two shells filled with fire-brick chequerwork; that is to say, while gas is passed through one, the other is being heated. The ground space can be figured as being equal to a fourth the generating capacity of the works if water gas is manufactured, and also one-fourth the purifying capacity of the primary purifiers. In addition to the above, condensers of the usual design are used to cool the gas from 150° Fahr. to the temperature desired for purification. The apparatus should be connected after the usual purifiers, and ahead of the station meter, so that the exhausters will force the gas through the primary purifiers, reheater, coolers, secondary purifiers, and station meter into the storage holder.

The total repair on the reheating plant, outside of the rechequering, amounted to \$125. The life of the chequers should be indefinite, since neither oil nor extreme heat is present to disintegrate the brickwork. Repairs to the brickwork of the producers, in which solid fuel is used, should also be low in maintenance, since the best producer practice has demonstrated low heats in operating.

In conclusion, Mr. Papst said he should like to draw the attention of the gas fraternity to the fact that companies who have been limited in their choice of raw materials to those low in sulphur content may, by using the reheating process, select a cheaper coal, which will of itself tend to reduce the price of all raw materials by increasing the number of available ones. A difference of only 50 c. per ton in the price of two coals—one low and the other high in sulphur—means 5 c. per 1000 cubic feet of increased profits. He adds: "I feel satisfied this is the cheapest process ever invented for the removal of organic sulphur."

In the letter accompanying the preceding particulars, Mr. Egner says: "I believe there is something in this process, and possibly some English gas managers might wish to take up the matter with Mr. Papst. Plant for carrying out the process is now being erected at Los Angeles, California, at one of the works of the Gas and Electric Company, of which Mr. W. B. Cline is President."

## ANALYSIS OF FERROCYANIDES.

In the "JOURNAL" for the 25th of January, we gave an abstract of a long paper read before the Manchester Section of the Society of Chemical Industry by Dr. F. W. Skirrow, containing laboratory notes made by him on the estimation of ferrocyanides. We have now received from Dr. Harold G. Colman a reprint from the "Analyst" for last month of a paper on the subject lately read by him before the Society of Public Analysts. It was a second communication; the first having been read rather more than two years ago, and the full text, with notes of the discussion, given in the "JOURNAL" for July 21, 1908 (p. 171). In his paper Dr. Colman stated that the Feld method of estimating ferrocyanides gave very reliable results. Dr. Skirrow's determinations, however, seem to throw doubts on the accuracy of the method. The experience of this investigator being entirely contrary to that of Dr. Colman, it seemed to the latter advisable to publish a representative set of the actual figures obtained. This he has done in his second paper, which we give below in its entirety, with the remarks thereon. In order, however, to make the subject more intelligible, we reproduce from the text of Dr. Skirrow's paper, contained in the "Journal of the Society of Chemical Industry" for March 31, the conclusions arrived at by him as the result of his investigations.

## SUMMARY OF DR. SKIRROW'S INVESTIGATIONS.

1.—In the Feld method for the estimation of ferrocyanides, some loss of hydrocyanic acid takes place on boiling the ferrocyanide solutions with caustic soda and excess of magnesium chloride under the conditions of the test. A 99.5 per cent. yield of hydrocyanic acid may be obtained on distilling mercuric cyanide with sulphuric acid in presence of chloride, if the concentration of the sulphuric acid be not allowed to become too great. If this distillation, however, be carried out in presence of the other products of the decomposition of the ferrocyanide which are present in the test, a less yield than the above is obtained. Furthermore, it seems probable that under the conditions of the test ferrocyanide is not completely converted to mercuric cyanide.

2.—In the zinc sulphate method for the estimation of ferrocyanide, it is advantageous to use more concentrated solutions of ferrocyanide and of zinc sulphate than those generally adopted. With the more concentrated solutions, a sharper end-point is obtained, and the effect of the presence of excess of alkali sulphate is minimized; the end-result in presence of excess of the sulphate of the alkali metal in question being the same as in absence of excess of the sulphate if the precipitated solution be allowed to stand for a quarter to half an hour before completing the titration. It is thus unnecessary to regulate the amount of sulphate present so finely, provided we are dealing with the ferrocyanide and sulphate of the same alkali metal. This has been shown both in the titration of the potassium salt and of the sodium salt. In the titration of sodium ferrocyanide, it is better to use a zinc sulphate which has been standardized against pure sodium ferrocyanide, though results of comparative accuracy can be obtained using a solution which has been standardized against potassium ferrocyanide, provided that sufficient potassium sulphate be added and the solution allowed to stand.

3.—In the separation of ferrocyanide from carbonyl ferrocyanide by alcohol, the greater accuracy of the method in the presence of caustic soda is indicated, and the advantage of washing the precipitate finally with absolute alcohol, draining and titrating direct in presence of the filter-paper, is pointed out.

4.—In estimating the ferrocyanide in the residues obtained after extraction of spent oxide of iron with carbon bisulphide, it is shown that a higher result is obtained if the alkaline solution be boiled and filtered before proceeding with the estimation. On boiling, some dissolved iron is precipitated which would otherwise cause precipitation of ferrocyanide on acidification.

Lastly, caustic soda does not extract the whole of the blue from oxide, there being some varying residue of blue which is difficultly soluble in caustic soda, and is probably in the form of the calcium-iron double salt.

## DR. COLMAN'S PAPER.

Two years ago I read a paper before the Society on the "Commercial Analysis of Ferrocyanides," in which I stated that the Feld method of estimation gave very reliable results. Recently, however, F. W. Skirrow has published a series of determinations which seem to throw doubts on the accuracy of the method; his experiments, starting from known quantities of ferrocyanide and of cyanide, giving results from 3 to 4 per cent. low. Skirrow's experience is entirely contrary to mine; and as I have largely employed the Feld method during the past few years, both for the analysis of commercial products and of the pure salts, it seems advisable to publish a representative set of the actual figures obtained.

The Feld method is, briefly, as follows: A quantity of ferrocyanide, amounting to from 0.3 to 0.5 gramme of potassium ferrocyanide or its equivalent, is dissolved in water, heated to boiling with 10 c.c. of N/1 caustic soda, 15 c.c. of 3N magnesium chloride solution added, and the boiling continued for five minutes. [If free cyanide is also present, the hydrocyanic acid in this form then distils over, and may be condensed and collected for analysis; the boiling being in that case continued for a longer



period.] There are then added 100 c.c. of boiling N/10 mercuric chloride, and the boiling continued for a further ten minutes; all ferrocyanide being thus converted into mercuric cyanide. The hydrocyanic acid in the latter is recovered by distilling for 20 to 30 minutes with 30 c.c. of 3N sulphuric acid; the condensed distillate being collected in 25 c.c. of N/1 caustic soda, and, after addition of a crystal of potassium iodide, titrated with N/10 silver nitrate until a permanent yellow precipitate of silver iodide makes its appearance.

From the results of his tests, Skirrow concludes that there are two sources of error in the method: (1) That on boiling the ferrocyanide solution with magnesium chloride solution and magnesium hydroxide, some hydrocyanic acid is evolved; and (2) that loss of hydrocyanic acid occurs either in conversion of the ferrocyanide into mercuric cyanide or in the distillation with acid.

ACTION OF MAGNESIUM CHLORIDE SOLUTION.

With regard to the first point, the two following tests, made with pure potassium and sodium ferrocyanides, may be given, in which boiling with magnesium chloride was prolonged to 25 minutes.

| N/10 Silver Nitrate Solution Used.                             |                                  |                             |           |            |
|----------------------------------------------------------------|----------------------------------|-----------------------------|-----------|------------|
| Weight of Salt Taken.                                          | 25 Min. with MgCl <sub>2</sub> . | After HgCl <sub>2</sub> &c. | Total.    | Theory.    |
| 0.3350 K <sub>4</sub> Fe(CN) <sub>6</sub> ·3H <sub>2</sub> O   | 0.15 c.c.                        | 23.65 c.c.                  | 23.8 c.c. | 23.79 c.c. |
| 0.4140 Na <sub>4</sub> Fe(CN) <sub>6</sub> ·10H <sub>2</sub> O | 0.15 c.c.                        | 25.45 c.c.                  | 25.6 c.c. | 25.66 c.c. |

These and other tests of a similar character are so far in agreement with Skirrow that they show a loss of hydrocyanic acid on long-continued boiling with the magnesium chloride solution, though the extent of the loss (0.6 per cent.) is much smaller than he found; and it will also be seen that there is no absolute loss of cyanide—the total yield of hydrocyanic acid being practically in accord with theory.

Where, on the other hand, the boiling with magnesium chloride is continued only for the specified five minutes, I have found in a large number of tests that no appreciable evolution of hydrocyanic acid occurs; a single drop of N/10 silver nitrate solution always producing a decided yellow cloudiness in the alkaline distillate. The two following tests may be given as an example.

| N/10 Silver Nitrate Solution Used.                             |                                 |                             |            |            |
|----------------------------------------------------------------|---------------------------------|-----------------------------|------------|------------|
| Weight of Salt Taken.                                          | 5 Min. with MgCl <sub>2</sub> . | After HgCl <sub>2</sub> &c. | Total.     | Theory.    |
| 0.3240 K <sub>4</sub> Fe(CN) <sub>6</sub> ·3H <sub>2</sub> O   | nil                             | 23.05 c.c.                  | 23.05 c.c. | 23.01 c.c. |
| 0.3675 Na <sub>4</sub> Fe(CN) <sub>6</sub> ·10H <sub>2</sub> O | nil                             | 22.75 c.c.                  | 22.75 c.c. | 22.78 c.c. |

In testing for ferrocyanide in the absence of cyanide, correct results are therefore obtained if boiling with magnesium chloride is not continued longer than the specified five minutes. When, on the other hand, a mixture of cyanide and ferrocyanide is being analyzed, and the boiling must be continued for longer than five minutes to drive off all hydrocyanic acid present as cyanide, the tendency from this source of error will be to give rather too high results for cyanide, and correspondingly low figures for ferrocyanide. It is found, however, that, with the quantities of cyanide present in such analyses, ten minutes' fairly quick distillation is sufficient to remove the hydrocyanic acid present as cyanide, without also driving off material quantities of the hydrocyanic acid present as ferrocyanide, as shown by the following tests.

(1) 0.3006 gramme K<sub>4</sub>Fe(CN)<sub>6</sub>·3H<sub>2</sub>O (= 21.35 c.c. N/10 AgNO<sub>3</sub>) was dissolved in water, mixed with 10 c.c. of pure sodium cyanide solution (12.15 c.c. N/10 AgNO<sub>3</sub>), and analyzed by Feld's method.

|                                                                              | Found.     | Theory.    |
|------------------------------------------------------------------------------|------------|------------|
| After ten minutes' boiling with MgCl <sub>2</sub>                            | 12.15 c.c. | 12.15 c.c. |
| After HgCl <sub>2</sub> and distillation with H <sub>2</sub> SO <sub>4</sub> | 21.30 c.c. | 21.35 c.c. |

(2) 0.4094 gramme Na<sub>4</sub>Fe(CN)<sub>6</sub>·10H<sub>2</sub>O (25.37 c.c. N/10 AgNO<sub>3</sub>) and 10 c.c. sodium cyanide solution (12.15 c.c. N/10 AgNO<sub>3</sub>) treated in the same manner.

|                                                                              | Found.     | Theory.    |
|------------------------------------------------------------------------------|------------|------------|
| After ten minutes' boiling with MgCl <sub>2</sub>                            | 12.10 c.c. | 12.15 c.c. |
| After HgCl <sub>2</sub> and distillation with H <sub>2</sub> SO <sub>4</sub> | 25.50 c.c. | 25.37 c.c. |

EXPERIMENTS STARTING FROM SODIUM CYANIDE SOLUTION.

Skirrow found further that, starting with cyanide solution, and converting this into ferrocyanide by the action of ferrous sulphate solution and caustic alkali, the yield of hydrocyanic acid on subsequent analysis by the Feld method was from 3 to 4 per cent. less than that found by the direct titration of the original cyanide solution with N/10 silver nitrate. A set of experiments was therefore made with a solution of pure sodium cyanide prepared by distilling hydrocyanic acid into a solution of pure caustic soda; and 25 c.c. of this solution required 30.4 c.c. of N/10 silver nitrate on direct titration.

Successive quantities of 25 c.c. of this solution were converted into ferrocyanide by the addition of 25 c.c. of N/1 caustic soda and a solution of 0.5 gramme of ferrous sulphate crystals; the mixture being allowed to stand an hour, with occasional shaking. The whole was then analyzed by the Feld method (N/10 silver nitrate being used), with the following results.

| 5 Min. after MgCl <sub>2</sub> . | After HgCl <sub>2</sub> . | Total.     | Theory.   | Loss. Per Cent. |
|----------------------------------|---------------------------|------------|-----------|-----------------|
| Nil                              | 30.20 c.c.                | 30.20 c.c. | 30.4 c.c. | 0.66            |
| Nil                              | 30.25 "                   | 30.25 "    | 30.4 "    | 0.50            |
| Nil                              | 30.35 "                   | 30.35 "    | 30.4 "    | 0.16            |
| Nil                              | 30.30 "                   | 30.30 "    | 30.4 "    | 0.33            |
| Nil                              | 30.25 "                   | 30.25 "    | 30.4 "    | 0.50            |

Average . . . . . 0.43

Here, again, while a small loss was always found (averaging about 0.5 per cent.), this is much less than the 3 to 4 per cent.

observed by Skirrow. It was further noticed that the residual liquid in the flask after distillation, which is normally a yellow solution coloured by ferric sulphate, and containing a precipitate of mercurous chloride, had in all cases a greenish tinge, indicating the presence of undecomposed iron ferrocyanides. It seemed most probable that the formation of such insoluble ferrocyanides would be due to the presence of ferrous hydroxide in the liquid analyzed, owing to an excess of ferrous sulphate having been used for conversion of the cyanide into ferrocyanide, as the presence of ferrous hydroxide might be expected to result in the formation of some ferrous ferrocyanides, which are known to be more stable towards alkalis than the ferric ferrocyanides. To avoid this formation, attempts were made to remove the excess of ferrous hydroxide from the solution before analysis; but these were unsuccessful, as it was found impracticable to wash the precipitate free from ferrocyanide. A further test was therefore made in which, previous to analyzing the solution, the ferrous hydroxide was oxidized to ferric hydroxide by the addition of a few drops of ammonium persulphate solution. The result then obtained was as follows.

| After MgCl <sub>2</sub> . | 5 Min. after HgCl <sub>2</sub> . | Total.    | Theory.   | Loss. |
|---------------------------|----------------------------------|-----------|-----------|-------|
| 0.6 c.c.                  | 29.8 c.c.                        | 30.4 c.c. | 30.4 c.c. | Nil   |

In this case it will be seen that the total hydrocyanic acid obtained was in accordance with theory, although, owing to the action of the slight excess of persulphate used, a small amount of ferrocyanide was converted into cyanide; this quantity being evolved on boiling with magnesium chloride. The residual solution in this case did not show the slightest green tinge.

To ascertain further the effect of ferrous hydroxide, a mixture of pure potassium ferrocyanide with ferrous sulphate solution and caustic soda was made and analyzed, with the following result: 0.3272 gramme K<sub>4</sub>Fe(CN)<sub>6</sub>·3H<sub>2</sub>O (= 23.25 c.c. N/10 AgNO<sub>3</sub>) was mixed with 0.5 gramme FeSO<sub>4</sub>·7H<sub>2</sub>O and 25 c.c. NN/1. NaOH, and the mixture analyzed by Feld's method.

| After MgCl <sub>2</sub> . | 5 Min. after HgCl <sub>2</sub> &c. | Total.    | Theory.    | Loss. Per Cent. |
|---------------------------|------------------------------------|-----------|------------|-----------------|
| Nil                       | 22.8 c.c.                          | 22.8 c.c. | 23.25 c.c. | 1.9             |

The residual solution in this case had a decided green colour.

The loss observed by Skirrow in this and many of his other experiments appears, therefore, to be due largely to the fact that an excess of ferrous hydroxide was present in the solutions tested, which is not the case when the test is carried out under normal conditions. The reason that Skirrow also obtains a much greater loss during the boiling with magnesium chloride solution is, however, unaccounted for; and the only suggestion that occurs to me is that it may have been due to some impurity present in the magnesium chloride used. In the tests given above, pure crystalline magnesium chloride was employed throughout.

Generally, therefore, these tests seem to show that the Feld method, when carried out under the conditions specified in the former paper, gives results which are substantially accurate.

ANALYSIS OF PURE SALTS.

As indirect evidence of the accuracy of the method, the following complete analyses of various ferrocyanides which had been prepared in as high a state of purity as possible may be quoted. In these analyses, the basic metals and the iron were determined in the usual manner—the cyanogen by Feld's method, and the water by heating the salt in a current of air, and collecting in a calcium chloride tube the moisture evolved. Determination of the water by loss of weight on heating gives unsatisfactory results.

Potassium Ferrocyanide.

|                  |                                                                            | Calculated for K <sub>4</sub> Fe(CN) <sub>6</sub> ·3H <sub>2</sub> O. |        |
|------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|--------|
| K                | 0.5395 grm. gave 0.4424 grm. K <sub>2</sub> SO <sub>4</sub>                | K = 36.80                                                             | 37.02  |
| Fe               | 0.6035 " took 14.3 c.c. N/10 K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | Fe = 13.24                                                            | 13.23  |
| CN               | 0.3028 " took 21.45 c.c. N/10 AgNO <sub>3</sub>                            | CN = 36.84                                                            | 36.96  |
| H <sub>2</sub> O | 0.8874 " gave 0.1118 grm. H <sub>2</sub> O                                 | H <sub>2</sub> O = 12.60                                              | 12.79  |
|                  |                                                                            | 99.48                                                                 | 100.00 |

Sodium Ferrocyanide.

|                  |                                                                            | Calculated for Na <sub>4</sub> Fe(CN) <sub>6</sub> ·10H <sub>2</sub> O. |        |
|------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------|--------|
| Na               | 0.8315 grm. gave 0.4847 grm. Na <sub>2</sub> SO <sub>4</sub>               | Na = 18.86                                                              | 19.00  |
| Fe               | 0.7518 " took 15.5 c.c. N/10 K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | Fe = 11.53                                                              | 11.55  |
| Cy               | 0.3253 " took 20.15 c.c. N/10 AgNO <sub>3</sub>                            | CN = 32.20                                                              | 32.23  |
| H <sub>2</sub> O | 0.6418 " gave 0.2382 grm. H <sub>2</sub> O                                 | H <sub>2</sub> O = 37.12                                                | 37.22  |
|                  |                                                                            | 99.71                                                                   | 100.00 |

Calcium Ferrocyanide.

|                  |                                                                             | Calculated for Ca <sub>3</sub> Fe(CN) <sub>6</sub> ·11½H <sub>2</sub> O. |        |
|------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|--------|
| Ca               | 0.6912 grm. gave 0.1568 grm. CaO                                            | Ca = 16.21                                                               | 16.06  |
| Fe               | 0.6912 " took 13.95 c.c. N/10 K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | Fe = 11.28                                                               | 11.20  |
| CN               | 0.4688 " took 28.35 c.c. N/10 AgNO <sub>3</sub>                             | CN = 31.46                                                               | 31.26  |
| H <sub>2</sub> O | 0.4120 " gave 0.1696 grm. H <sub>2</sub> O                                  | H <sub>2</sub> O = 41.18                                                 | 41.48  |
|                  |                                                                             | 100.13                                                                   | 100.00 |

Strontium Ferrocyanide.

|                  |                                                                            | Calculated for Sr <sub>2</sub> Fe(CN) <sub>6</sub> ·14H <sub>2</sub> O. |        |
|------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------|--------|
| Sr               | 0.6224 grm. gave 0.3598 grm. SrSO <sub>4</sub>                             | Sr = 27.53                                                              | 27.40  |
| Fe               | 0.6224 " took 9.75 c.c. N/10 K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | Fe = 8.76                                                               | 8.74   |
| CN               | 0.3464 " took 16.3 c.c. N/10 AgNO <sub>3</sub>                             | CN = 24.47                                                              | 24.40  |
| H <sub>2</sub> O | 0.4166 " gave 0.1650 grm. H <sub>2</sub> O                                 | H <sub>2</sub> O = 39.61                                                | 39.46  |
|                  |                                                                            | 100.37                                                                  | 100.00 |



Magnesium Ferrocyanide.

|                  |             |                                     | Calculated<br>for<br>$Mg_2Fe(CN)_6 \cdot 12H_2O$ |        |
|------------------|-------------|-------------------------------------|--------------------------------------------------|--------|
| Mg               | 0.5054 grm. | gave 0.2384 grm. $Mg_2P_2O_7$       | Mg = 10.31                                       | 10.21  |
| Fe               | 0.4832      | „ took 10.15 c.c. N/10 $K_2Cr_2O_7$ | Fe = 11.74                                       | 11.73  |
| CN               | 0.3419      | „ took 21.45 c.c. N/10 $AgNO_3$     | CN = 32.62                                       | 32.73  |
| H <sub>2</sub> O | 0.3402      | „ gave 0.1544 grm. $H_2O$           | $H_2O$ = 45.37                                   | 45.33  |
|                  |             |                                     | 100.04                                           | 100.00 |

It will be seen that the figures are generally satisfactory, which would not be possible if the Feld method gave results from 3 to 4 per cent. too low, as found by Skirrow. This is particularly the case with the percentages of iron and cyanogen, for, whatever the exact degree of purity of the salts may have been in other respects, it is reasonably certain that all the iron and cyanogen were present in each case solely as the radical  $Fe(CN)_6$ ; the theoretical ratio Fe:CN in this radical being 1:2.792. The actual ratio found in the analysis of the above five salts was as follows.

| K salt  | Fe : CN   | Error per Cent. |
|---------|-----------|-----------------|
| K salt  | 1 : 2.783 | - 0.4           |
| Ca „    | 1 : 2.793 | Nil.            |
| Na „    | 1 : 2.789 | - 0.1           |
| Sr „    | 1 : 2.793 | Nil.            |
| Mg „    | 1 : 2.778 | - 0.5           |
| Average | 1 : 2.787 | - 0.18          |

It may be remarked that the number of molecules of water of crystallization found in some of the above salts does not agree with the statements found in the literature. Potassium ferrocyanide has long been known to crystallize with 3H<sub>2</sub>O, and sodium ferrocyanide, though still stated in many text-books to crystallize with 12H<sub>2</sub>O, has for many years been recognized as only containing 10H<sub>2</sub>O. Calcium ferrocyanide is usually stated to crystallize with 12H<sub>2</sub>O, and this is probably correct. But the crystals are very efflorescent, and the author has never succeeded in getting figures corresponding with that formula in different preparations, giving results varying between those required for 11 and 12H<sub>2</sub>O. Strontium ferrocyanide is described by Bette ("Annalen," 1836, XXII., 148) and Wyruboff ("Ann. Chim. Phys.," 1868, [4] XVI., 287; 1870, [4] XXI., 271) as crystallizing with 15H<sub>2</sub>O; whereas, with several different preparations, the author finds only 14H<sub>2</sub>O. These crystals lose 7H<sub>2</sub>O on standing in the air, and a further 6H<sub>2</sub>O over sulphuric acid *in vacuo*. Apparently only one analysis of magnesium ferrocyanide has been published (Bette, "Annalen," 1836, XXIII., 115), leading to the formula  $Mg_2Fe(CN)_6 \cdot 10H_2O$ , against 12H<sub>2</sub>O found by the author; but Bette's figures are too incomplete and approximate to justify his formula. The magnesium ferrocyanide crystals lose 5H<sub>2</sub>O on standing in the air.

Discussion.

Dr. LESSING said he commenced to use the Feld method shortly after it was introduced, five or six years ago, and at the beginning experienced some difficulty with it. He had then just completed some experiments relating to the decomposition of ferrocyanides by acids, and had found that the complex nature of the ferrocyanogen ion by no means prevented its decomposition by ordinary mineral acids. He had even found it possible to decompose some of the alkaline ferrocyanides with sulphur dioxide, liberating free hydrocyanic acid. This, of course, had made him particularly careful to see that no ferrocyanide was decomposed during the boiling with magnesium chloride; and he had never found any appreciable decomposition to occur, provided that Feld's original instructions were followed. Long-continued boiling was quite unnecessary; the only object of the boiling being to convert any free alkali into magnesium hydroxide. With regard to the green coloration observed by the author, he (Dr. Lessing) had frequently obtained this coloration at first, and the results were very discordant in consequence, since the ferrocyanide was not completely decomposed—a certain quantity of cyanogen remaining in the flask in the form of some compound of ferrocyanogen and iron. This difficulty was overcome by so adjusting the reagents that they were always present in approximately equivalent quantities—*i.e.*, starting with a certain quantity of caustic soda for the purpose of decomposing the original substance, an equivalent quantity of magnesium chloride was used, and the caustic soda and magnesium chloride were both adjusted in relation to the excess of iron that was present. Under these conditions, the green coloration was never obtained, and the results for total cyanogen were always satisfactory. With regard to the question of water of crystallization, he had found that, to make pure potassium or sodium ferrocyanide with a constant proportion of water, it was necessary to dry the recrystallized salt over a quantity of the same salt which itself had been previously freed from water of crystallization. Possibly this difficulty in obtaining as a basis for analysis a salt of constant composition might furnish a clue to the lowness of some of Skirrow's results.

Mr. J. L. FOUCAR said he also was in a position to corroborate the author's observations. He had not at first been able quite to understand Skirrow's results; but Dr. Colman had explained the main differences, especially with regard to the question of excess of ferrous hydroxide. The following results might be of interest: Sodium cyanide—by direct titration, 125.2 per cent. HCN; by Feld's method, 125.38 per cent.; by precipitation as silver cyanide, 125.13 per cent. Here, if anything, Feld's method seemed to give rather higher results than the others. A cyanogen liquor—4.14 lbs. of Prussian blue per gallon by Feld's method,

4.11 lbs. by titration with zinc. He had recently followed very closely some work the object of which was the investigation of this question, and he could state with certainty that, under standard conditions, the Feld method for the determination of ferrocyanide was at least as accurate as any other.

DETERMINING THE VOLATILE MATTER IN COAL.

The Director of the United States Geological Survey has permitted the "Journal of Industrial and Engineering Chemistry" to publish, in No. 7 of their second volume, the results of some experiments conducted in the Washington and Pittsburg Laboratories by Messrs. A. C. Fieldner and J. D. Davis.

As reprinted in recent numbers of the "Chemical News," the authors say: In view of the proposed revision of the official methods of coal analysis, it may be of interest to present certain experimental data bearing on the present official method for the determination of volatile matter in coal.

The experiments referred to were made primarily to ascertain the difference in the volatile matter produced by using a 20 cm. natural gas-flame as compared with the 20 cm. coal-gas flame. After starting the work, it was found desirable to investigate the influence of other factors, such as gas pressure, type of burner, and surface condition of the platinum crucible—*i.e.*, dull grey or polished. In order to eliminate the influence of variation in size and shape, three 30-grm. platinum crucibles, of practically the same capacity and weight, with closely-fitting covers, were used in all the experiments; it having been demonstrated by actual trial that the three crucibles each gave the same results.

As the crucibles had been regularly used for volatile determinations, both inner and outer surfaces had the dull grey appearance which platinum assumes when heated several times in the natural gas-flame. To protect the flame from air currents, the platinum triangle supporting the crucible was enclosed in a cylindrical sheet-metal shield, lined with asbestos, 15 cm. long and 7 cm. in diameter; the platinum triangle being placed 3 cm. below the top of the shield. The bottom of the crucible was exactly 8 cm. above the mouth of the burner.

The temperature measurements were taken on a parallel test, using the same crucible with the regular cover replaced by one of nickel. The thermo-couple, inserted through a small opening in the cover, was placed 2 mm. above the bottom of the crucible. The opening around the thermo-couple leads was closed with a cement of barium sulphate and sodium silicate.

The description of coals tested is given in Table I.

TABLE I.—Description of Coals Tested.

| Coal No. | Type.           | Locality.            |
|----------|-----------------|----------------------|
| 1 to 3   | Semi-bituminous | Pocahontas (W. Va.). |
| 10 to 12 |                 |                      |
| 4 to 6   | Bituminous      | Pennsylvania         |
| 7        | Anthracite      | Pennsylvania         |

INFLUENCE OF CHANGE IN GAS PRESSURE.

Coal gas can be burned efficiently at low pressures, 2 to 3 inches of water being sufficient; natural gas, owing to the much larger proportion of air required, must be supplied to the burner at higher pressure.

Table II. gives results obtained by varying the pressure from 1 to 13 inches of water.

TABLE II.—Influence of Gas Pressure on Volatile Matter.

| [Natural gas; Tyrell burner; 20 cm. flame.] |    |                            |             |             |                             |                |    |     |    |                             |
|---------------------------------------------|----|----------------------------|-------------|-------------|-----------------------------|----------------|----|-----|----|-----------------------------|
| Gas Pressure in Inches of Water.            |    | Per Cent. Volatile Matter. |             |             | Maximum Temperature Deg. C. | Kind of Flame. |    |     |    |                             |
|                                             |    | Coal No. 1.                | Coal No. 3. | Coal No. 6. |                             |                |    |     |    |                             |
| 1                                           | .. | 15.4                       | ..          | 15.8        | ..                          | 32.4           | .. | 760 | .. | Yellow tipped.              |
| 2                                           | .. | 15.2                       | ..          | 16.7        | ..                          | ..             | .. | ..  | .. | —                           |
| 3                                           | .. | 15.4                       | ..          | 16.7        | ..                          | 32.3           | .. | 780 | .. | Faint yellow tip.           |
| 4                                           | .. | 16.3                       | ..          | ..          | ..                          | 32.7           | .. | ..  | .. | —                           |
| 5                                           | .. | 16.7                       | ..          | 16.5        | ..                          | 32.6           | .. | 800 | .. | Yellow tip just removed.    |
| 6                                           | .. | 17.2                       | ..          | 16.7        | ..                          | 33.0           | .. | ..  | .. | Long inner cone.            |
| 8                                           | .. | 16.7                       | ..          | ..          | ..                          | 32.7           | .. | ..  | .. | —                           |
| 9                                           | .. | ..                         | ..          | 17.2        | ..                          | ..             | .. | 825 | .. | Well-defined inner cone.    |
| 12                                          | .. | 17.2                       | ..          | 16.9        | ..                          | 32.7           | .. | ..  | .. | —                           |
| 13                                          | .. | 17.1                       | ..          | 17.1        | ..                          | 32.5           | .. | 845 | .. | Sharp, greenish inner cone. |

Temperature (Deg. C.) during Volatile Determination on Coal No. 1 with Varying Pressures.

| Time in Minutes. |     | Pressure in Inches of Water. |     |     |     |     |
|------------------|-----|------------------------------|-----|-----|-----|-----|
|                  |     | 1.                           | 3.  | 5.  | 9.  | 13. |
| 0.5              | 180 | 185                          | 180 | 220 | 320 |     |
| 1.0              | 450 | 440                          | 450 | 480 | 550 |     |
| 1.5              | 590 | 590                          | 605 | 635 | 690 |     |
| 2.0              | 670 | 670                          | 710 | 720 | 780 |     |
| 2.5              | 725 | 740                          | 765 | 775 | 825 |     |
| 3.0              | 745 | 760                          | 790 | 805 | 840 |     |
| 3.5              | 750 | 770                          | 800 | 815 | 848 |     |
| 4.0              | 755 | 780                          | 803 | 820 | 848 |     |
| 4.5              | 760 | 780                          | 803 | 820 | 848 |     |
| 5.0              | 760 | 780                          | 802 | 823 | 848 |     |
| 6.0              | 760 | 780                          | 800 | 823 | 847 |     |
| 7.0              | 760 | 780                          | 800 | 823 | 845 |     |

The maximum temperature varies from 760 to 845° C. Coal No. 6 (a bituminous coal) gives practically just the same yield of



volatile matter throughout the series. The semi-bituminous coals, Nos. 1 and 3, are more sensitive to variations in temperature; the extremes being nearly 2 per cent. The maximum pressure, 13 inches, was used in all subsequent work with natural gas.

It has frequently been noted by the writers that during the early part of the seven-minute volatile process, the coke swells or puffs up to the lid of the crucible—oftentimes raising it slightly. On comparing such determinations with duplicates that did not swell, they were invariably found to be 1 to 2 per cent. lower in volatile matter. This peculiar swelling has been noticed only in the case of semi-bituminous coals. It is more apt to happen at the lower temperatures, and when the coal is kept perfectly level in the bottom of the crucible. The swelling can be prevented by simply tapping the crucible on one side, so as to settle the coal in an inclined position across one corner of the bottom of the crucible—thus preventing the formation of a film of fused coal across the crucible. Comparative results are given in Table III.

TABLE III.—Variations Due to Swelling or Puffing-up of Coke in Crucible.

|            | Coke Residue in Compact Lump in Bottom of Crucible. | Coke Residue Swelled Half-Way to Cover.    | Coke Residue Swelled up to Cover.            |
|------------|-----------------------------------------------------|--------------------------------------------|----------------------------------------------|
| Coal No. 1 | 16.7<br>17.2<br>17.1<br>..<br>..<br>..              | 16.2<br>16.8<br>16.0<br>15.5<br>15.7<br>.. | 15.3<br>14.8<br>15.2<br>15.1<br>15.7<br>15.6 |
| Average    | 17.0                                                | 16.0                                       | 15.3                                         |
| Coal No. 2 | 17.0<br>16.9                                        | 15.4                                       | 15.4                                         |

TABLE IV.—Influence of Different Types of Burners.

| Coal No.                                  | Per Cent. Volatile. |         |         | Difference.          |                      |
|-------------------------------------------|---------------------|---------|---------|----------------------|----------------------|
|                                           | Fletcher.           | Tyrell. | Bunsen. | Fletcher and Tyrell. | Fletcher and Bunsen. |
| (a) NATURAL GAS.                          |                     |         |         |                      |                      |
| 1                                         | 17.2                | 17.0    | 15.7    | 0.2                  | 1.5                  |
| 2                                         | 17.0                | 16.8    | 15.8    | 0.2                  | 1.2                  |
| 6                                         | 32.8                | 32.6    | 32.6    | 0.2                  | 0.2                  |
| 4                                         | 31.8                | 31.3    | 31.2    | 0.5                  | 0.6                  |
| 5                                         | 31.5                | 31.5    | ..      | 0.0                  | ..                   |
| Average                                   | ..                  | ..      | ..      | 0.2                  | 0.8                  |
| Temperature 850° C. .. 850° C. .. 790° C. |                     |         |         |                      |                      |
| (b) COAL GAS (PITTSBURG).                 |                     |         |         |                      |                      |
| 1                                         | 17.0                | 16.7    | 16.3    | 0.3                  | 0.7                  |
| 6                                         | 33.0                | 32.3    | ..      | 0.7                  | ..                   |
| 5                                         | 31.7                | 31.4    | ..      | 0.3                  | ..                   |
| Average                                   | ..                  | ..      | ..      | 0.4                  | ..                   |
| Temperature 855° C. .. 810° C.            |                     |         |         |                      |                      |
| (c) CARBURATED WATER GAS (WASHINGTON).    |                     |         |         |                      |                      |
| 1                                         | 18.3                | ..      | 17.2    | ..                   | 1.1                  |
| 11                                        | 18.6                | ..      | 17.8    | ..                   | 0.8                  |
| 12                                        | 18.0                | ..      | 17.7    | ..                   | 0.3                  |
| 10                                        | 18.7                | ..      | 18.4    | ..                   | 0.3                  |
| 3                                         | 18.8                | ..      | 18.5    | ..                   | 0.3                  |
| 2                                         | 18.2                | ..      | 17.6    | ..                   | 0.6                  |
| Average                                   | ..                  | ..      | ..      | ..                   | 0.6                  |
| Temperature 970° C.                       |                     |         |         |                      |                      |

TABLE V.—Temperature Measurements (Deg. C.). Coal No. 1.

| Time in Minutes. | (a)              |                |                | (b)            |                  | (c) |
|------------------|------------------|----------------|----------------|----------------|------------------|-----|
|                  | Fletcher Burner. | Tyrell Burner. | Bunsen Burner. | Tyrell Burner. | Fletcher Burner. |     |
| 0.5              | 280              | 250            | 250            | 260            | ..               | ..  |
| 1.0              | 590              | 530            | 580            | 540            | 630              | ..  |
| 1.5              | 710              | 670            | 700            | 680            | ..               | ..  |
| 2.0              | 768              | 780            | 760            | 760            | 910              | ..  |
| 2.5              | 830              | 825            | 780            | 810            | ..               | ..  |
| 3.0              | 845              | 840            | 785            | 835            | 975              | ..  |
| 3.5              | 850              | 850            | 785            | 850            | ..               | ..  |
| 4.0              | 850              | 850            | 785            | 855            | 975              | ..  |
| 4.5              | 850              | 850            | 790            | 855            | ..               | ..  |
| 5.0              | 850              | 850            | 790            | 855            | 970              | ..  |
| 6.0              | 850              | 850            | 790            | 855            | 970              | ..  |
| 7.0              | 850              | 850            | 790            | 855            | 970              | ..  |

(a) Natural gas at 13 inches water pressure; 20 cm. flame.

(b) Pittsburgh coal gas at 2.5 inches pressure; 20 cm. flame.

(c) Washington illuminating gas at 2.5 inches pressure; 20 cm. flame.

#### INFLUENCE OF TYPE OF BURNER.

It is reasonable to expect some lack of uniformity in volatile results where widely different types of bunsen burners are used. A burner with a large bore will give a larger flame volume, with a correspondingly increased heating effect. Determinations were made with the following types of burners on both natural and coal gas:—

(a) The simple bunsen burner, bore 9 mm.

(b) The Tyrell burner, bore 9 mm. ("Eimer and Amend's Catalogue," p. 80).

(c) The Fletcher, No. 5 g burner, bore 12 mm. ("Eimer and Amend's Catalogue," p. 80).

The results are given in Table IV.

The Fletcher burner gives slightly higher volatile matter than the Tyrell burner, with practically the same maximum temperature. The larger flame volume of the Fletcher burner heats up the crucible more rapidly, which increases the gas yield slightly. With the use of natural gas, the maximum temperature of the bunsen burner is 60° less than either the Fletcher or Tyrell burner.

This produces a marked difference in the volatile matter in the case of the semi-bituminous coals. Evidently a burner like the Fletcher or the Tyrell, admitting of both gas and air regulation, is preferable to the simple bunsen.

#### INFLUENCE OF COMPOSITION OF GAS.

In order to determine the influence of composition of fuel gas, determinations were made over 20 cm. coal-gas flame and 20 cm. natural-gas flame; each gas being supplied to the burner at its proper pressure. The natural gas analyzed as follows:—

|                       | Per Cent. |
|-----------------------|-----------|
| Carbon dioxide        | 0.1       |
| Paraffin hydrocarbons | 98.6      |
| Nitrogen              | 1.3       |
|                       | 100.0     |

The coal gas taken from the mains of the gas company supplying artificial gas in Pittsburg (Pa.) analyzed as follows:—

|                          | Per Cent. |
|--------------------------|-----------|
| Unsaturated hydrocarbons | 7.5       |
| Carbon dioxide           | 1.5       |
| Oxygen                   | 0.2       |
| Carbon monoxide          | 8.9       |
| Methane                  | 44.8      |
| Hydrogen                 | 33.7      |
| Nitrogen                 | 3.4       |
|                          | 100.0     |

Both series of volatile determinations were made by the same analyst, using the same apparatus; the only difference being in the fuel gas used. The results are shown in Table VI.

TABLE VI.—Difference Due to Using Natural or Coal Gas. Per Cent. Volatile Matter.

| Coal No.                           | Coal Gas, 2.5 In. Pressure. | Natural Gas, 13 In. Pressure. | Difference. |
|------------------------------------|-----------------------------|-------------------------------|-------------|
| (a) FLETCHER BURNER.               |                             |                               |             |
| 1                                  | 17.0                        | 17.2                          | +0.2        |
| 2                                  | 17.1                        | 17.0                          | -0.1        |
| 6                                  | 33.0                        | 32.8                          | -0.2        |
| 4                                  | 31.5                        | 31.8                          | +0.3        |
| 5                                  | 31.7                        | 31.5                          | -0.2        |
| Average                            | ..                          | ..                            | 0.0         |
| (b) TYRELL BURNER.                 |                             |                               |             |
| 1                                  | 16.7                        | 17.0                          | +0.3        |
| 6                                  | 32.3                        | 32.6                          | +0.3        |
| 4                                  | 31.6                        | 31.3                          | -0.3        |
| 5                                  | 31.4                        | 31.5                          | +0.1        |
| 7                                  | 4.5                         | 4.3                           | -0.2        |
| Average                            | ..                          | ..                            | +0.04       |
| Temperature. .. 855° C. .. 850° C. |                             |                               |             |

The temperatures are practically the same, and the variations in volatile matter average zero. It should be noted, however, that the natural gas was supplied to a carefully regulated burner at 13 inches pressure. If the comparisons were made at the lower pressures usually found in laboratories, the results by natural gas would be decidedly lower.

Table VII. gives a comparison of volatile matter obtained on the same samples of coal in two different laboratories of the Geological Survey. The Pittsburg laboratory used natural gas at 13 inches water pressure with a Tyrell burner; the Washington laboratory used illuminating gas at 2 inches pressure with the Fletcher burner. The height of flame was 20 cm. in each case.

TABLE VII.—Comparison of Results Obtained in Different Laboratories.

| Coal No.                           | Per Cent. Volatile Matter.                              |                                                                  | Difference. |
|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------|-------------|
|                                    | Pittsburg. Natural Gas, 13 In. Pressure, Tyrell Burner. | Washington. Illuminating Gas, 2.5 In. Pressure, Fletcher Burner. |             |
| 1                                  | 17.0                                                    | 18.3                                                             | +1.3        |
| 2                                  | 16.8                                                    | 18.2                                                             | +1.4        |
| 3                                  | 17.0                                                    | 18.8                                                             | +1.8        |
| 4                                  | 31.3                                                    | 32.5                                                             | +1.2        |
| 5                                  | 31.5                                                    | 32.6                                                             | +1.1        |
| 6                                  | 32.6                                                    | 33.4                                                             | +0.8        |
| 7                                  | 1.3                                                     | 5.3                                                              | +4.0        |
| 10                                 | 17.7                                                    | 18.7                                                             | +1.0        |
| Average                            | ..                                                      | ..                                                               | +1.2        |
| Temperature. .. 850° C. .. 970° C. |                                                         |                                                                  |             |

From the previous experiment on natural and coal gas, closely agreeing results would be expected. Such, however, was not the case. As shown in the table, the Washington series averaged 1.2 per cent. higher than the Pittsburg. The maximum temperature of 970° C., noted in the Washington laboratory, was 120° higher than noted with either coal or natural gas at the Pittsburg laboratory. It had been supposed that the Washington illuminating gas was of a similar composition to that of the Pittsburg coal gas. This assumption, however, proved to be erroneous, as shown by the following analysis:—

TABLE VIII.—Analysis of Washington Illuminating Gas.

|                          | Per Cent. |
|--------------------------|-----------|
| Carbon dioxide           | 3.0       |
| Unsaturated hydrocarbons | 10.4      |
| Oxygen                   | 1.0       |
| Carbon monoxide          | 27.6      |
| Methane                  | 19.0      |
| Hydrogen                 | 33.1      |
| Nitrogen                 | 5.9       |
|                          | 100.0     |



The Washington gas consists entirely of carburetted water gas. It contains 26 per cent. less methane and 19 per cent. more carbon monoxide than coal gas. The replacement of methane by carbon monoxide decreases the flame volume very materially; and since the height of flame is the same in both cases, the heating effect of a low methane gas is, under ordinary laboratory conditions, considerably greater.

Chikashiga and Matsumoto, in a paper submitted to the Society of Chemical Industry in 1904,\* call attention to the disadvantages of uncarburetted water gas as a laboratory fuel, on account of the high temperature of the flame produced. They state that "comparatively thick copper wire and sheet, and even thin platinum wire, are easily melted and hard glass easily worked in its flame."

Another factor that may have contributed to the difference in temperature noted in the two laboratories is the surface condition of the platinum crucible. Constam, in a paper communicated to the Seventh International Congress of Applied Chemistry,† mentions "that the slower rise and the lower final temperature in dull platinum crucibles caused the yield of coke in them to be greater than in polished platinum crucibles."

As the crucibles used in all the experiments at the Pittsburg laboratory were very dull and tarnished in appearance, it was decided to polish them, and then run some determinations to check Constam's conclusions. The results are given in Table IX.

TABLE IX.—Comparison of Volatile Matter Produced in the Same Crucible Before and After Polishing.

| Coa No.     | Per Cent. Volatile Matter. |         | Difference. |
|-------------|----------------------------|---------|-------------|
|             | Before.                    | After.  |             |
| 10          | 17.0                       | 18.1    | 1.1         |
| 3           | 17.0                       | 18.1    | 1.1         |
| 6           | 32.6                       | 33.3    | 0.7         |
| Temperature | 845° C.                    | 890° C. | 45 C.       |

Temperature Measurements (Deg. C.).—Coal No. 1.

| Time in Minutes. | Before Polishing. |     | After Polishing. |
|------------------|-------------------|-----|------------------|
|                  |                   |     |                  |
| 0.5              | 250               | 320 | 240              |
| 1.0              | 30                | 550 | 590              |
| 1.5              | 670               | 690 | 750              |
| 2.0              | 780               | 780 | 840              |
| 2.5              | 825               | 825 | 880              |
| 3.0              | 840               | 840 | 890              |
| 3.5              | 848               | 848 | 890              |
| 4.0              | 850               | 848 | 890              |
| 4.5              | 850               | 348 | 890              |
| 5.0              | 850               | 848 | 890              |
| 6.0              | 850               | 847 | 890              |
| 7.0              | 850               | 845 | 890              |

In tests Nos. 1 to 6 inclusive [Table X.], Pocahontas coal was subjected to destructive distillation in an iron retort made from a piece of 1-inch gas-pipe, capped at one end and tubulated at the other. The retort was heated by means of a train of bunsen burners to a bright red heat in a furnace of asbestos board. A 20-gramme charge was used.

TABLE X.—Volatile Matter by Distillation.

| Test No.        | Time in Minutes. | Vacuum.                       | Per Cent. Volatile Moisture. |
|-----------------|------------------|-------------------------------|------------------------------|
| 1               | 30               | 3 in. mercury                 | 18.3 (a)                     |
| 2               | 45               | " "                           | 18.7 (b)                     |
| 3               | 45               | " "                           | 19.4 (b)                     |
| 4               | 45               | " "                           | 18.2 (b)                     |
| 5               | 40               | 4 in. water                   | 18.8 (b)                     |
| 6               | 45               | Atmospheric pressure          | 18.7 (c)                     |
| Average         |                  |                               | 18.7                         |
| 7               | 7                | Atmosphere of CO <sub>2</sub> | 18.5 (d)                     |
| 8               | 7                | " "                           | 18.3 (d)                     |
| 9               | 7                | " "                           | 18.6 (d)                     |
| Average         |                  |                               | 18.5                         |
| Official method |                  |                               | 19.3                         |

(a) Retort weighed. (b) Coke weighed. (c) Gradual heat.  
(d) 30-gramme platinum crucible heat treatment as in official method.

Tests Nos. 7 to 9 inclusive were made in a 30-gramme platinum crucible with a tubulated cover; carbon dioxide being kept passing through during the determination. The heat treatment was exactly the same as in the official method. Both the retort and the crucible tests give results somewhat lower than the official method, though not materially.

SUMMARY.

The results of these experiments may be briefly summarized as follows:—

Two laboratories are likely to vary some 2 per cent. in volatile matter, both using the official method. The percentage of volatile matter obtained from the same sample of coal varies with the temperature and rate of heating. This is not sufficiently defined by the height of the flame. Temperatures ranging from 760° C. to 890° C. may be attained with a 20 cm. natural-gas flame, when the gas pressure is varied from 1 to 13 inches of water; variations of 2 per cent. volatile matter are thus produced. Differences in type and size of burner influence the results from about 0.3 to 1.5 per cent.

Polished crucibles become hotter, and yield about 1 per cent. more volatile matter than dull grey ones.

Laboratories using natural gas are apt to get results on volatile matter that are considerably lower than those using coal gas, unless the following precautions are observed: (1) Gas should be supplied to the burner at a pressure of not less than 10 inches of water. (2) Natural-gas burners admitting an ample supply of air should be used. (3) Gas and air should be regulated so that a flame with a short, well-defined inner cone is produced. (4) The crucibles should be supported on platinum triangles, and kept in well-polished condition.

## HIGH-PRESSURE GAS FOR TEXTILE MILLS.

In a previous issue of the "JOURNAL," reference was made to a paper read before the Textile Society of the Manchester School of Technology by Mr. CHARLES WALTON, of Oldham, on the subject of high-pressure gas lighting for textile mills. We have since received from the author the full text of the paper, and make the following extracts from it.

Mr. Walton began by reminding his audience that, though lighting by means of natural gas seemed to have been practised by the Chinese from very early times, its production from coal was not carried out till towards the end of the Seventeenth Century, and then only as a laboratory experiment. A hundred years later, however, William Murdoch invented the present system of gas lighting; and in 1803 he illuminated a portion of the works of Boulton and Watt at Soho, Birmingham. Three years after this, the firm supplied plant for lighting a cotton-mill in Manchester. Since then many improvements of various kinds have been made; but, in the domain of lighting, two stand out conspicuously. The first was making practicable the phenomenon of incandescence, which was the work of Welsbach; and the second was the application of high pressure in the production of intensified lighting. The author pointed out that what is wanted for incandescent lighting is a flame which will impinge on the whole inner surface of the mantle. The first step in high-pressure lighting was in compressing the gas to a pressure of 8 inches of water, whereas it is now worked at 54 inches, or 2 lbs. This increases the velocity of the gas at the jet, and thereby induces a great volume of air to be drawn into and mixed with it in the body of the burner.

Passing on to deal with the chemical constituents of coal gas, the author said that they might be divided into light-giving and heat-giving; and in incandescent lighting it is the latter which are utilized. In intensified lighting, the gas and air are more thoroughly and correctly mixed in various ways to give, with perfect combustion, the maximum heat contained in a gas; and according to the degree of perfection attained in the mixture, a more intense heat can be obtained from a smaller quantity of gas, and the mantle would have a higher incandescence. While with the old-fashioned flat-flame burner the pressure of gas at the tip should be reduced to a minimum in order to get the most light, with the incandescent mantle the conditions are reversed, and it is essential that the pressure should be at least 2 inches of water in order to get a good light. In intensified lighting, the pressure is further increased up to 54 inches with still better results. The author laid stress upon the fact that gas of high illuminating power required by the flat-flame burner is unsuitable for incandescent lighting, as it is far too rich. Its reduction to (say) 10-candle power would, he said, open out immense possibilities in the cheapening of gas; and the sooner flat-flame burners become relics of the past, the better it would be for the gas consumer. The gas of the future would be one of low illuminating power, distributed at three or four times the present pressure.

These remarks led the author to consider the question of illumination; and he reminded his audience that mere brilliancy is not the highest property of a light-giving medium—diffusion, or more correctly suffusion, being of greater importance. He illustrated this by comparing the light of the electric arc with that of the incandescent mantle; the former being, he said, brilliant but coldly penetrating, and only very slightly diffusive, whereas the latter seemed to suffuse the air with light, and make luminous all the space within its range. By widening its range, its usefulness was increased. It did not produce violent shadows like the arc light, but distributed the light with remarkable uniformity. It was the object of high-pressure lighting to widen the range of the ordinary incandescent mantle, and thus increase its illuminating value. In the spectrum of the electric arc light, the blue and violet rays predominated, while in that of the incandescent light there was more of the yellow and red, so that it more nearly resembled sunlight. With regard to the hygienic side of the question, the author said that practically, with ordinary incandescent lighting, the hygienic results might be said to equal those of electric lighting; but with intensified light they were better. The atmosphere was purer, owing, in the first place, to the complete combustion of the gas; and, secondly, to the smaller quantity of gas required to produce the same illumination. Of course, there were instances where it was not advisable to burn gas, and where electricity was found to be very useful.

Mr. Walton next described, by the aid of lantern slides, two systems representative of the different classes of intensified lighting which the managers of the particular mill in which all the observations were taken had under consideration after they had decided to adopt high-pressure lighting. These were the Keith system of compressed gas, and the Selas system of compressed

\* See "JOURNAL," Vol. LXXXV., p. 89.  
† *Ibid.*, Vol. CVIII., p. 184.



air and gas. Having explained the machinery employed in the first-named system, the author passed on to refer to the lamps used in connection with it. One of the slides illustrated the 300-candle and 75-candle burners, both fitted with globes and galleries; also a small flat-flame governor burner which it is sometimes desired to make use of on the high-pressure line of piping as a pilot light when the compressor is stopped, so that the place will not be in total darkness. The burners are adjustable, so that they do not flare up like those of the ordinary type when under pressure. Coming to later lamps and fittings on Keith's system (spoken of as the 1908 patterns), the author showed a rotary compressor which can be arranged for any form of driving—belt, direct-coupled electric motor, or gas-engine. These compressors are generally used at the pressure of a 54-inch column of water, or 2 lbs. per square inch, in order to obtain good results with the new lamps, which are all of the inverted type, and from 60 to 1500 candle power per single burner. These were shown on the screen; and it was stated that the one most suitable for factories is the 100-candle burner. The lamps can be used without globes, with a single globe, or with two globes; but the only way in which a secondary air supply can be properly heated is by the use of two globes—the outer one being without an opening, and the inner one having an opening at the bottom. The result is that by the two glasses an annular space is formed, down which air has to pass for supporting combustion, and is thus heated before reaching the mantle. The author thought that the gain in light was not worth the extra expense and trouble entailed in cleaning for factory purposes, as the accumulation of dust, even after an hour's work, must nullify the gain in light. He gave the following as theoretical comparisons of candle power with and without globes, in a clear atmosphere: No globe, 50; with one globe, 55; with two globes, 60. From experience in textile factory lighting, it is found that the inverted burner meets with approval, from both the proprietors' and the workers' points of view; and burners of about 100-candle power, each suitably arranged, are found of general utility, with burners of from 300 to 500 candle power for the engine-house and yards. The 100 and 120 candle power burners require 2 cubic feet of gas per hour; and with gas at 2s. 6d. per 1000 cubic feet this works out to 0.06d., or 16½ burning hours for 1d. To obtain equal illumination from electricity, by the most approved lamp on the market, it would be necessary for current to cost less than ½d. per unit. These remarks were illustrated by views of a spinning-room and a cop-winding room taken by the Keith light.

The author next proceeded to describe the Selas system of lighting, in which the greater portion of the air required for the efficient combustion of the gas is mixed with the gas at the compressor, generally in the proportion of one part of gas and at the utmost two parts of air. It is then passed through the pipes under a pressure of 10 to 12 inches of water. The reason assigned for lamps on this system working so economically with so low a pressure, though the mixture of air and gas is preheated at the lamp, is that the gas and air being already mixed, a greater volume has to pass through the nipple than in the case of compressed gas. Moreover, high velocity is not required to induce a large quantity of air at the burner; and therefore the nipple is made larger, with a consequent reduction of surface friction. Having described the compressing plant, the author said the lamps on this system are made to cover a very large range; a duty of from 50 to 5000 candle power being obtainable from the same general mixing and service pipes. Until recently, the lamps for textile mills were of 80-candle power, without preheaters, and consumed 2 cubic feet of gas per hour. Those with which the audience were specially concerned, however, were the 100-candle power lamps specially constructed for textile use. The author showed first a spinning-lamp, and it was noticeable that there was no shade to it, and very little surface to facilitate the collection of much dust and fluff—thereby reducing the possibility of firing. The points of difference between these lamps and those previously described were indicated; and then a weaving-lamp, having a shade reflector, was shown. Both lamps had globes; but, as the author had previously stated, he did not think any advantage was derived from their use. Another lamp shown was of the same candle power, and suitable for mill yards or other outside illumination; all parts being well protected against weather. One claim made for these lamps is that the consumption is the same, independently of the size—i.e., 0.02 cubic foot per candle power per hour. Consequently, the makers' present standard textile lamp consumes, on an average, 2 cubic feet per hour for 100-candle power. Another claim is that the plant can be fitted to existing piping which will withstand a pressure of 10 to 12 inches of water, whereas with 54-inch pressure new piping is required throughout. The author said he knew of installations where the old piping was being used under both pressures without any trouble; but he thought that it was a risky undertaking, and personally, for high-pressure lighting, he would put in new piping throughout.

MAINTENANCE.

The next subject dealt with was that of maintenance. The author pointed out that one of the most remarkable features of these new lamps is the smallness of the mantle compared with its illuminating power. This is attainable by the concentrated nature of the flame; and it shows that the characteristics of the flame rather than the mantle area are of supreme importance in attaining high efficiencies. The reduction of the mantle to a small size for a large illuminating power lessens the chance of

breakage, and consequently decreases the cost of maintenance. The author said the best way to illustrate this would be by giving his actual figures for one year's working.

MANTLES.

|                        |             |            |        |         |                 |
|------------------------|-------------|------------|--------|---------|-----------------|
| Pressure . . . . .     | 54 in.      | 10 in.     | 10 in. | 54 in.  |                 |
| No. of lights . . . .  | 584         | 64         | 4      | 5       | Total, 657.     |
| Candle power. . . .    | 100         | 90         | 75     | 300     |                 |
| Mantles used . . . .   | 740         | 144        | 12     | 12      | Total, 908.     |
| " per light . . . . .  | 1.27        | 2.25       | 3.0    | 2.4     | Aver., 1.38.    |
| Average price each .   | 3.25d.      | 4.0d.      | 3.0d.  | 4.5d.   | Aver., 3.38d.   |
| Cost of renewals . .   | £10 os. 6d. | £2 8s. 0d. | 3s.    | 4s. 6d. | Total, £12 16s. |
| Cost per light . . . . | 4.12d.      | 9.0d.      | 9.0d.  | 10.8d.  | Aver., 4.68d.   |

The 90-candle power lights working at 10-inch pressure have a much larger mantle than the 100-candle lights working at 54-inch pressure; and the increase in mantles per light is remarkable, seeing that they are in similar rooms. It can only be accounted for by the difference in mantle area—the 90-candle power light presenting more surface for destruction. The mantles may either be collodionized or of the soft form, which are much preferred, because the high pressure gas is particularly suitable for shaping each mantle to the flame to which it has to accommodate itself. It is advisable to have a man to put on the mantles and keep the lamps in order; and in lighting hours his sole duty should be to attend to them. It is useless to instal the high-pressure system of gas lighting and expect it to look after itself; for so much depends upon the lamps being always in perfect order. They should be kept so. In all cases there should be entirely new piping. For running the compressor when the main engine is stopped, a small gas-engine is very suitable. It is fairly efficient, and as it will be in close proximity to the meter and compressor, it can be easily arranged for.

We give in full the concluding portion of the paper, in which the author dealt with the subject of the

COST OF LIGHTING.

First of all we will consider a theoretical comparison of costs, only taking into account the consumption of lighting medium and the candle power obtained. For this purpose, I have worked out various systems on the basis of 1000-candle power (nominal in the case of electricity) for one hour.

Gas.

|                           | Efficiency per Cubic Foot per Hour. | Consumption in Cubic Feet per Hour. | Cost in Pence at |       |       |
|---------------------------|-------------------------------------|-------------------------------------|------------------|-------|-------|
|                           |                                     |                                     | 3/-              | 2/3   | 2/6   |
| Flat-flame burner . . .   | 3                                   | 333.3                               | 12.00            | 10.66 | 10.00 |
| Ordinary incandescent do. | 16                                  | 62.5                                | 2.25             | 2.00  | 1.87  |
| Inverted " . . . . .      | 20                                  | 50.0                                | 1.80             | 1.60  | 1.50  |
| Keith's old system . .    | 30                                  | 33.3                                | 1.20             | 1.06  | 1.00  |
| Selas " . . . . .         | 40                                  | 25.0                                | 0.90             | 0.80  | 0.75  |
| " new " . . . . .         | 50                                  | 20.0                                | 0.72             | 0.64  | 0.60  |
| Keith's " (1908) . . .    | 60                                  | 16.6                                | 0.60             | 0.53  | 0.50  |

Electricity.

|                        | Watts per Hour. | In Watts per Hour. | Cost in Pence at |       |      |
|------------------------|-----------------|--------------------|------------------|-------|------|
|                        |                 |                    | 4d.              | 3d.   | 1½d. |
| Carbon filament lamp . | 0.25            | 4000               | 16               | 12.00 | 6.00 |
| Metallic " (Tantalums) | 0.5             | 2000               | 8                | 6.00  | 3.00 |
| " " (Osrams) . . . .   | 0.8             | 1250               | 5                | 3.75  | 1.87 |

The efficiencies of the electric incandescent lights have been taken at the manufacturers' own rating. The figures for the high-pressure gas-lights have been calculated from what the makers guarantee, and are well within reach. There is, however, a difference between these comparisons and those taken from actual working conditions when all maintenance and sundry expenses are considered. Therefore we will at once pass on to take a particular case.

We will consider first the conditions under which the mill was working before high-pressure lighting was installed. From January to December, 1907, it was entirely lighted by flat-flame burners, 860 in number, which consumed in the year 2,316,600 cubic feet of gas at a cost of £290 18s. The maintenance and depreciation charges on this method of lighting are a negligible quantity; therefore the total cost for the year was the sum stated. The burners were all 15-candle power; giving a total for the installation of (15 × 860) 12,900-candle power. These 15-candle burners are generally supposed to consume 5 cubic feet of gas per hour; and to verify this, and at the same time permit of more accurate calculations in estimating the saving to be made by using the high-pressure system, from figures the makers had given us and guaranteed, 250 flat-flame burners were lit, and the consumption taken for half-an-hour amounted to 562 cubic feet, or 4½ cubic feet per hour per burner. This equals a total consumption per hour for all the lights of (860 × 4½) 3870 cubic feet. But a better figure for comparison is the consumption per candle power, which is 0.3 cubic foot per hour. The cost per hour for the time the lights were in use is 9s. 9d. But here again the figure is not a comparative one. The cost per candle power should be used, which equals 5.41d. per candle power per annum.

It was then decided to employ high-pressure gas for lighting; but before installing the system throughout the mill, experimental plant was put down in one section. It was of the type already described, having a rotary compressor working at from 8 to 10 inches of water pressure. The cost for similar plant for the whole mill is given along with particulars of the consumption, upkeep, and cost per candle power. This installation proved to be a success in accordance with the figures given. Therefore a



complete plant, on the improved system, of 54 inches water pressure was put down. When this was completed, it consisted of—

|                                                     |               |  |  |  | Cubic Feet<br>per Hour. |
|-----------------------------------------------------|---------------|--|--|--|-------------------------|
| 584 lights, 100 c.p., consuming 2 cub. ft. per hour |               |  |  |  | 1168                    |
| 64 " 90 " " 3 " "                                   |               |  |  |  | 192                     |
| 4 " 75 " " 1½ " "                                   |               |  |  |  | 6                       |
| 5 " 300 " " 5 " "                                   |               |  |  |  | 25                      |
| 657                                                 |               |  |  |  |                         |
| 32 { ord.<br>incan.<br>lights                       | 60 " " 4 " "  |  |  |  | 128                     |
| 67 { flat-<br>flame<br>burn's                       | 15 " " 4½ " " |  |  |  | 302                     |
| 99                                                  |               |  |  |  |                         |
| 756 lights, with a calculated consumption of        |               |  |  |  | 1821                    |

Thus the 756 burners consisted of 657 intensified lights and 99 ordinary lights which were necessary as pilot-lights and for special purposes.

In the particulars of consumption and costs tabulated, it must be taken into consideration that the compressor is driven from a gas-engine of 2½-H.P., and that the quantity of gas required for running it is included in the quantity used for lighting. The renewal of mantles is taken from the maintenance sheet, and is the actual cost for one year. It will be noticed that the calculated consumption of gas is in each case greater than the actual consumption. The makers' figures are therefore well within reach. The consumption per candle power per hour practically bears out the theoretical calculations already given; but the reduction in cost is not so great (5'41 to 0'812), and is due to interest, depreciation, and renewal charges.

At the time of these alterations, estimates were also obtained for lighting the mill electrically, two systems being considered—(1) using 16-candle power carbon filament lamps, one to each loom; (2) using 50-candle power Osram lamps, one to two looms. Two manufacturers are, to my knowledge, installing electric lights—one using Tantalum lamps, and the other Osrams. The latter is the most efficient on the market, according to the makers' own rating.

Another important point to consider in electric lighting is whether you are going to generate your own current or buy it. In the first case, there is a greater initial cost by requiring generators, &c.; and the running charges include coal and engine-room expenses. But these are more than counterbalanced by the enormous cost of buying current, even when all is obtained at its lowest possible figure—i.e., 1½d. per unit (for this district). The carbon filament lamps being of very low efficiency—i.e., ¼—require considerably more current than Osrams. This means a larger

dynamo and increased coal consumption and sundry expenses. The coal consumption is worked out on the basis of 2 lbs. per indicated horse-power-hour.

Using one lamp per loom, 2000 lamps are required, giving a total of 32,000-candle power, which is much poorer than that of the intensified lights—in fact, less than half. In the calculations for the renewals of lamps, each lamp was allowed a life of 2400 hours, which is a high figure, and was charged at 8½d. each.

The results between purchasing and generating current are surprising—being 5'32 and 3'25 respectively. The same method of comparison is used with the Osram lamps. The initial cost is much less, as a smaller generator may be used. There is also less wiring and fewer connections by using a smaller number of lamps of greater power and efficiency. Here one lamp of 50-candle power is used for two looms, so that 860 lamps altogether are required, giving a total of 43,000-candle power. This is much better than that obtained by the carbon filament lamps, but still not so good as the high-pressure light.

For obtaining the cost of renewals, each lamp was, in this case, allowed a life of 1200 hours. This is high, considering the very fragile nature of these lamps. The price per lamp is 3s. 9d. Here again the difference between buying and generating current is great; being 1'83 and 2'16 per candle power per annum. The great difference between carbon and Osram lamps is entirely due to the efficiency and arrangements of the lamps. For instance, to get 32,000 nominal candle power from carbon lamps, 128 units per hour are required, while for Osram lamps only 53'32 units are wanted for 43,000-candle power; or, for correct comparison, 4 watts against 1'24 watts per candle power per hour.

In the cost, 4½ per cent. interest on capital has been allowed; also for depreciation, 7½ per cent. on electricity and 10 per cent. on gas. Coal, mantles, and lamps, also gas and current, are charged at present prices. Allowance is made for gas used in electrically-lit mills for pilots and sundry purposes. The attendance charges, engine-room, and running expenses are from the analysis of a season's working. The cost per hour must not be considered when comparing lights, as it does not take into account the luminosity, but the cost per candle power per year. Thus, taking the three representative classes, we get—

|                           |                                    |
|---------------------------|------------------------------------|
| Flat-flame                | 5'410d. per candle power per year. |
| 54-inch high-pressure     | 0'812 " " "                        |
| Osram (generated current) | 1'830 " " "                        |

The difference is sufficient, I should think, to entice the most conservative business man.

The reduction in gas consumption in 1909 compared with 1907 is 55 per cent. The actual saving on the flat-flame system, when charging interest on the cost of plant, and allowing full depreciation, is 19'81 per cent.

CONCLUSION.

In conclusion, I think I am justified in saying that, so far, the

Summary of Costs.

|                                                                                   | GAS.             |                                             |                                                                 | ELECTRICITY.                                 |                                  |                     |                                  |
|-----------------------------------------------------------------------------------|------------------|---------------------------------------------|-----------------------------------------------------------------|----------------------------------------------|----------------------------------|---------------------|----------------------------------|
|                                                                                   | Flat-Flame.      | High Pressure, 10-Inch Water Gauge.         | High Pressure, 54-Inch.                                         | Electric Incandescent Carbon Filament Lamps. |                                  | Osram Lamps.        |                                  |
|                                                                                   |                  |                                             |                                                                 | Generating Current.                          | Buying Current at 1½d. per Unit. | Generating Current. | Buying Current at 1½d. per Unit. |
| Total initial cost of installation                                                | ..               | £532                                        | £532                                                            | £2300                                        | £1475                            | £1100               | £600                             |
| Number of lights and nominal candle power                                         | 860 × 15         | 653 × 90<br>4 × 75<br>32 × 60<br>67 × 15    | 5 × 300<br>584 × 100<br>64 × 90<br>4 × 75<br>32 × 60<br>67 × 15 | 2000 × 16                                    | 2000 × 16                        | 860 × 50            | 860 × 50                         |
| Total nominal candle power                                                        | 12,900           | 61,995                                      | 68,885                                                          | 32,000                                       | 32,000                           | 43,000              | 43,000                           |
| Horse power required for dynamo or compressor.                                    | ..               | 2½                                          | 2½                                                              | 170                                          | ..                               | 75                  | ..                               |
| Amount of coal used per I.H.P. per hour                                           | ..               | Gas                                         | Gas                                                             | 2 lbs.                                       | ..                               | 2                   | ..                               |
| Hours lighting per year                                                           | 598              | 600                                         | 612                                                             | 600                                          | 600                              | 600                 | 600                              |
| Renewals of mantles and lamps per year                                            | ..               | 1,400                                       | 908                                                             | 500                                          | 500                              | 430                 | 430                              |
| Total consumption—                                                                |                  |                                             |                                                                 |                                              |                                  |                     |                                  |
| For the year                                                                      | 2,316,600 c. ft. | 1,332,000 c. ft.                            | 1,041,600 c. ft.                                                | ..                                           | 76,800 units                     | ..                  | 31,992 units                     |
| Per hour for all lights (actual)                                                  | 3,870 "          | 2,220 "                                     | 1,700 "                                                         | ..                                           | ..                               | ..                  | ..                               |
| " " (calculated).                                                                 | ..               | 2,395 "                                     | 1,821 "                                                         | ..                                           | 128 units                        | ..                  | 53'32 units                      |
| Per candle power per hour                                                         | 0 3 "            | 0'0358 "                                    | 0'0246 "                                                        | ..                                           | 4 watts                          | ..                  | 1'24 watts                       |
| Interest on capital, 4½ per cent.                                                 | ..               | £23 18 9                                    | £23 18 9                                                        | £103 10 0                                    | £66 7 6                          | £19 10 0            | £27 0 0                          |
| Depreciation: 7½ per cent. electricity, 10 per cent. gas                          | ..               | 53 4 0                                      | 53 4 0                                                          | 172 10 0                                     | 110 12 6                         | 82 10 0             | 45 0 0                           |
| Coal, at 10s. per ton                                                             | ..               | Driven by gas-engine charged through meter. | ..                                                              | 45 10 0                                      | ..                               | 20 0 0              | ..                               |
| Renewals—Lamps: Carbon, 8½d.; Osrams, 3s. 9d. Mantles.                            | ..               | £23 6 8                                     | £12 16 0                                                        | 17 11 2                                      | 17 14 2                          | 80 12 6             | 80 12 6                          |
| Gas at 2s. 8d. per 1000 cubic feet; electricity at 1½d. per unit                  | £290 18 0        | 172 12 0                                    | 134 16 3                                                        | ..                                           | 480 0 0                          | ..                  | 100 10 0                         |
| Including gas used in electrically-lit mills                                      | ..               | ..                                          | ..                                                              | 30 0 0                                       | 30 0 0                           | 30 0 0              | 30 0 0                           |
| Attendance                                                                        | ..               | 8 10 0                                      | 8 10 0                                                          | ..                                           | 5 0 0                            | ..                  | 5 0 0                            |
| Proportion of engine-room wages, &c.                                              | ..               | ..                                          | ..                                                              | 15 0 0                                       | ..                               | 15 0 0              | ..                               |
| " running expenses                                                                | ..               | ..                                          | ..                                                              | 50 0 0                                       | ..                               | 50 0 0              | ..                               |
|                                                                                   | £290 18 0        | £281 11 5                                   | £233 5 0                                                        | £434 4 2                                     | £709 14 2                        | £327 12 6           | £187 11 6                        |
| Cost per candle power per year (the correct method of comparison)                 | 5'41d.           | 1'09d.                                      | 0'812d.                                                         | 3'25d.                                       | 5'32d.                           | 1'83d.              | 2'16d.                           |
| Total cost per hour worked by light (a sometimes convenient method of comparison) | 9s. 9d.          | 0s. 4d.                                     | 7s. 7d.                                                         | 14s. 6d.                                     | 23s. 7d.                         | 10s. 11d.           | 12s. 11d.                        |



high-pressure gas system is considerably cheaper than any other present form of lighting suitable for textile works, and holds its own in competition. It is efficient, generally reliable, and usually simple. Occasionally, however, it is wise to look round to see how others who are aiming for similar utility and efficiency are developing their ideas.

## REINFORCED CONCRETE FOR WATER-WORKS.

At a recent Meeting of the University of Liverpool Engineering Society, the Student President, Mr. HAROLD J. F. GOURLEY, selected this subject for his address.

The author began by saying that the use of reinforced concrete in water-works engineering was quite a recent development in this country, though it had been used in Canada and the United States for a number of years, and had for some time been adopted on the Continent, principally in France and Germany. The question naturally arose, Why are we behind the countries named in taking up the use of reinforced concrete? In the first place, there had been considerable difficulty in obtaining loans to cover the cost of reinforced concrete structures for any reasonable period with the sanction of the Local Government Board; but the fact that in the new War Office and the new General Post Office, London, reinforced concrete was used to a considerable extent, indicated a certain inconsistency in the attitude of the Board. In the second place, there was still a prejudice among some engineers against its use. Of course, it was a comparatively new material, but it had stood many severe tests in other countries; and the precise ground of objection to it was rather hard to find.

While time would not permit of an exhaustive consideration of these objections, it might be mentioned that a number of engineers had made experiments bearing on these points; a common procedure being to embed rods of metal up to (say) 1 inch diameter in small blocks of concrete of varying constitution, and to note the appearance after being embedded for, say, three months—during which time the concrete had been subjected to varying external influences—compared with the original appearance of the metal. The results of these experiments showed that, where the concrete was of a suitable character and the metal well embedded, the results were quite satisfactory. Experiments of this kind would yield more instructive and convincing results if they were carried out on a larger scale over longer periods and under more practical conditions. Numerous experiments had been made to determine the magnitude of the ultimate adhesive stress between metal and concrete for different proportions of the latter and for varying conditions in the surface of the metal. These results had shown that for plain rods an ultimate stress of 650 lbs. per square inch at three months was not exceptional. The value used in design, which varied from 60 to 100 lbs. per square inch with different authorities, gave an ample margin.

Before passing on to point out the advantages claimed for reinforced concrete, the author said the various materials of which it is composed should be considered. The sand should be clean, coarse, and sharp. The presence of clay or loam in sand in any considerable proportion rendered it unfit for use. The shingle or broken stone used must be of a hard, close-grained quality, and perfectly clean. The sand, if any, in this material should be screened out. The stones should be varied in size; but the maximum size allowable depended entirely on the size of the concrete members. In small beams, slabs, and columns,  $\frac{3}{4}$  inch might be the maximum diameter; but  $1\frac{1}{4}$  or  $1\frac{1}{2}$  inches might be allowable in larger members. The stone and sand must always be gauged separately. It was most unscientific and unsatisfactory to go to some trouble to carefully determine the proportions of a concrete, and specify accordingly, and then, as was sometimes done, to allow a mixture of the two to rank as equivalent to the separate gaugings. The cement should fulfil the British standard specification; and for this class of work it must be thoroughly aerated before use in properly constructed sheds. For parts which were subjected to any pressure of water, the proportions of the concrete would be 1 of cement, 2 of sand, and 3 of stone; or, as is the more modern and scientific method of specifying, 770 lbs. of cement, 18 cubic feet of sand, and 27 cubic feet of stone. In other parts, such as the roofs of reservoirs and tanks, a 1 : 2 : 4 mixture was generally used. The mixing should be done in a batch mixer, and after finding the quantity of clean water which gave a rather wet mixture, this quantity should be strictly adhered to afterwards. The aim in concrete making, particularly in reinforced concrete work, should be to get absolute uniformity throughout. The working stress allowable for concrete in compression was about 600 lbs. per square inch for pieces subjected to bending, 500 lbs. in columns, and 60 lbs. in shear.

Regarding the reinforcement, the author remarked that this was now usually mild steel; but when welding was necessary, wrought iron was the safer metal to use. The working tensile stress for steel was about 16,000 lbs. per square inch, and about 11,000 lbs. per square inch for wrought-iron stirrups, joists, or straight or twisted steel bars. As to the amount of reinforcement usually provided in a simple beam, the percentage of the whole area of beam section taken up by the metal would not greatly exceed 1 per cent. on the tension side. Anything above 1 per cent. was usually provided for by using metal in the upper portion

of the beam, which was not economical, since such extra metal could carry only about half the working stress of the metal in tension. A slight rust film on the metal was not objectionable—in fact, it was an advantage; but any loose scale, rust, or oil should be removed, as it tended to destroy the adhesion between the metal and the surrounding concrete. As regards the amount of cover necessary, some authorities gave a minimum of  $\frac{1}{2}$  inch; but this evidently referred to beams and the like. Probably for water-works structures (particularly those actually in contact with water), the minimum would be 1 inch to  $1\frac{1}{2}$  inches.

Coming to the advantages of using reinforced concrete in reservoirs, tanks, and filter-beds, the author said they were as follows: (a) It was more economical. The roofs, walls, and floors were very much lighter than if built in concrete or masonry. For reservoir bottoms in bad ground, it was much more reliable and less costly than the ordinary methods of construction. The cost of a reservoir built entirely of reinforced concrete was 14 to 15 per cent. cheaper, on an average, than one of equal capacity built of mass concrete or brick or of a combination of both. (b) The cost of maintenance was practically nil. This was also true of an all-concrete structure. (c) Works in reinforced concrete could be constructed very rapidly, due to the simple character of the materials employed. In this very rapidity lay the possible danger of giving too much attention to "speeding-up" the work, and too little to efficient supervision. (d) It was generally conceded that reinforced concrete had a high hygienic value. (e) By employing reinforced concrete in a reservoir, very much less material was used, and consequently less space occupied. (f) The reservoir increased in strength with age. This was an important consideration. Other materials deteriorated, while concrete increased in strength with age. (g) A reservoir built of concrete or reinforced concrete throughout, or a combination of both, had no joints; and repairs were readily made if required. As in all other branches of engineering, great care had to be taken in designing the various structures so that they were strong enough to stand all the possible conditions of loading.

The advantages mentioned regarding reservoirs applied equally well to aqueducts. Reinforced concrete conduits also had this advantage over concrete or masonry structures, that they could be, and they had been, subjected to internal pressure due to water under a head. Before expanded steel was used as a reinforcement in certain portions of the Birmingham aqueduct, the engineer had a series of tests made on 4 to 1 concrete slabs, 6 inches thick. Without the expanded steel, the uniformly distributed breaking load was 4 cwt. per square foot, and when reinforced with expanded steel, 3-inch mesh,  $\frac{1}{4}$  in. by  $\frac{3}{16}$  in. strands, the load was 20 cwt. per square foot. This showed marked advantage due to the reinforcement. Reinforced concrete had also been found suitable for high-pressure water-mains; and it was likely to be largely used for this purpose in the future, particularly as no corrosion could take place in such pipes, whereas in cast-iron pipes and steel tubes this was a serious matter.

For heads up to 40 or 50 feet, reinforced concrete dams had been used to a large extent in the United States, particularly for power schemes. There was one under construction there having a height of about 140 feet; and three or four others of similar magnitude were just about to be built. Among some of the advantages possessed by this type of dam, the author mentioned the following: (a) There was practically no danger that the dam would be swept down stream, and absolutely no possibility of the dam being overturned. (b) The hydrostatic pressure, acting up, which reduced the stability of a solid masonry dam, was totally absent. (c) The strength increased with age. (d) The time required for construction was considerably less than for other methods. (e) The crushing strength of massive masonry was a somewhat uncertain quantity, and therefore low unit values were adopted for working stresses whenever crushing strength became a factor in the design. In the case of the reinforced concrete structure, the stresses on every part of the structure were quite definite; and the engineer could not only tell exactly how much stress would be found in each part, but could also design the work with any desired factor of safety.

**The Late Mr. Trewby's Estate.**—Mr. George Careless Trewby, whose death on the 19th ult., at the age of 71, was recorded in the "JOURNAL" the following Tuesday, left estate of the gross value of £120,118; the net personality being £110,253.

**Mine and Quarry Statistics.**—A Blue-Book containing Part I. of the general report of the Chief Inspector of Mines for 1909 was issued a short time since. The volume deals with district statistics; and it will be followed by separate parts dealing with labour, output, and foreign and colonial statistics. The total output at the mines under the Coal Mines Act was 277,906,059 tons, of which 263,758,562 tons were coal, 2,695,861 tons fire-clay, 8,039,441 tons ironstone, 2,966,937 tons oil shale, and 445,258 tons sundry minerals. Adding 15,750 tons from open quarries, the total output of coal was 263,774,312 tons, an increase of 2,245,517 tons on the preceding year. The average output of minerals at mines under the Coal Mines Act was 340 tons per person employed underground—a decrease of 6 tons. The total output of minerals at the mines under the Metalliferous Mines Act was 3,095,780 tons, of which 1,674,643 tons were iron ore. The total output from the quarries under the Quarries Act was 44,614,931 tons, of which 4,682,253 tons were iron ore. Including 583,642 tons obtained from shallow open workings, the total output of iron ore was 14,979,979 tons.



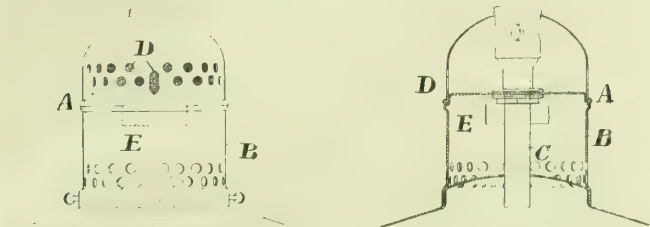
## REGISTER OF PATENTS.

### Incandescent Gas-Lamps.

WOLF, O., BAMBURY, N. F., and BERNARDY, E., of Bradford.

No. 17,194; July 23, 1909.

According to this invention, the lamp-burner is constructed so that the air is superheated before being mixed with the gas, and the air inlets are disposed in such relationship to the outlets for the products of combustion that the air supply is prevented from being vitiated.



**Wolf, Bambury, and Bernardy's Incandescent Lamp.**

The two chambers may either be formed separately as shown, and attached by screws, or they may be formed integrally. In either case they are separated one from the other by a plate A, composed of heat-conducting material. The partition is integral with the walls of the lower chamber B; and the bunsen tube is preferably made in two parts, the upper part of which screws on to the lower part, where it protrudes through the partition. This construction also provides means for securing the two chambers together; the upper chamber being clamped between an enlargement on the top of the bunsen tube and the lower chamber. A gas-tight joint is formed at the centre on each side of the partition by asbestos washers. The upper compartment constitutes the chamber wherein the air supply to the burner is superheated prior to being admitted into the bunsen tube C to mix with the gas. The air-admission openings D in the upper chamber are disposed so as to be on the opposite side of the lamp body to the emission openings E in the lower chamber; or if a plurality of openings are round the two chambers, then the air-inlet openings will be disposed so as to be intermediate of the emission openings.

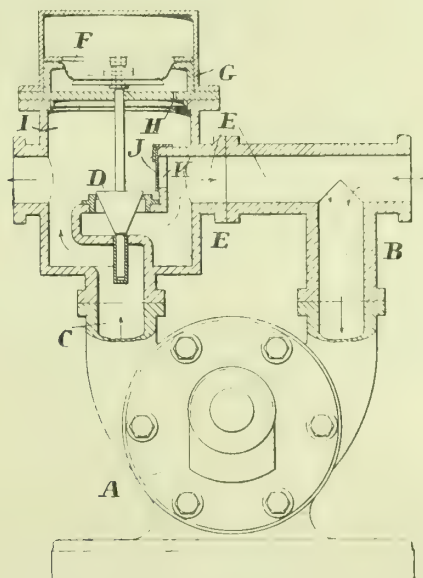
When the lamp is in use, the heat from the products of combustion is transmitted through the partition A to the upper chamber, thereby superheating the air therein before it passes into the bunsen tube to mix with the gas. By means of the two chambers, the air supply is kept entirely separate from the burnt gases; but at the same time it is heated thereby, and consequently, after mixing with the gas in the usual way, it produces a "better burning mixture."

## Supplying Gas under Pressure for Illuminating Purposes.

WOLF, O., BAMBURY, N. F., and BERNARDY, E., of Bradford.

No. 17,195; July 23, 1909.

This invention relates to the supply of gas under pressure to be employed for illuminating or like purposes; and it has reference to apparatus which comprises a compressor or pump arranged to supply gas from the main through a pressure-regulating valve to the service-pipe of a lighting or similar installation. The pressure-regulating valve is in the form of an excess-pressure valve, and is automatically operated by the pressure of the gas in the service-pipe to regulate the supply of gas according to the consumption.



**Wolf, Bambury, and Bernardy's High-Pressure Lamp Plant.**

The usual portion of the apparatus comprises a rotary compressor or pump A driven in any suitable manner. B is the inlet and C the outlet—in direct communication respectively with the gas-main and with the service-pipe of the installation. On the outlet side of the com-

pressor is a valve D, which opens and closes a circulating conduit or passage E between the outlet and inlet. The valve is connected to a diaphragm F within a chamber G, and a passage H forms a communication between the chamber and the interior of the valve casing I; so that the diaphragm is submitted to, and acted upon by, the pressure of the gas in the main.

The compressor runs at a constant speed and normally the valve D remains closed and the gas from the main takes a course indicated by the full-line arrows—*i.e.*, direct into the inlet B, through the compressor, out at the outlet C, and then direct into the service-pipe. When an increase of pressure occurs in the service-pipe, the diaphragm F is raised and opens the valve D, so as to allow gas coming from the outlet to pass through the passage E, as indicated by the dotted-line arrows, back to the inlet. This excess of gas is thus allowed to circulate through the compressor, instead of being forced into the service-pipe; and the compressor draws gas from its outlet side instead of from the main. When the excess pressure in the service-pipe falls, the valve D is closed, and the normal supply of gas is continued.

The automatic bye-pass or supplementary valve for supplying gas to the installation when the apparatus ceases to operate as mentioned, consists of a hinged flap J, located in the valve casing I of the excess pressure valve so as to communicate between the service-pipe and the inlet of the compressor or the gas-main. The flap is loosely pivoted so that it may swing outwards to uncover the opening K, as in the dotted lines. The flap is arranged so that it will close by its own weight and afterwards be kept closed by the influence of increased pressure in the service-pipe when the compressor is in operation. But upon the cessation of the latter and the consequent reduction of the pressure in the service-pipe, the ordinary pressure in the gas-main will open the flap—swing it away from the opening K—so as to uncover the latter, and the gas will then pass through the passage E, opening K, and valve casing I, to the service-pipe, so that the installation will be supplied with gas at the ordinary gas-main pressure until the compressor is restarted.

### Mouthpieces of Gas-Retorts.

HELPS, J. W., and PATEMAN, J. W., of Croydon.

No. 18,260; Aug. 7, 1909.

This invention has for its object to provide improved means for supporting and securing the hinge and fastening device of the retort-lid, whereby it may be readily opened and closed, "even when the parts are worn through long service."

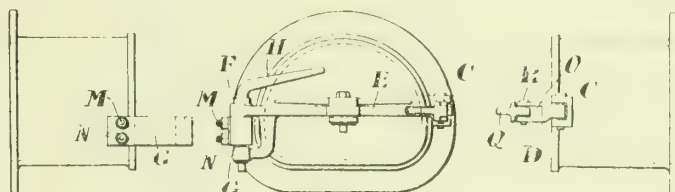
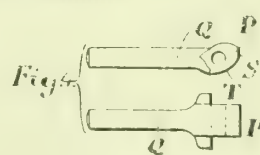
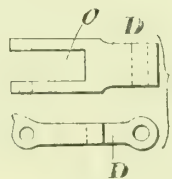
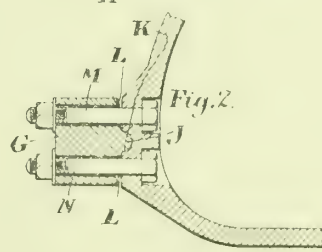
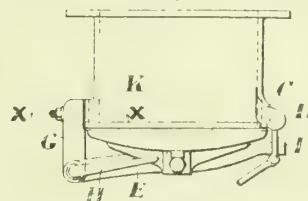


Fig. 1.



### Helps and Pateman's Retort-Lid Fastener.

The illustration shows the preferred embodiment of the invention, as applied to a retort mouthpiece and closure of the Morton type. Fig. 1, is a front elevation (also plan and side elevations) of the mouthpiece with the lid or closure in its closed position. Fig. 2 is a section, on an enlarged scale, taken on the line X of fig. 1. Fig. 3 shows the hinged fastening member in plan and elevation. Fig. 4 shows the eccentric member in plan and elevation, which forms the end of the slot in the hinged fastening member.

The mouthpiece is in the form of a D-shaped iron casting, having the usual lid and an integral lug C, in which is pivoted a hinged fastening member D. Attached to the lid is a cross-piece E, pivoted upon an eccentric pin F in the lug G—the pin having a handle H, by which it may be rotated. The end I of the cross-piece remote from the pin is adapted to be engaged by the member D when it is desired to close the mouthpiece; the lid being finally brought firmly against the face of the mouthpiece by rotating the pin.



According to the present invention, the lug G is adjustably secured to the mouthpiece so as to permit of the ready vertical adjustment of the lid. The lug is provided upon one side with a half-round projection J, which fits into a recess K of corresponding shape in the side of the mouthpiece—forming a kind of knuckle or cup joint. The portions of the face of the lug upon each side of the projection are bevelled off as L. In order to secure the lug in place, the two bolts M N are provided, extending through the lug and wall of the mouthpiece above and below the projection J.

The engaging surfaces of the hinged connection between the lug and the cross-piece, of course, tend to wear during use; and this causes the end I of the cross-piece to drop—rendering it difficult to swing the fastener D around the end of the cross-piece. To rectify this, all that is necessary is to slightly slack back the nut on the bolt M and tighten up the nut on the bolt N. This causes the projection J to rotate slightly in the recess K in a counter-clockwise direction (looking at fig. 2), with a consequent lifting of the end I of the cross-piece.

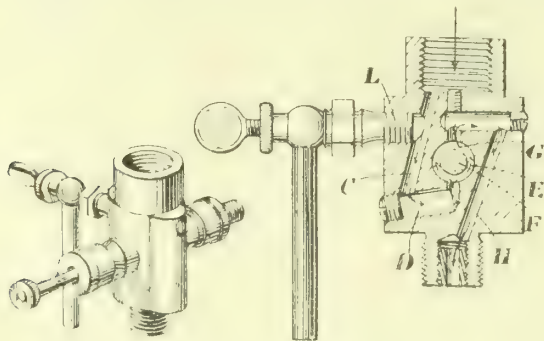
In order to allow of the member D being readily engaged with the end I of the cross-piece, the outer end of the slot O, instead of being closed by an end-piece integral with the member, is formed by the cam end P of a lever Q, which is pivoted by a pin R in the end of the fastening member. It will be seen by fig. 4 that the portion S of the end P of the lever Q is at a greater distance from the centre of the pivot hole than is the portion T. Consequently, if the lever is turned so that this portion forms the end of the slot O in the fastening member, the length of the slot will be substantially greater than if the lever is turned so that the portion forms the end of the slot. By providing these means for varying the length of the slot in the fastening member, the fastening of the lid is facilitated, for the fastening member may be engaged with the slot when the latter is opened to its greatest extent—the aperture being reduced by rotating the lever Q before the final closing of the lid is effected.

### Controlling a Gas-Conduit.

EDWARDS, A. N., of Farringdon Street, E.C.

No. 18,435; Aug. 10, 1909.

This apparatus for controlling a conduit for gas or other fluid, by a piston valve acting under fluid pressure, has particular reference to the type of fitting described in patent No. 23,759 of 1906.



Edwards's Inverted Burner Pressure Controller.

The illustration gives a perspective view of the apparatus, and a sectional view to a larger scale.

The valve-casing is provided with an internally screwed inlet, leading from which is a conduit C, which has an angular bend communicating with a second conduit D, which, in turn, communicates with a chamber E, placed cross-wise of the main portion and wherein is a piston F. From the chamber E, the gas travels through conduits G and H to the outlet which communicates with the burner. The piston has a groove in it which registers with small conduits opening into the main conduits G and D. It also has an extension, which is carried through a small cap or nipple screwed on to one end of the chamber E. The other end of the chamber is provided with a cap or nipple adapted to receive the supply pipe from the source of pressure or suction for operating the piston F. Communicating with the conduit C is an orifice L, adapted to receive a bye-pass arm M (provided with an adjustable screw) and lock nut to control the amount of gas flowing through the bye-pass.

Gas, on entering the valve, exerts a pressure on the piston F, the weight of which, however, acting against the pressure of the gas, prevents any escape of gas between the piston and the sides of the chamber E when it is in position to close the conduits. Upon the piston, however, being sucked or forced inwards, gas flows into the chamber G, and thence, by the chamber H and outlet, to the burner.

### Utilization of Materials Employed for Purifying Illuminating Gas.

SIMONIN, H., of Pierrefitte (Seine), France.

No. 25,360; Nov. 3, 1909. Date claimed under International Convention, Nov. 5, 1908.

This invention relates to the extraction of the sulphur contained in gas-purifying materials and the transformation of the insoluble nitrogen into soluble nitrogen.

In processes from obtaining products from spent oxide of iron, the patentee points out, the sulphur has been extracted by sulphide of carbon, naphtha, benzol, turpentine, and mineral oils; but he claims to have discovered that, though some of these solvents (together with chloroform and ether) may be used for this purpose in the present process, it is preferable by far to use tetra-chloride of carbon (which is also known for extracting the sulphur) for the reasons hereafter set

forth. Bisulphide of carbon has also been proposed to be used for extracting the sulphur; but it is quite impossible to employ this under pressure in such a manner as to produce a vapour tension, in view of the fact that the tension of the vapours of carbon bisulphide is so high that the risk of explosion is great, since an explosive mixture is formed on these vapours being mixed with air. It is therefore essential that the sulphur may be dissolved under tension or pressure of vapours of the solvent in such a manner that the solvent may penetrate (equally and intimately) every part of the mass in spite of the humidity of the vapour. To effect this, he preferably makes use of tetra-chloride of carbon "which is possessed of an extremely low vapour tension and offers no risk of explosion or fire; this substance being non-inflammable and non-explosive when combined with air."

In order to obtain a practical result, the sulphur is dissolved in digesters maintained at a pressure of between 2 and 3 kilos per square centimetre in order to increase the solution coefficient of the sulphur and to limit the quantity of the solvents required. The method of employing a solvent under pressure for dissolving the sulphur constitutes a feature of the invention. Tetra-chloride is, as already pointed out, particularly appropriate for this treatment by reason of the low tension of the vapours and of its oxidizing action; the latter being useful for assisting in the subsequent conversion of the nitrogen. The extraction of the sulphur having been effected, the material is then subjected to an oxidizing action by means of water vapour acting at a pressure of from 2 to 3 kilos per square centimetre for a time sufficient to produce the transformation of the insoluble nitrogen into soluble nitrogen. This period varies between two and three hours. The mixture treated by steam is composed of iron protoxide, cyanides, and carbonate of ammonia. The oxidation is effected by causing steam to pass over this mixture so that the oxygen of the steam becomes fixed upon the protoxide of iron so as to convert it into oxide of iron. The free hydrogen becomes partly fixed on the cyanide of calcium contained in the "crude ammonia" and forms ammonia.

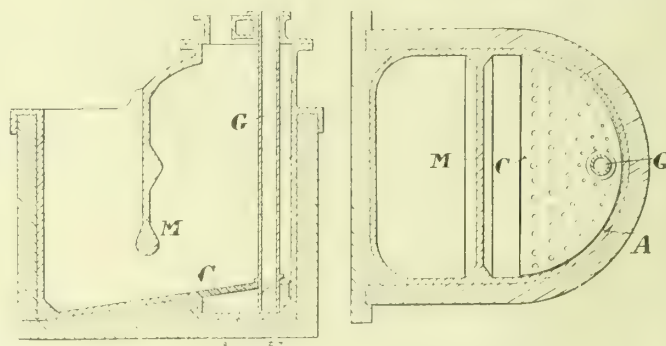
The material thus treated is then mixed with hydrated lime in suitable proportion (determined in accordance with the proportion of nitrogen) and distilled by a dry process or otherwise, or in retorts or in suitable furnaces for producing the liberation of the ammonia; this step of distillation with hydrated lime having already been proposed in a somewhat similar process for converting cyanogen compounds into ammonia. The ammoniacal gas may be collected in the form of an ammoniacal solution or of ammoniacal salts.

### Sulphate of Ammonia Saturator.

PETTIGREW, G., of Thornaby-on-Tees.

No. 25,460; Nov. 4, 1909.

According to this invention, a pocket A is formed in the inclined bottom of the saturator which, with a top plate C, forms a "cracker-box," the top plate of which, over its entire surface, is covered with perforations, which increase in area as they recede from the ammonia gas inlet E, so as to ensure the equal distribution of the gas throughout the top surface of it. Through the manhole cover of the saturator pass the inlet pipe G for the ammonia gas as well as the inlet pipe for the acid supply; the pipe G extending through the saturator and through a hole in the "cracker-box" and coming to rest on the bottom of the saturator—thus ensuring proper support for the pipe. An opening is also provided in the manhole cover for the outlet of the waste gas.



Pettigrew's Sulphate of Ammonia Saturator.

The box A is made of acid-proof material, separated from the body of the saturator so as to enable it to be removed through the manhole or under the "apron" or "midfeather" M of the saturator for cleaning or other purposes.

In use, the ammonia gases pass down the inlet pipe into the "cracker-box," and thence through the perforated top into the liquid within the saturator; "being evenly distributed throughout the liquid under all variations of pressure in the gas inlets."

### Water-Gas Apparatus.

GLASGOW, A. G., of Victoria Street, Westminster.

No. 25,474; Nov. 4, 1909.

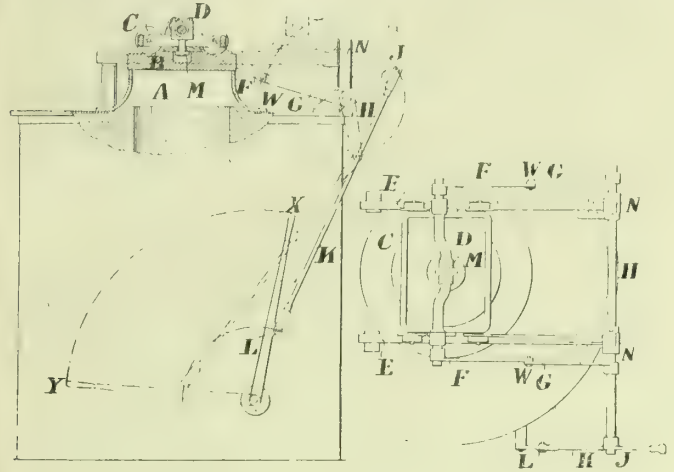
This invention has for its prime object to facilitate the manipulation of the stack-valve, which is open while blasting to allow the escape of the blast products to the atmosphere, and closed during the process of gas-making. The improved valve (which has sufficient weight to overcome the normal gas pressure, and is free to act as a relief-valve for excessive gas pressure) "is provided with manipulative means which first lift the valve just off its seat and then move it sideways clear of the opening, giving powerful mechanical advantage for the slight lift and suitably reduced mechanical advantage with accelerated speed for the long side movement."

The illustration shows, in plan and elevation (partly in section), the



top of the superheater of the carburetted water-gas plant equipped with a stack-valve according to this invention.

A is the blast products outlet; its upper rim forming the seat upon which the movable valve lid B rests when in its closed position. C is a frame and carriage from which the lid B is suspended by the crank-shaft D. The wheels of the carriage travel along the track formed by the rails E. The lid is suspended from the crank of the shaft, so that the full weight of the lid when closed bears evenly upon the valve-seat; and when the crank-shaft revolves in the direction indicated by the arrow, the lid is lifted off the valve-seat. To the ends of the crank-shaft are fitted levers F, which are, in turn, pin-jointed (at W) with the levers G keyed to the shaft H, which is actuated by hand through the lever J, link K, and lever L.



Glasgow's Water-Gas Stack-Valve.

The single movement of the hand lever L from X to Y first lifts the lid off its seat, and then rolls the carriage along the rails to the dotted position shown; thus leaving the opening quite free for the escape of the blast products. The first angular movement of shaft H and lever G (starting with the valve closed) turns the crank-shaft D and slightly lifts the lid without transmitting any appreciable movement to the carriage; so that during this time the whole effort of the operator is given to lifting the lid a very small distance. But as the revolution of the shaft H proceeds, its turning effect on the shaft D soon diminishes to nil, and its angular movement is utilized in pulling the carriage and lid along the rails until checked by the stops N, when it is in full-open position as shown in dotted lines. The hand lever L further increases the mechanical advantage for lifting.

With horizontal rails, the opening lid ceases to exert any further closing effect against the hand lever after it has reached its maximum lift; and its weight then tends to complete the stroke. By varying the grade of the rails from the horizontal, the effort curve of the hand lever can be modified accordingly.

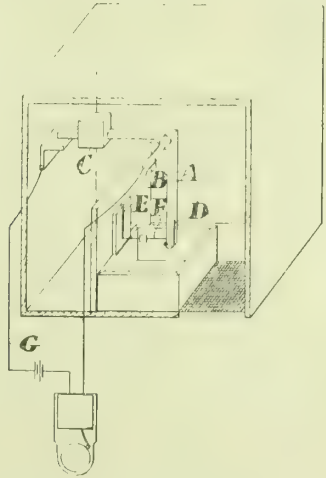
The lid is suspended from the stud M in such a manner that it has some play vertically, and is, to this extent, free to lift from its seat to relieve any excess gas pressure. Should further relief be necessary, the combined lid and carriage is free to lift and turn about the pin-joints W, without having to give any motion to the system of levers.

Preventing Gas Explosions and Poisoning.

PAUSINGER, F. VON, of Carinthia, Austria.

No. 774; Jan. 11, 1910. Date claimed under International Convention, Jan. 11, 1909.

This invention relates to an alarm apparatus of the type in which the contact of a current circuit is held open against the action of a spring or weight by a thread provided with a pill of spongy platinum. Its object is to increase the sensitiveness of the apparatus and prevent



Von Pausinger's Gas-Escape Alarm Apparatus.

explosions due to the formation of sparks during their operation. This is essentially secured by employing a thread of easily fusible material—for example, Wood's alloy—for holding the contact open; so that, with

the least warming of the platinum sponge, the thread is melted, and the arrangement is thus brought into operation.

The apparatus as illustrated is enclosed in a box. It comprises a right-angled contact lever A mounted to oscillate upon a partition arranged in the box, as upon an arm B. One end of the arm of the contact lever is loaded by a spring or by a weight C, and is adjacent to an angular contact piece upon one wall of the box. Between the end D of the vertical arm of the lever and a slotted plate E on the partition is stretched a thread F of fusible metal, carrying a pill of spongy platinum, so that the free end of the contact lever is lifted above the upper contact piece. Beneath the stretched metal thread is a receptacle filled with liquid (preferably glycerine), and covered by a thin paraffin membrane, into which the heated platinum sponge pill falls after melting of the metal thread, whereby ignition of the gas in the box is prevented.

For permitting the entry of gas to the box, one or more walls of it are formed of fine-mesh wire net or gauze preventing the spread of ignited gas to the exterior, or one wall, or (as shown) the floor may be alone provided with a gauze window, in which latter case the advantage is secured of protecting the apparatus against dust.

If gas is admitted to the platinum sponge pill through the window—and particularly in the application of the apparatus to illuminating gas, water gas, &c.—issuing into an enclosed space, the platinum sponge heats and melts the metal thread. The contact lever is therefore liberated, and falls under the action of the weight upon the upper contact piece, closing an electric circuit G, so that the alarm bell connected to it is sounded.

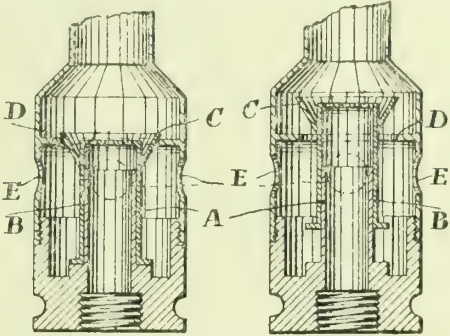
Bunsen Burner for Illuminating Purposes.

MEYER-ZIMMERLI, E., of Zurich, Switzerland.

No. 830; Jan. 12, 1910. Date claimed under International Convention, Jan. 19, 1909.

This invention consists in providing the body of the gas-nozzle of the bunsen with a cap, which, as the pressure of the gas rises, is lifted more and more from a contracted opening in the mixing-pipe and situated above the point of admission of the air, thereby enlarging the cross sectional area of the passage for the air.

The two figures show the burner with the parts in two positions.



Meyer-Zimmerli Regulator Bunsen Burner.

The burner-nipple is formed with a gas-inlet A, on which is placed a movable gas-nozzle B. The head of the nozzle contains the outlet openings for the gas, and carries an inverted conical collar C. When the gas is cut off, the nozzle is in its lower position, and the edge of the collar thereupon closes the contracted opening D provided in a mixing pipe, which surrounds the gas-nozzle body—the mixing-pipe being screwed in the nipple. The mixing-pipe has openings E underneath the opening D for admitting air. When gas is admitted into the nozzle, the gas pressure raises the nozzle body into the second position shown. The collar C moves away from the opening, and the cross sectional area for admitting the air is increased.

If the cross sectional area for admitting the air is again contracted, by a further rise of the nozzle, in consequence of the contraction of the mixing-pipe, the cross sectional enlargement corresponding to the rise in pressure is only possible for a short distance above the first position shown, after which the cross section remains the same for a distance and is then again reduced. If the pressure of the gas is diminished, the nozzle settles down, and the edge of the collar comes over the contraction of the mixing-pipe. The cross section is in this way decreased in the same relation as the quantity of gas flowing out is decreased, through the decrease in pressure.

Constant-Emission Gas-Calorimeters, &c.

FAHRENHEIM, H., of Essen-an-der-Ruhr, Germany.

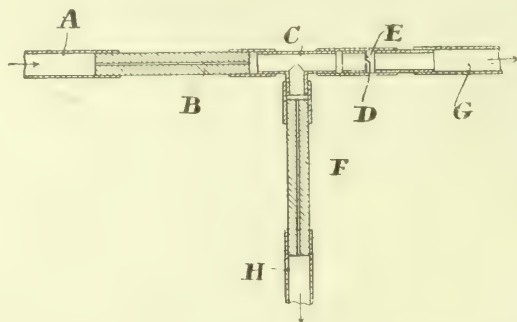
No. 3641; Feb. 14, 1910.

In apparatus used for the discharge or emission of constant streams of gaseous matter, the patentee points out, capillary tubes are in some cases used for the purpose of rendering the rate of discharge more or less independent of changes of specific weight. To secure complete independence, the ratio of the length to the diameter of the tube would have to be infinitely great. In practice, therefore, the influence of specific gravity is never entirely obviated by the means referred to—more particularly in apparatus used for delivering predetermined quantities of gas per unit of time, as in certain calorimeters. In most cases, the gas is only slightly above normal atmospheric pressure; so that the ratio of length and diameter of the tube must be very far from the ideal indicated. It has been established by careful tests that, under these conditions, there is actual dependence between the rate of emission and the specific weight of the gas; the dependence being linear in the sense that, with decreasing specific weight, the velocity of the gas in the tube increases.

The object of the present invention is to provide apparatus which



"enables considerable, practically uniform, quantities of gas to be discharged per unit of time, independently of changes of weight." Substantially, the invention consists in using, in parallel with a capillary tube of adequate dimensions, a small orifice in a thin wall, through which gas is discharged into the atmosphere; the gas issuing from the tube being alone used for the measurement, test, or other purpose for which a constant gas-supply is required.



Fahrenheit's Uniform Gas Discharger for Calorimeters.

The theory of the combination described is as follows: Under normal constant conditions, the rates of flow through the tube and hole respectively bear a definite, constant relation to each other. This relation is, however, at once upset if the conditions change. This is due to the fact that the rate of flow through the tube is subject to linear variation; whereas the rate of flow through the small orifice in the thin wall is subject to quadratic variation. With constant gas pressure, the square of the velocity of emission from the hole in the wall is inversely proportional to the specific weight of the gas. It follows that, with decreasing specific weight, the velocity of the gas flowing through the hole increases in quadratic progression. On the other hand, the velocity in the tube undergoes only linear variation; so that the quantitative change due to change of weight occurs mainly at the hole. In other words, if the passage afforded by the hole were not available, the total effect of change of weight would be evidenced in a quantitative change in the emission by the tube, whereas the provision of the hole causes the greater part of the change to be transferred to the hole. The change in the rate of delivery of the tube is then practically negligible.

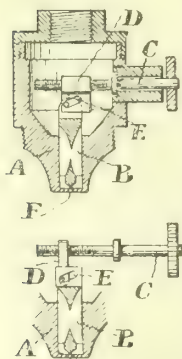
A construction embodying the combination described is shown in the accompanying section. A represents a conduit through which the gas flows from a pressure regulator to a capillary tube B, and thence into a chamber C. The latter has a minute discharge orifice D in a thin wall E; and a second parallel discharge is afforded by a capillary tube F. The gas issuing from the orifice D is led by a pipe G into the atmosphere—preferably through a chimney; while the gas issuing from the tube F is led by a pipe H to the apparatus or instrument in which it is required—for example, a calorimeter or analytical appliance.

### Regulating Device for Bunsen Burners.

HIRSCHHORN, J., of Berlin.

No. 2528; Feb. 1, 1910. Date claimed under International Convention, Feb. 16, 1909.

The object of this invention is to provide means for moving the valve of a bunsen burner by turning the spindle, so that the adjustment can be very accurately performed, and the risk of binding reduced to a minimum.



Hirschhorn's  
Bunsen  
Regulator.

Two constructions embodying the improvement are shown. In the first (A representing the nozzle, and B the valve), a spindle C has bearing in a sleeve fixed to the wall of the nozzle-chamber, and is screw-threaded within the chamber, in which it carries a screw-threaded rider D having a depending lug. This lug has an inclined groove or slot E engaged by a pin fixed to the valve. Inasmuch as the rider, thus engaged, cannot rotate on the spindle, it is moved to the right or left by rotating the spindle; and inasmuch as the valve cannot move to the right or left, it is compelled by the slot E to move downwards or upwards, to and from the gas-orifice F, during the movement of the rider. In the second arrangement, the valve B has a lug provided with a slot E, and the latter is engaged by a pin fixed to the rider D.

Other modifications are possible. For instance, the spindle itself may be longitudinally movable, by working in a screw-threaded bearing; the rider being in this case either axially immovable relatively to the spindle or engaged with the latter by a thread oppositely directed to the thread of the bearing.

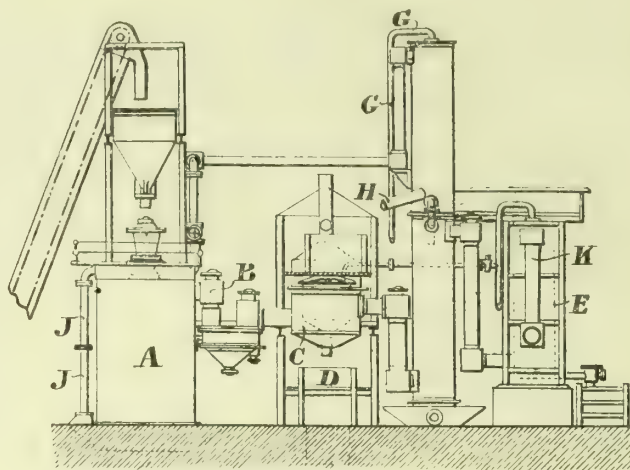
### Recovery of Ammonia from Producer Gas.

DUFF, A. B., of Pittsburg, U.S.A., and the GAS POWER AND BYE-PRODUCTS COMPANY, LIMITED, of Glasgow.

No. 4372; Feb. 22, 1910.

This invention has for its object to improve the process and simplify the apparatus used in the recovery of ammonia from producer gas.

As shown, the gas-producers (of which only one, A, is shown) are fed with fuel as usual by a central hopper, charged when required from an overhead hopper to which the fuel is raised by the usual elevator. The gas generated on leaving the producer passes, by a pipe B, into



Duff's Ammonia-Recovery Plant.

the usual collecting and dust-separating main. From the main the gas is led to the interior of a casing C surrounding a boiling-down pan, of usual construction—that is, it is fitted with an overhead vapour collecting canopy and vapour discharge pipe, and a valve controlled outlet through which the crystals and liquor formed are discharged to a drainer D, beneath which is the usual liquor well. By means of a valve controlled pipe, circulation is kept up in the ammonia recovery tower E (as hereafter described), so that the weak "sulphate liquor," produced in the tower in the usual manner, may pass, when required, to the boiling-down pan. Only a small amount of the heat in the gas within the casing C is required to expeditiously boil down this liquor; so that the gas leaves the casing still having a considerable portion of its sensible heat. From the casing C, the gas passes by a pipe connection to, and enters, the bottom of a gas washing and heat exchanging tower (of any known form). Water is admitted to the top of the tower and falls through it, so that the water is brought into intimate contact with the ascending gases, and as the heat in the gas is ample for the purpose, the temperature of the water is raised to, or near to, boiling point; and at the same time the water washes out the dust and a portion of the tars which the gas held in a fluid condition. On reaching the bottom of the tower, the water and tars fall into a tank luting the bottom of the tower; and the water is drawn from this tank by a pump (not shown) and forced up a pipe G to the top of a second tower placed above the gas-washing tower—the water entering this tower through some form of spray device on its upper end and leaving the bottom through a pipe connection, communicating through a spray device with the interior of the lower tower at the top of the latter. The upper tower is of "any known heat exchanging type."

Air from a blower (not shown) enters the bottom of the upper tower through a pipe H; and, as the air and the boiling water pass through this upper tower in opposite directions, not only is the air highly heated, but a very large amount of the steam required in the producer passes off with the heated air. The end of the pipe connections next the producer is fitted with a regulating valve, and enters what may be termed a false top, or enclosed space, formed in the top of the producer, so that advantage may be taken of the great heat at this part of the producer to superheat the mixture of air and steam. From the enclosed space the air and steam are led by a pipe J communicating, as usual, with the interior of the producer.

As described, the water, after parting with most of its heat and steam to the air passing through the upper tower, passes into the gas-washing tower, and is there reheated to or near the boiling point and again forced by the pump, through the pipe G, to the upper end of the upper tower; the circulation thus being continuous.

When the gas leaves the washing tower, its temperature is sufficiently reduced to permit of it being treated in the ordinary ammonia-recovery tower; and from the gas-washing tower the gas passes to the bottom of the ammonia-recovery tower E, where it is treated in the usual way with a weak sulphuric acid solution to produce the weak sulphate of ammonia—the solution being kept in circulation by a pump (not shown) drawing the liquid from an acid tank and forcing it to the top of the ammonia-recovery tower E. From this tower the gas passes through the usual main K either direct to a receiver or through mechanical washing plant of any desired form, depending on the use to which it is to be put.

It is to be understood, the patentees point out, that the various steps in the process and the various parts of the plant described are known separately, and that they make no claim to each individual step or part by itself.

**Gas Supply in Cork.**—Compared with the first half of the past year, the accounts presented at the ordinary general meeting of the Cork Gas Consumers' Company last Thursday showed a small increase in the consumption of gas in the six months ended the 30th of June, and a good return of residuals on the quantity of coal carbonized. The Directors in their report remarked that an increasing source of revenue was the extended use of gas for cooking and heating purposes; and that the consumption of gas on the slot-meter system was satisfactory. The balance of profit and loss was £6007, out of which the Directors proposed to pay a dividend at the rate of 8 per cent. per annum. This would amount to £5507, and leave £500 to be added to the reserve fund. The Chairman (Mr. George Lynch) pointed out that the consumers now numbered 9239, an increase of 388 over the previous year; while the demand for cooking and heating appliances continued. With regard to lighting, it was becoming more and more apparent that gas was more than able to hold its own in the competition it had to contend against by electricity.



## LEGAL INTELLIGENCE.

### RIVAL POWER-GAS PATENTS.

Lord Ardwall, on Wednesday last, in the Bill Chamber of the Court of Session at Edinburgh, disposed of an application made by the Gas Power and Bye-Products Company, Limited, of No. 116, Hope Street, Glasgow, to have Messrs. Wm. Beardmore and Co., Limited, of No. 36, Victoria Street, Westminster, carrying on business at Parkhead Forge, Glasgow, and elsewhere in Scotland, interdicted from permitting the Power Gas Corporation, Limited, of No. 39, Victoria Street, S.W., and their representatives or experts, to inspect the details and construction of gas producers and ammonia recovery plant erected by Messrs. Beardmore as licensees of the complainants. By contract entered into in October, 1904, the complainants granted a licence to Messrs. Beardmore to construct machinery and plant of the nature described in a patent held by them, at Parkhead and Dalmain, Glasgow. There was a provision in the contract by which Messrs. Beardmore undertook not to supply the plans and details of the machinery and plant to third parties, or to let the knowledge or contents of them out of their immediate possession. Messrs. Beardmore did not oppose the application, either by lodging answers or by appearing; and the Lord Ordinary, on July 19, granted interim interdict. This order would have become perpetual; but the Power Gas Corporation interposed by lodging a minute, in which they sought to be sisted as parties to the cause, for the purpose of opposing the application. To this minute answers were lodged by complainants, who asked that the minute be dismissed.

Lord ARDWALL stated his opinion to be that the Corporation had no right to be made parties to the action, which was founded entirely upon the contract between the complainants and Messrs. Beardmore, with which contract, or the performance of it, it appeared to him that the Corporation had no right to interfere, whatever supposed interest they might have to do so. The condition regarding the keeping secret of the plans and details of the machinery was a lawful and proper condition to be inserted in a licence; and the complainants were entitled to enforce it. Messrs. Beardmore had no answer, even if they had desired to make one—which they did not—to the granting of interdict as craved; but the Corporation intervened and pleaded that, by an indenture dated June 10, 1901, between the United Alkali Company, Limited (whose assignees the Corporation were), and Messrs. Beardmore and Co., and which granted a licence to the latter to use and exercise certain patented inventions, it was provided that the licensees would, at all suitable times, permit the grantor, or any person nominated by him, to visit and inspect the works and machinery of the licensees in use for the manufacture of all or any of the bye-products named in the letters patent. There seemed little doubt that this would cover the machinery put up by, or under the directions of, the complainants at Messrs. Beardmore and Co.'s works; but there could be no doubt that, so far as regarded the question between Messrs. Beardmore and the complainants, the provision could have no effect whatever. If Messrs. Beardmore had disabled themselves from carrying out the contract in the indenture, that might give rise to an action of damages against them, at the instance of the Corporation; but he could not see how, in a question with the complainants, it could invalidate a condition under which the complainants granted their licence to Messrs. Beardmore. The Corporation further said the complainants were not entitled to the interdict they craved, or that the Court should not grant it, in respect of an undertaking given by Messrs. Beardmore in the English Courts, as appeared from a copy order by Mr. Justice Joyce, dated May 30, 1910—that undertaking being to give the plaintiffs' witnesses (Mr. Humphrey and Mr. Hogg) inspection of ammonia recovery plant. If this were so, it was an undertaking which, in a question with the complainants, Messrs. Beardmore and Co. were not entitled to give, and which could not be held to affect the complainants in enforcing their contract against Messrs. Beardmore. He might add, though it was not necessary for the decision of the matter, that it appeared to him that an attempt was there being made by the Corporation to take advantage of the clause in their indenture with Messrs. Beardmore and Co. to obtain information regarding certain secret processes, not patented but of importance to the complainants, and which were worked, along with the complainants' patents, at Messrs. Beardmore and Co.'s works. It would be noticed, from the amended statement of claim of the Corporation against Messrs. Beardmore and Co., in the Chancery Division, that the action, while nominally an action for royalties under the indenture of licence of June, 1901, endeavoured to bring in a statement implying that the complainants' apparatus and plant were infringements of the Corporation's patents. If this were so, the proper course for the Corporation to take was to bring an action against the complainants for infringement; but it seemed that they had, in 1908, raised an action in the High Court of Justice in England, against Messrs. Beardmore and Co., asking injunction against them for infringing certain patents, and for damages. This action was defended by the present complainants, in the name of Messrs. Beardmore and Co., in terms of the minute of licence; and after defences were lodged, it appeared that the Corporation abandoned the action and paid Messrs. Beardmore's costs. The action in which the undertaking by Messrs. Beardmore and Co. was given was raised in 1908, and, as had been pointed out, was an action for accounting for royalties, to which the complainants had not been called, and could not appear, as defenders. They had now raised the present note of suspension and interdict it, to protect themselves against the inspection of their plant and machinery by representatives of rivals in trade; and he was of opinion that, under their contract with Messrs. Beardmore, the complainants were entitled to the protection they asked. In his opinion, the Corporation had no right to intervene in the present action; and he accordingly refused to sist them. With regard to expenses, it was open to doubt whether any decree for such could be competently pronounced against the Corporation. Seeing that they were not, and had not been, sisted as parties to the process, he thought the only safe course to follow was to give no expenses. He refused to sist the Corporation, appointed the minute to be withdrawn from the proceedings, and in respect of no answers having been lodged for Messrs. Beardmore

and Co., the only respondents called, he declared the interim interdict already granted perpetual; and he found no expenses were due to or by either party.

### TOWN COUNCILLOR'S GAS SUPPLY.

#### A Prosecution that Failed.

At a sitting of the Rawtenstall Police Court last Thursday, Peter Trickett, dentist, of Crawshawbooth, was summoned at the instance of the Rossendale Union Gas Company, firstly, for a breach of the Gas-Works Clauses Act, 1847, and, secondly, with stealing a quantity of coal gas.

The defendant, who is a member of the Rawtenstall Town Council, was represented by Mr. C. E. SUTCLIFFE; and Mr. J. L. WHITAKER appeared to prosecute for the Gas Company.

Mr. WHITAKER explained that there were two summonses issued at the instance of his clients. One of them charged the defendant with having laid, or known to be laid, a certain pipe to communicate with a pipe conveying gas to his house—a pipe belonging to the Rossendale Union Gas Company—without the consent of the Company, contrary to the Gas-Works Clauses Act, 1847. The other summons charged the defendant with having, between the dates mentioned, stolen a quantity of coal gas, the property of the Company. Mr. Whitaker submitted that it had been decided in more than one case—certainly in one—that for any kind of connection to be made with one of the Company's pipes without the consent of the Company, though it was done quite openly and without any fraudulent intent, was, in fact, an offence for which a penalty must be imposed. His chief difficulty in the present case was that he could not allege that this was done without a fraudulent intent. He was bound on the evidence he had to suggest to the Bench that, if the thing was done, it appeared to have been done fraudulently, and for the purpose of taking gas from the Company's pipes without passing through the meter. Since August of 1903, the defendant had practised as a dentist at Crawshawbooth, and had certain appliances there for which gas was used. Defendant had a gas-bracket adapted so that he might use it either for the purpose of lighting or for heating his boiler and the driving of a small engine. Compared with the gas consumption by his immediate predecessor, who was merely a householder and not in any kind of business, there was a marked diminution in the gas used, and there had been a tendency during the last few years for it to become less.

Evidence was given by Frank Carrington, an outside foreman in the employ of the Gas Company, and Joseph Clayton, a meter inspector. This was to the effect that about 10 o'clock in the forenoon of June 7 they visited the defendant, and had to wait something like a quarter-of-an-hour before being admitted. They examined the meter, which was in a cupboard up against an outside wall. Alongside the cupboard, and also against the wall, was a stone slab, and against this again was the slopstone. On getting a clear view of the meter, the officials found under the stone slab beneath the slopstone some woodwork; and when the woodwork was pulled away, it was discovered that there was a piece of india-rubber tube, about 12 or 15 feet long. Into the elbow of the service-pipe a brass tap had been inserted at some time, and the tubing was connected with the nozzle of the tap, and still underneath the woodwork. The officials, having made this discovery, went back to the Gas Company's office to report; and on returning the following day to take the elbow out and put a new one in, they found that a portion of the india-rubber tube had been torn off, leaving a small piece, however, which was produced in Court. If gas had been taken by the tap in the elbow, it would not have passed through the meter.

Mr. SUTCLIFFE argued for the defence that the tap and box arrangement, as found on June 7, was exactly in the same condition when Mr. and Mrs. Trickett took over the tenancy of the house seven years ago; that defendant knew nothing about the tube; that he did not, as suggested, between June 7 and 8 tear away the tube, and plug the tap; that the hole bored in the elbow had been bored by an expert, many years ago; and that as most of Mr. Trickett's dental work was done at his Burnley establishment, there was not much gas used at the house in Crawshawbooth. Mr. Sutcliffe added that it was common knowledge that outside Mr. Trickett's place in Crawshawbooth there used to be a public lamp which was lighted free of cost; and it appeared to him (Mr. Sutcliffe) that the tap had been put into the elbow for the specific purpose of supplying gas to that lamp, and that a hole was also bored in the cellar of Mr. Trickett's house to supply gas free to an Institute which at one time formed part of the premises.

Mr. and Mrs. Trickett gave evidence in support of this statement. Both strenuously denied having interfered with the tap or the tubing after the gas officials' visit on June 7. Asked to suggest a reason why the officials of the Company should state there was a piece of india-rubber tubing attached to the tap if such was not the case, Mr. Trickett declined to express any opinion—saying that he was not there to make allegations against anyone, but to speak the truth about himself. Mrs. Trickett strongly denied the suggestion that she kept the officials waiting at the door while the india-rubber tubing was torn off.

The Magistrates retired to consider their decision; and on returning into Court,

The CHAIRMAN (Mr. J. Ashworth) said: "The evidence is so conflicting that we have decided to dismiss the case."

**Camborne Gas and Water Supply.**—The accounts of the Camborne Gas Company for the year ended the 30th of June last, which were presented at the recent annual meeting, showed a sum of £626 available for distribution; and the Directors recommended the payment of a dividend at the rate of 3 per cent. for the six months, making 5½ per cent. for the year. The accounts presented at the half-yearly meeting of the Water Company showed a credit balance of £1048; and it was decided to pay dividends of 8 per cent. on the "A" shares and £5 12s. per cent. on the "B" shares.



## MISCELLANEOUS NEWS.

### PUBLIC LIGHTING OF WESTMINSTER.

#### Statement by an Electric Light Company's Secretary.

There has recently appeared in the electrical and other papers a statement by Mr. E. Willmot Seale, the Secretary of the Charing Cross, West End, and City Electricity Supply Company, Limited, on the subject of the street lighting in Westminster. The reason assigned for its publication is that the reports persistently appearing in the Press to the effect that electricity has been displaced by gas for street lighting "throughout that city" are untrue.\* He says the facts are as follows.

The Westminster City Council transferred the lighting of that part only of the City of Westminster which has been hitherto very efficiently and economically lit by the St. James's Electric Light Company, to the Gas Company. This lighting comprised the supply to 66 arc lamps. The Westminster Electric Lighting Company, under contract, are still supplying, and will continue to supply until 1931, 970 arc lamps, and the Charing Cross Company, under contracts which do not expire for some years, 165 arc lamps, in the City of Westminster. It will be seen, therefore, that about 5½ per cent. of the lighting previously carried out by the Electricity Supply Companies has been entrusted to the Gas Company.

These figures speak for themselves, and need no further comment on this head. When, however, so much attention is being called to the difference in the price quoted by the Electricity Supply Companies and the Gas Company respectively, it is only fair to the former that the conditions under which the respective prices were quoted should be understood and appreciated; and I therefore call attention to the following points.

The Electricity Supply Companies were invited, at considerable capital cost, to enter into a contract for five years, determinable at the expiration of that period at the option of the City of Westminster without compensation of any kind. Prices were also invited alternatively for ten and fifteen years contracts.

By the terms of the specification, the Electricity Supply Companies (the Gas Company's network of street lighting mains already covered the entire area) were compelled to quote for the whole of such specific district or districts as might be within their particular area of supply. The City of Westminster Council on their part reserved the right to select any part or parts of those districts for lighting by electricity, to the exclusion of other parts of the district, at the contract price per lamp quoted for the whole district. It is obvious, therefore, that the Electricity Supply Companies, in the event of the exclusion of parts of the district, might suffer serious loss.

The concessions of these Companies expire in 21 years, and all capital charges would have to be provided for within that period. The Gas Company is not purchasable by the local authority, and has, therefore, a practically unlimited period in which it would be possible to deal with capital charges.

The furnishing of the supply by the Electric Light Companies would have necessitated the laying of additional cables and construction of other works involving a very large capital expenditure. With the Gas Company, as to the greater portion of the work involved, mains were already laid and capital expenditure made.

The terms of the specification imposed by the Westminster Council were thus (unintentionally, no doubt) exceedingly unfair to the Electric Light Companies, and, owing to the existing conditions, were relatively favourable to the Gas Company.

In circumstances such as these, could the Electric Light Companies do otherwise, on business lines, than safeguard their shareholders' interest by making provision for these capital charges and contingencies in the price quoted per lamp? What could have been done if the specification had been framed so as to allow the Companies, as well as the City of Westminster, to select convenient portions of districts for tender, is evidenced by the fact that the St. James's Company, owing to matters which transpired at the Westminster City Council meeting on the 14th of April last, offered to continue their supply to the section then lit by them at a price which compared not unfavourably with the Gas Company's. Their request, although supported by nearly the whole of the principal shopkeepers in the area, was refused, on the ground that it had already been decided to place the contract with the Gas Company.

It has also been published abroad that the City of Westminster will effect very large savings by the arrangement with the Gas Company. This is not accurate *quâ* electric lighting. The City of Westminster in this connection is saving only the small difference between the low price charged by the St. James's Company and the cut-prices offered by the Gas Company. If, therefore, a saving is being effected, it is probably due to the drastic revision of the Gas Company's own prices for the supply they themselves have hitherto given in the City of Westminster.

The question, whether or not the contract will pay the Gas Company other than as an advertisement, is, of course, one for themselves and their shareholders. But an analysis of their published accounts would appear to show their costs are 1s. 10d. per 1000 cubic feet, while the contract price, which includes capital charges for street work, would appear to yield certainly not more than 1s. 3d. per 1000 feet, as against 2s. 8d. per 1000 feet charged to the general public. Would it be very unfair to deduce that considerations of advertisement and preference had an undue bearing upon the composition of the prices tendered by the Gas Company?

To put the matter shortly, making allowance for the considerations mentioned in the preceding paragraph, the whole of the difference between the prices tendered by the Gas Company and the Electric Lighting Companies respectively is due to this question of capital

charges in connection with the short unexpired periods of the Provisional Orders, the duration of the proposed contract (five years), and the handicapping conditions imposed by the terms of the tender upon the Electricity Supply Companies, and not to the price at which electricity could be sold under ordinary and reasonable conditions.

The method of arriving at the above figures of 1s. 10d. per 1000 cubic feet, the cost to the Gas Company of the gas sold to the public at 2s. 8d. per 1000 cubic feet, and 10½d. the price likely to be obtained by the Company under their contract with the City of Westminster, is set out by Mr. Seale in a communication to the "Electrician." In the course of it he makes the following remarks.

According to Mr. Bradley's report published in the "Electrician" of March 11, 1910, a 1000 candle power (nominal) high-pressure gas lamp, giving an average candle power of 880, takes 30 cubic feet of gas per hour. Therefore a 3000-candle lamp must take at least 90 cubic feet, or (say) 1000 cubic feet per 11 hours. As the number of lighting hours per annum is 3340, the total consumption of gas would be 354,600 cubic feet. With gas at 10½d. per 1000 cubic feet, the cost of 354,600 cubic feet is £15 10s. 3d.; leaving for the maintenance of 3000-candle power lamps (three mantles) £6 9s. 9d.—the contract price, £22.

It should be noted that maintenance items are not chargeable against private consumers in the price of 2s. 8d. per 1000 cubic feet. So this item is therefore omitted in the comparison; and the figure of 10½d. compares with 2s. 8d. Also, when the extreme urgency of the conditions relating to maintenance of candle power for the street-lamps is borne in mind, it will be evident that the above sum allowed for maintenance will probably be exceeded.

Moreover, no allowance has been made for capital charges. In this connection, it is true that the expenditure has already been incurred in the greater part of the area. But we understand that special mains are being laid for the 3000-candle power lamps; so that the figure of 10½d. must include capital charges, and make the price more inadequate still.

In regard to the cost of manufacturing the gas, the following figures are taken from the half-yearly accounts to Dec. 31, 1909, of the Gas-light and Coke Company:—

|                                                      | 1000 Cub. Ft. |
|------------------------------------------------------|---------------|
| Gas sold by meter . . . . .                          | 10,846,734    |
| Gas sold for public lighting and contracts . . . . . | 445,772       |
| Gas manufactured . . . . .                           | 12,109,500    |
| Costs—                                               |               |
| Total costs, including distribution . . . . .        | £1,424,941    |
| Less lighting and repairs of public lamps . . . . .  | £19,573       |
| „ depreciation of works on leasehold lands . . . . . | 500           |
| „ received for residuals . . . . .                   | 367,517       |
|                                                      | 387,590       |
|                                                      | £1,037,351    |

The cost per 1000 cubic feet of gas manufactured is therefore 1s. 8½d., and the cost per 1000 cubic feet of gas sold 1s. 10d.

### ELECTRIC LIGHTING AT PETERBOROUGH.

#### Local Government Board Inquiry.

At the Guildhall, Peterborough, last Tuesday, an inquiry was held by Mr. F. H. TULLOCH, M.Inst.C.E., into an application made to the Local Government Board by the Corporation, for authority to raise £2100 for electric lighting purposes. This sum was made up as follows: Extension of mains, £1120; street lighting, £310; additions to plant, £670.

The DEPUTY TOWN CLERK (Mr. W. T. Mellows) defined the district in which it was proposed to lay the new mains, and said the Electricity Committee had received applications during the past year or two from eight residents to instal electricity in their houses or premises; but, owing to there being no mains laid in the roads, these applications had been reluctantly refused, with the result that gas was at present installed in the houses. The Committee were therefore of opinion that, in the interests of the undertaking, the time had arrived to extend the mains along the roads specified, so as to be in a position to supply the new houses before gas was installed as the system of lighting. Until last year, the financial result of each year's working showed a steady improvement in the figures; and in 1907, 1908, and 1909 a surplus was realized after providing for interest and repayment of loans. Last year, however, the undertaking suffered a heavy loss through arbitration proceedings with the Peterborough Traction Company, who applied for a revision of the price at which electricity was supplied to them for power purposes. They had to refund £268, the cost of the proceedings was £1016, and £476 had been spent for new mains—making together £1760. There was a deficit on the year's working of £1801, or, regarding the last-named items as extraordinary expenditure, £41. The total amount of loans previously sanctioned for the electricity works was £54,317, of which £13,862 had been repaid or provision made for repayment. The amount of loans outstanding was £44,581. The last sanction was for £2880 for new mains and feeders, for which a period of 25 years was allowed.

The CITY ENGINEER (Mr. J. C. Gill) said the application might be divided into two parts—first, £1430 for laying new mains, promoted with the object of increasing the revenue; and, secondly, £670 for appliances at the generating station, the object of which was to enable the present plant to work more efficiently and economically. The station would not be complete without the proposed equipment. The adoption of metallic filament lamps had had a serious effect upon the consumption of electricity for power.

Mr. NORRIS (representing certain ratepayers) opposed the application. He said that when it was first proposed to start electricity works in Peterborough, there was considerable opposition, and several inquiries were held, at which large numbers of ratepayers were represented by Counsel. The Inspectors conducting the inquiries reported against the

\* Allusion to this letter is made in "Electric Supply Memoranda" this week.



establishment of electricity works in the city; and it was not until the Electricity Committee attended at the Board of Trade that the scheme was sanctioned. Since the works started, there had been a deficit of £7547, which had been paid out of the district fund as rates. It would therefore be seen that it was a serious question, from the ratepayers' point of view, as to how far this tremendous charge on the rates was to be allowed not only to continue, but, he feared, rather to increase. At any rate, the past year's trading had shown a rather disastrous result. Certainly, it was brought about to a great extent by unforeseen circumstances; but apparently they had a white elephant among them. They felt bound, it seemed, to keep it up; but what they objected to was the further increase of liabilities by the sanction of the proposed loan. Peterborough was a peculiarly constituted city, inasmuch as the great bulk of the inhabitants were of the working classes, and they would never be likely to require electric light. In support of his contention, he pointed out that a few years ago quite seven-eighths of the houses in the city were illuminated by oil-lamps; and it was only in recent years that gas had been adopted for cooking purposes through the medium of the penny-in-the-slot meters. Coming to the question of the cost of gas and electricity, Mr. Norris asserted that the comparative prices worked out very much against the latter illuminant. The difference in the cost of lighting the streets by gas and electricity was a very important item; and at a time like the present, when many public bodies in London and elsewhere were installing gas in the place of electricity, it was a very undesirable thing that electric lighting should be increased in a city like Peterborough. The cost of lighting five miles of streets to-day by electricity was £1000 more than it was when lighted by gas. From figures obtained from the Borough Surveyor, there were in the city 34 miles of streets, 5 miles of which were lighted by electricity, at a cost of £1653. The remaining 29 miles were lighted by gas, at a total cost of £2401. The actual cost per mile for electric light was £330 12s., and for gas £82 16s. 4d. In order to ascertain the cost of gas if it were used in the principal streets, he had added one-half as much again—£41 8s. 2d.—making the cost per mile in the main streets £124 4s. 6d. for gas. The cost for 5 miles of streets electrically lighted was £1653, and the cost of gas would be £621; leaving a balance, on this assumption, in favour of gas, of £1032. The ratepayers he represented believed that public lighting by electricity was a most expensive thing, and ought not to be extended. The only part of the city that could possibly yield a profitable return was already supplied; and they considered that the remaining portion should not be lighted by electricity, because they knew for a fact that, except where large carbon lamps were burnt at an enormous cost, the light given by the incandescent electric lamps was not so good as that afforded by gas. It was causing a large amount of extra rate to be expended, and great care should be taken that the charge on the rates should not be increased. He suggested that the amounts asked for should not be sanctioned, as he was quite sure they would never show a profit.

The DEPUTY TOWN CLERK having dealt with some of Mr. Norris's remarks,

The ENGINEER took up the subject of the public lighting. He said that in comparing the cost they could not take 5 miles of streets in the centre of the city and contrast them with 29 miles on the outskirts. The only way was to take the same streets and compare the cost when lighted by gas and by electricity respectively. If they took the principal business streets of the city, which were now lighted by electric arc lamps, and compared the cost with that previously paid for gas, they found the annual cost was greater for gas than for electricity, while the electric lamps gave ten times the light. With regard to the lamps in the outer part of the city, they had two incandescent lamps of 50-candle power on each column where they had superseded the gas-lamps, and they cost the same as the gas.

The INSPECTOR: You can do that at the same price as gas without loss, and give the same light?

The ENGINEER: Yes; and I say we give a much better light.

Mr. NORRIS said that in 1900 the whole city was lighted by gas for £2267, while last year electricity alone for the 5 miles of streets cost £1653.

The ENGINEER explained that a great many more streets were lighted now than there were then.

Mr. NORRIS said there could not be more than a mile. In 1900, when there were at least 32 or 33 miles, the cost of gas for the whole area was only £2267; whereas last year the electric light cost £1653. The cost of gas and electric lighting together was £4054, which was nearly double what it was in 1900, when no electricity was used. This sum seemed to him to be prohibitive and showed that the extension of electricity should not go on indefinitely.

The DEPUTY TOWN CLERK explained that there were a great many streets and bye-ways lighted now that were not lighted in 1900.

Alderman CLIFTON (the Chairman of the Electricity Committee), in supporting the application, said the Committee had come to their decision after the fullest consideration; and they felt thoroughly justified in proceeding with the proposed works.

The inquiry then closed.

## MUNICIPAL LOANS FOR TRADING UNDERTAKINGS.

### Local Government Board's Right to Dispense with a Public Inquiry.

Mr. P. Percival, Secretary to the Manchester Ratepayers' Association, has not as yet received a reply from the Local Government Board to his communication asking upon what authority the Board relied for dispensing with a public inquiry in reference to the Electricity Committee of the Manchester Corporation and a loan of £40,000 for extensions at the works—a matter that was referred to in the last issue of the "JOURNAL." Mr. Percival has, however, been informed by the Electricity Committee that the Board acted as they did by virtue of the Electric Lighting Act, 1909. "That being so," says Mr. Percival, "the action of the Board may be perfectly legal; but yet my Association think it may be destructive to the interests of the ratepayers as a body, and against the best principles of local government."

According to information supplied by the Electricity Committee, it

seems that tentative sanctions for raising loans to the amount of £40,000 were granted in 1907; and this money has been spent. Mr. Percival, explaining how it was expended, says: "In round figures, the sum of £30,000 has been spent in providing equipment for 23 consumers. These consumers, with one exception, are large manufacturers; and they are, according to the admission of the Electricity Committee, supplied with current at cost price. The total capital outlay of the Electricity Committee is £2,680,000; and the sole return from this to the general body of the ratepayers this year is £15,000, or less than three-quarters per cent., obtained under great pressure. The policy underlying these transactions is greatly open to question, especially as the Gas Committee have so much capital of the citizens invested in their undertaking—an undertaking we are in the habit of looking to annually to prevent an increase in the rates. In any case, the operations of the Electricity Committee ought to be dealt with in full daylight, when applications for large sums are made; for it is only at a public inquiry that the policy of the Committee can be searchingly, and therefore adequately, examined. The action of the Local Government Board is a new departure, and in the wrong direction. It ought to be resisted in every legitimate manner possible."

## EASTBOURNE GAS COMPANY.

Presiding at the half-yearly meeting of the Eastbourne Gas Company, the Chairman (Dr. G. A. Jeffery, J.P.) remarked that the sales of gas for the six months to June 30 amounted to 220 million cubic feet, as against 213 millions in the corresponding period of the previous year, or an increase of  $4\frac{1}{2}$  per cent. This increase was partly derived from the extension of the mains to the Hailsham district. The total number of consumers was 9739—4846 ordinary, and 4893 prepayment. This showed a gain on the year of 793 consumers. Coal and oil cost £16,953 in the half year, as against £16,876 in the first six months of last year; the price of coal having been 17s. 5d. per ton, compared with 17s. 1d. The capital expenditure was now £191,841, a sum equal to £415 per million cubic feet on the sale last year of 458½ million feet. The net profit for the past half year was £8777, as against £7456 in the corresponding period of last year—an increase of £1321, or 9.46 per cent. The report and accounts were adopted; and dividends were declared for the half year at the rates of 7½ per cent. per annum upon the "A" stock, 6½ per cent. per annum upon the "B" stock, and 5 per cent. per annum upon the 5 per cent. preference stock. Thereafter the salary of the Secretary (Mr. J. S. Garrard, F.C.I.S.) was increased by £50 per annum, free of income-tax; and a vote of thanks was accorded to the Directors, officers, and workmen for the care with which they had conducted the affairs of the Company, as shown in the accounts and by the growth of the business. The services of the Chairman were also acknowledged.

## SALISBURY GAS COMPANY.

At the recent annual meeting of this Company, the Chairman (Mr. George Fullford), in moving the adoption of the report and accounts, and the payment of the usual dividends, said the work during the past year had been satisfactory; and he could again congratulate the shareholders on the position of the business. The recent reduction in the price of gas represented a loss of £860 per annum to the Company, and a corresponding gain to the consumers. The Directors always had in view the desirability of fully and efficiently maintaining the plant necessary for the manufacture, purification, and distribution of gas; and the Engineer and Manager (Mr. Norton H. Humphrys), who was an expert in these matters, was ever ready to adopt any recognized improvement. Some alterations were in progress at the works. The fitting, service, maintenance, and other departments of the outside staff had been fully occupied during the year; and consumers gladly appreciated the economy and the other advantages of having their burners and mantles kept in proper order by experienced hands. In view of the installation of the high-pressure system of gas lighting at Westminster and elsewhere, the Engineer had been instructed to arrange an exhibition of the system at the town office of the Company. The Directors desired to recognize most fully the excellent work carried on by Mr. Humphrys, the capable services of Mr. A. Whitehead, the Secretary, and the foremen of the several departments, and the whole of the staff, for he felt that one and all had co-operated in assuring the success of the undertaking during the past year. The report was unanimously adopted; and the thanks of the meeting were accorded to the Chairman, Directors, and staff for their services.

## NEW MILLS GAS-WORKS EXTENSIONS.

### Local Government Board Inquiry.

Mr. A. W. Brightmore, M.Inst.C.E., one of the Inspectors of the Local Government Board, recently held an inquiry at the offices of the New Mills Urban District Council in regard to an application by them for sanction to borrow £3400 for extensions at the gas-works and the provision of water-gas plant. The Clerk to the Council (Mr. Joseph Pollitt) explained that in 1905 they had 827 gas consumers, whereas now they had 1411—an increase at the rate of 70 per cent. The quantity of gas made in the year 1904-5 was 26,178,000 cubic feet; for the past year it was 41,674,000 cubic feet, or an increase at the rate of 60 per cent. The average annual make was now about 42 millions; and they had 820 cookers and grillers in use. The Gas Manager (Mr. P. Lancashire) furnished particulars of the proposed extensions; the amount to be spent on the water-gas plant being put down at £1500. He added that there was no doubt the plant would be a great acquisition to the works, and would obviate, at any rate for the present, the necessity for the construction of a gasholder at a cost of about £4000. Mr. Billinge, who supported the application, referred to the progress made since the gas-works were acquired by the Council. He said they had been almost rebuilt; and the price of gas had been very greatly reduced.



## GAS STOKING MACHINERY FOR PERTH.

The Gas Committee of the Perth Town Council have approved the report of a Sub-Committee in reference to the proposal to introduce stoking machinery into the gas-works.

The report stated that the present system of charging and discharging retorts consists of coal breaking, elevating, and conveying machinery, overhead coal-storage bunkers, and four hand-stoking appliances. It is proposed to take advantage of the existing coal breaking, elevating, and (it is anticipated) conveying plant; and greater economies will be effected by working it in conjunction with a new charging and discharging machine. None of the existing plant will require to be displaced except hand-stoking appliances, two of which can be sold, and two retained as a stand-by. Circumstances have entirely changed since the hand appliances were installed. Not only has the output of gas greatly increased, but the methods for the carbonization of coal have been practically revolutionized. The development of the vertical retort, and the improved results obtained from chambers packed full of coal, has attracted the attention of gas engineers to the possibility of obtaining improved results from the existing horizontal system by increasing the thickness of the layer of coal in the retort. By the new system a charge of 16 cwt. of coal may be laid in a through retort at one operation; the process of opening the retort doors, discharging the coke, and refilling the retort with coal occupying the space of only 55 seconds. To carbonize 100 tons of coal by this system—the average daily consumption during the winter months in Perth—only 125 charges would be required per twenty-four hours day. To perform this work and attend to the other duties of the retort-house, only three men per eight-hour shift would be employed. At the present time, five to six men are required to perform this work, because the coal is laid in 560 charges of 3½ cwt. each; and in the charging and drawing operations four hand-worked rakes and four hand appliances are employed. The report of the Manager, dated Nov. 23 last, showed that the proposed work could be carried out at an initial outlay of £3900. The money saving to be effected by the introduction of machinery, it is estimated, will amount to the net sum of £700 a year, after providing for repairs and maintenance, and interest and sinking fund charges.

The Committee, after careful consideration, unanimously approved of the Manager's report, and appointed a Sub-Committee to institute further inquiries regarding the De Brouwer projector and discharger, the best example of which could be seen at Derby, where the system has been in operation for about six years, and the Fiddes-Aldridge simultaneous charger and discharger, which has been in operation in Liverpool for four years. The Sub-Committee made inquiry at twelve gas-works using the De Brouwer machine, and of a like number using the Fiddes-Aldridge machine, in order to ascertain the practical results obtained by them. After full and careful consideration of all the features of the various machines which were inspected, the Sub-Committee were unanimously of opinion that the De Brouwer combined charger and discharger, as seen at Derby, was better adapted for Perth than any of the others; and while the prime cost did not unduly influence the Sub-Committee, it was a point in its favour that the initial cost of the De Brouwer machine was less, and the cost of maintenance was not more, than any of the other machines. The Sub-Committee therefore unanimously recommended the adoption of the De Brouwer machine. It had been urged that the hand appliances, which were put to work ten years ago, should be continued in use until their original cost had been redeemed. But as it had been considered prudent to retain two of these machines as a stand-by, only two machines, of the original value of £420, would require to be disposed of; and the difference between the price which these will bring and the original cost will not amount to more than £250—a trifling sum compared with the saving to be effected of money and labour by the new system, and one which could be cleared off during the first year's working of the new plant. The following is a detailed statement of the annual saving estimated by the adoption of the new machine.

|                                                                                                              |           |
|--------------------------------------------------------------------------------------------------------------|-----------|
| Reduction in coal account, due to increased yield of gas                                                     | £613 15 0 |
| Reduction in working expenses (wages)                                                                        | 448 8 4   |
| Total saving                                                                                                 | £1062 3 4 |
| Less annuity to repay £3900 (the initial outlay) in ten years, calculated at 3½ per cent., compound interest | 332 8 9   |
| Net annual saving                                                                                            | £729 14 7 |

It has been urged that further capital expenditure at the Friarton Gas-Works is not desirable at present, owing to the already heavy capital on the undertaking. It is not now proposed to incur capital expenditure. It may be recalled, however, that the works, as originally planned in 1897-98, when the make of gas was at the rate of 138,357,000 cubic feet per annum, were estimated to cost £75,000—leaving contingencies out of account. Yet at May 15, 1910, when the output had reached 226,553,000 cubic feet per annum, the total expenditure on the new works had only reached £75,898. As the result of the increasing popularity of gas, and the extension of the gas supply area from time to time, considerable expenditure has been incurred in providing new mains, meters, and stoves. During the period from May 15, 1902, to May 15, 1910, the number of gas consumers has increased from 8804 to 10,125; and the number of cooking and heating appliances hired or sold by the Corporation has increased from 3048 to 10,798. During the eight years from May 15, 1902, to May 15, 1910, the gross capital expenditure was £38,624. In the same period, £10,937 has been repaid in respect of gas-stored capital and parliamentary expenses on Bills, and £36,891 has been carried to the sinking fund for redemption of loans—total £47,828. Taking into account this rapid rate of repayment, together with the fact that the capital account on the undertaking is now practically closed, and that the business is increasing most satisfactorily, the finances of the department are in a healthy condition. As an indication of the stability of the concern, it may be stated that during the period from May 15, 1902, to May 15, 1910, the output of gas has increased by 25·1 per

cent.; and while the capital charges per 1000 cubic feet of gas sold have increased from 11·15d. to 13·0·8d., the cost of manufacturing and delivering the finished gas into the holders, including all materials, renewals, repairs, maintenance, salaries, and wages, has been reduced from 1s. 8·22d. to 10·37d. per 1000 cubic feet sold, and the average price of gas to consumers has been reduced from 3s. 3·61d. to 2s. 10·57d.

The Sub-Committee were satisfied that the introduction of new automatic stoking machinery, as proposed, would effect further economies, and that the saving resulting from its use would be sufficient to repay the total initial outlay in a few years' time, without having recourse to capital expenditure.

## GAS AND WATER UNDERTAKINGS IN RHYMNEY VALLEY.

### A Transfer Agreement Arrived At.

The decision arrived at by the Bedwellty Urban District (Rhymer Valley) Council last week to purchase the undertaking of the New Tredegar Gas and Water Company, and that by the Caerphilly Council to purchase the Rhymer and Aber Valleys Gas and Water Company's works, will place the supply of these commodities in the whole of the Rhymer Valley under the absolute control of the local authorities. The decision is being hailed with general satisfaction, writes a Rhymer Valley correspondent, and is the goal for which many of the progressive councillors have been struggling, together with the local Press, for a very considerable period. The situation generally is, however, a very complex one, because the areas under control by the respective Companies dovetail so much into each other. The New Tredegar Company have in reality no water-works, nor even storage reservoirs; but they own a profitable undertaking in the gas-works. Though the price has not yet been divulged, it is understood that the interests of the ratepayers have been well protected.

The question of the purchase of the Rhymer and Aber Valleys Company's works was first brought about two years ago, in connection with the Glamorgan Water Bill. A formidable objection to the Bill was lodged by the Rhymer Valley authorities. Ultimately the opposition was withdrawn, upon certain conditions, one of which was that the District Councils interested in the area of supply of the Rhymer and Aber Company should have the right to purchase the whole of the undertaking—such option to remain in abeyance for three years. This period will expire next August. Joint conferences have been held to bring the option into effect. The Caerphilly and Gelligaer Councils, who have the local administration on the Glamorgan side of the valley, and the Rhymer, Bedwellty, Mynyddislwyn (Urban), and St. Mellons (Rural) Councils, who control affairs on the Monmouth side, attended the preliminary conferences. The Rhymer Council were the first to break away from the combine, because they had secured preferential treatment under the Rhymer and Aber Act. The Company were by Statute bound to deliver a minimum quantity of water to them each day at a fixed price, and the Council then became the distributors. In the matter of gas, the Company hold the monopoly; but a clause is inserted in the Act fixing the maximum charge which can be levied by the Company for the commodity. Thus, in consequence of this preferential treatment, Rhymer now hold simply a "watching brief" in the negotiations.

The Bedwellty Council were next to fall away from the Joint Board. The Council have for many years been the distributors of water to a very large proportion of the New Tredegar and Cwmystyog districts of the Council's area. This water is supplied to them by meter by the Tredegar District Council. The Aberbargoed and Pengam portions of their area are, however, under the jurisdiction of the Rhymer and Aber Company. With the prospect of the purchase of the New Tredegar Company's undertaking, it was thought inadvisable for them to continue with the Joint Board scheme any further.

Mynyddislwyn, who have a small portion of their district at Fleur-de-Lis, and the St. Mellons rural district, with the extensive developments at Bedwas, were, however, wholly dependent on the Rhymer and Aber Company, and consequently remained in the combine as "paying-guests." On the Glamorgan side of the valley, Gelligaer, with the exception of the Tirphil ward, are entirely in the hands of the Rhymer and Aber Company for both water and gas. True, there is an Electric Light Company at Bargoed, who have powers over the whole of the valley; but at present their operations are confined to Bargoed. The members of the Gelligaer Council, however, hold different views on the matter of municipalization; and though the reports from the conferences have repeatedly come up for discussion, there has not yet been a whole-hearted line of policy adopted.

Caerphilly occupy an equally important position so far as the operations of the Company are concerned; and, with the exception of the Taffs Well and Nelson wards, are entirely dependent on the Rhymer and Aber Company. Some six years ago, they entered into, and completed, negotiations with the South Wales Electric Light Supply Company to secure current from the Treforest Works for street lighting in the Aber Valley and Llanbradach; but the Company, having got into difficulties, they did not carry out the obligations referred to.

Unless steps were taken forthwith to issue the statutory notices, it became obvious that the clause secured during the discussions in London on the Glamorgan Water Bill would not be operative. With Rhymer and Bedwellty having abandoned the combine, Gelligaer in an undecided mood, and Mynyddislwyn and St. Mellons simply as purchasers, the Caerphilly Council alone became the "whole-hoggers." It speaks much for the democratic spirit of this Council that they have decided to tackle the enormous undertaking. There is, however, every probability that they will shortly be joined by Gelligaer. The combined rateable value of these two Councils is nearly £225,000, and the population close upon 50,000. There is a well-founded rumour that, in order to simplify matters of administration, the Bedwellty Council will offer an exchange of districts, and surrender their gas and water rights at Tirphil and Brithdir in return for the Rhymer and Aber Company's powers at Aberbargoed and Pengam. But it is premature for any decision upon this matter.



# BIRKENHEAD CORPORATION WATER SUPPLY.

## The Alwen Scheme.

Readers of the "JOURNAL" are aware that the Birkenhead Corporation have decided to proceed without further delay with their scheme for bringing a new water supply from large reservoirs to be constructed on the River Alwen. Although the undertaking will not approach in magnitude the Liverpool reservoirs at Vyrnwy or the Radnorshire supply of the Birmingham Corporation, it will be a very considerable one, involving ultimately an expenditure of £1,750,000. On its completion, three large centres of population will be drawing their water supplies from the North or Mid Wales watersheds. The following particulars in regard to the scheme have been furnished by a correspondent to the Engineering Supplement to "The Times."

Birkenhead obtained its parliamentary powers three years ago, and the Act allowed ten years for the execution of the scheme. Three years of this time have already elapsed. The immediate reasons for now deciding to proceed are that the water from the wells which form part of the present sources of supply is diminishing in quantity, and that a slight deterioration in quality is also noticed. It is estimated that a period of five years will be required for the completion of the dam and first reservoir from the time of cutting the first sod to the actual turning on of the water; and six months will probably be taken up beforehand in letting the contract and other preliminaries.

The original Engineer of the scheme was the late Dr. George F. Deacon; but after his death Sir Alexander Binnie, Son, and Deacon were appointed in his place. The scheme provides for the construction of three reservoirs, to be built at successive periods as required. The first will have a total capacity of 3500 million gallons, and it is proposed to take 7 million gallons a day for the supply of the borough. The second reservoir, which is to be constructed when necessary, will hold 1700 million gallons, yielding a supply of 5.9 million gallons a day, with a possible surplus of at least a million gallons daily from the first reservoir. It is not expected that the third reservoir will be required for a considerable number of years. The estimated cost of the first reservoir is £740,000, and of the second £545,000; and the aggregate expenditure for the entire scheme is put at £1,750,000. The population of Birkenhead will probably be between 130,000 and 140,000 when the first reservoir is completed; and there is a surrounding population that is continually increasing.

Two mountain watersheds are included in the area of 6313 acres from which the water supply will be drawn; and the first reservoir will be 1200 feet above the level of the sea. The third reservoir will eventually be formed below the confluence of the Alwen and another stream. The length of the dam of the first reservoir will be 458 feet, and its height 92 ft. 6 in. The top-water area of the reservoir will be 375 acres, and its length will be about three miles. The water-main will cross the Vale of Clwyd to the south of Ruthin, pass south of Moel Famau towards Mold, in Flintshire, on into Cheshire by Burton, and finally discharge into a large reservoir to be formed at a sufficiently elevated point a few miles from Birkenhead.

# NOTES FROM SCOTLAND.

## From Our Own Correspondent.

Saturday.

On another page, an account is given of a proposal by the Gas Committee to introduce stoking machinery into the Perth Corporation Gas-Works. The recommendation has come from the Gas Committee with unanimous voice. It is expected that when the matter comes before the Town Council there will be opposition to it. It may be regarded as natural that those members of the Council who were not privileged to go on deputations to view stoking plant in use in other works will, notwithstanding that they know next to nothing on the subject (perhaps because of their ignorance), bear a critical attitude towards the proposals of those who have been studying the problem for months. Although opposition is anticipated, there is every reason to believe that it will not be sufficient to bar the progress of the Gas Committee in their endeavour to bring the gas-works more up to date than they have become in the short space in which they have been open. It is probably on account of the desire to have the carbonizing plant more worked out than it is as yet, that there have been no proposals for either inclined or vertical retorts. For a time (for how long we cannot tell) carbonizing at Perth is to be done in horizontals. This decision, we must assume, has been arrived at intentionally. Mr. M'Lusky is sufficiently wide awake to be aware of what can be done in retorts set in other fashion; and if he has elected to continue horizontals in practice, we can only conclude that, at present at least, he does not see where would be the advantage to the undertaking of either inclines or verticals. I have called attention to this feature of the Perth proposals because of my belief in Mr. M'Lusky's rectitude of judgment on all matters he applies his mind to, and of the reflective value which the decision of one so well versed as he is in current conditions must have in the case of others who are studying the same subject.

The Greenock Town Council on Thursday fixed the prices of gas for the year. Bailie Taylor, the Convener of the Gas Committee, moved that the price to ordinary consumers be reduced from 2s. 10d. to 2s. 9d. per 1000 cubic feet, and that for power purposes the price remain at 2s. 6d. The minutes showed that in Committee Bailie Chalmers had moved that a reduction of 2d. be made, but that his motion was lost by eight votes to three. In the Council, Dean M'Callum said he had hoped that some of the surplus of £7000 would have been applied towards the relief of taxation, as it was anticipated that there would be an increase of the rates. He should also have liked to see another penny off the price of gas; but as the Convener and the Manager were anxious to have a fair surplus to work upon at this time, and as they had just come out of what he might call a state of chaos, he did not wish to press an amendment. The Convener's motion was agreed to.

The Corporation of Glasgow have adopted the recommendation of the Gas Committee, foreshadowed in these "Notes" last week, that they should undertake the supply of gas-fires on the hire-purchase system. The payments are to be twelve in number, quarterly, which will make the article hired the property of the consumer at the end of three years from the first payment. Arrangements have been made with

# GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 571.

| Issue.     | Share. | When ex- Dividend. | Dividend or Bonus. | NAME.                    | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex- Dividend. | Dividend or Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|--------------------|--------------------|--------------------------|-----------------|---------------------|------------------------|-----------|--------|--------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|
| £          |        |                    | p.c.               |                          |                 |                     | £ s. d.                | £         |        |                    | p.c.               |                            |                 |                     | £ s. d.                |
| 1,474,000  | Stk.   | Apr. 1             | 5                  | Alliance & Dublin Ord.   | 80-83           | ..                  | 6 0 5                  | 4,940,000 | Stk.   | May 12             | 9                  | Imperial Continental       | 184-116         | +7                  | 4 16 9                 |
| 310,000    | Stk.   | July 14            | 1                  | Do. 4 p.c. Deb.          | 97-99           | ..                  | 4 10 10                | 1,235,000 | Stk.   | Aug 12             | 3                  | Do. 3 p.c. Deb. Red.       | 122-94*         | ..                  | 3 14 5                 |
| 200,000    | 5      | May 12             | 7                  | Bombay, Ltd.             | 14-63           | ..                  | 5 7 7                  | 200,242   | Stk.   | Mar. 16            | 6                  | Lea Bridge Ord. 5 p.c.     | 122-124         | ..                  | 4 16 9                 |
| 40,000     | 5      |                    | 7                  | Do. New, £4 paid.        | 43-53           | ..                  | 5 9 3                  | 501,000   | Stk.   | Feb. 25            | 10                 | Liverpool United A.        | 219-221         | ..                  | 4 10 6                 |
| 50,000     | 10     | Feb. 25            | 15                 | Bourne- 10 p.c.          | 29-30           | ..                  | 5 0 0                  | 718,100   | "      | "                  | 7                  | Do. B.                     | 165-166         | ..                  | 4 4 4                  |
| 311,810    | 10     | "                  | 7                  | mouth Gas B 7 p.c.       | 162-163         | ..                  | 4 3 7                  | 306,083   | "      | June 29            | 4                  | Do. Deb. Stk.              | 104-106         | ..                  | 3 15 6                 |
| 75,000     | 10     | "                  | 6                  | and Water Pref. 6 p.c.   | 15-153          | ..                  | 3 17 5                 | 75,000    | 5      | June 29            | 5                  | Malta & Mediterranean.     | 40-413          | ..                  | 6 4 8                  |
| 380,000    | Stk.   | Aug. 12            | 123                | Brentford Consolidated   | 246-249         | ..                  | 5 0 5                  | 560,000   | 100    | Apr. 1             | 5                  | Met. of 15 p.c. Deb.       | 100-102         | ..                  | 4 18 0                 |
| 330,000    | "      | "                  | 93                 | Do. New                  | 184-186*        | ..                  | 5 2 2                  | 250,000   | 100    | "                  | 44                 | Melbourne 4 p.c. Deb.      | 100-102         | ..                  | 4 8 3                  |
| 50,000     | "      | "                  | 5                  | Do. 5 p.c. Pref.         | —               | ..                  | —                      | 541,920   | 20     | May 27             | 33                 | Monte Video, Ltd.          | 123-13          | ..                  | 5 7 8                  |
| 206,250    | "      | June 10            | 4                  | Do. 4 p.c. Deb.          | 99-101          | ..                  | 3 19 3                 | 1,775,892 | Stk.   | July 28            | 43                 | Newcastle & Gt. S. d. Con. | 101-102         | ..                  | 4 5 9                  |
| 220,000    | Stk.   | Mar. 16            | 11                 | Brighton & Hove Orig.    | 214-217         | ..                  | 5 1 5                  | 529,435   | Stk.   | June 29            | 33                 | Do. 3 p.c. Deb.            | 90-91           | ..                  | 3 16 11                |
| 246,320    | "      | "                  | 8                  | Do. A Ord. Stk.          | 153-156         | ..                  | 5 2 7                  | 55,940    | 10     | Feb. 25            | 7                  | North Middlesex 7 p.c.     | 134-133         | ..                  | 5 1 10                 |
| 460,000    | 20     | Apr. 1             | 108                | British                  | 443-453         | ..                  | 4 13 5                 | 300,000   | Stk.   | Apr. 29            | 8                  | Oriental, Ltd.             | 138-140         | ..                  | 5 14 4                 |
| 109,000    | Stk.   | Aug. 11            | 6                  | Bromley, A 5 p.c.        | 117-119*        | ..                  | 5 0 10                 | 60,000    | 5      | Apr. 1             | 8                  | Ottoman, Ltd.              | 64-63           | ..                  | 6 3 1                  |
| 165,700    | "      | "                  | 43                 | Do. B 3 p.c.             | 83-90*          | ..                  | 5 0 0                  | 31,800    | 53     | Feb. 25            | 13                 | Portsea Island A.          | 134-136         | ..                  | 5 1 0                  |
| 82,278     | "      | "                  | 53                 | Do. C 5 p.c.             | 106-108*        | ..                  | 5 1 10                 | 60,000    | 50     | "                  | 13                 | Do. B.                     | 126-128         | ..                  | 5 1 7                  |
| 55,000     | "      | June 29            | 33                 | Do. 3 p.c. Deb.          | 85-87           | ..                  | 4 0 6                  | 100,000   | 50     | "                  | 12                 | Do. C.                     | 110-121         | ..                  | 4 19 2                 |
| 250,000    | Stk.   | "                  | 4                  | Buenos Ayres 4 p.c. Deb. | 97-99           | ..                  | 4 0 10                 | 114,800   | 50     | "                  | 10                 | Do. D and E.               | 100-102         | ..                  | 4 18 0                 |
| 100,000    | 10     | "                  | —                  | Cape Town & Dis., Ltd.   | 3-4             | ..                  | —                      | 398,490   | 5      | Apr. 29            | 7                  | Primitiva Ord.             | 713-714         | ..                  | 4 11 1                 |
| 100,000    | 10     | "                  | —                  | Do. 4 p.c. Pref.         | 53-63           | ..                  | —                      | 796,980   | 5      | June 29            | 5                  | Do. 5 p.c. Pref.           | 58-52           | +13                 | 4 13 0                 |
| 50,000     | 50     | May 3              | 6                  | Do. 6 p.c. 1st Mort.     | 49-50           | ..                  | 6 0 0                  | 488,900   | 100    | June 1             | 4                  | Do. 4 p.c. Deb.            | 97-99           | ..                  | 4 0 10                 |
| 100,000    | Stk.   | June 29            | 43                 | Do. 4 p.c. Deb. Stk.     | 88-90           | ..                  | 5 10 0                 | 312,650   | Stk.   | June 29            | 4                  | River Plate 4 p.c. Deb.    | 97-99           | ..                  | 4 0 10                 |
| 157,150    | Stk.   | Aug. 12            | 5                  | Chester 5 p.c. Ord.      | 1083-1103*      | ..                  | 4 10 6                 | 250,000   | 10     | Apr. 1             | 9                  | San Paulo, Ltd.            | 153-162         | ..                  | 5 10 9                 |
| 1,513,280  | Stk.   | "                  | 57                 | Commercial 4 p.c. Stk.   | 105-107*        | ..                  | 4 17 2                 | 62,500    | 10     | "                  | 6                  | Do. 6 p.c. Pref.           | 113-124         | ..                  | 4 18 0                 |
| 560,000    | "      | "                  | 5                  | Do. 3 p.c. do.           | 101-103*        | ..                  | 4 17 1                 | 125,000   | 50     | July 1             | 5                  | Do. 5 p.c. Deb.            | 51-52           | +13                 | 4 16 2                 |
| 475,000    | "      | June 29            | 3                  | Do. 3 p.c. Deb. Stk.     | 80-82           | ..                  | 3 13 2                 | 135,000   | Stk.   | Mar. 16            | 10                 | Sheffield A.               | 234-236         | ..                  | 4 4 9                  |
| 800,000    | Stk.   | June 10            | 5                  | Continental Union, Ltd.  | 93-97           | +2                  | 5 3 1                  | 209,981   | "      | "                  | 10                 | Do. B.                     | 234-236         | ..                  | 4 4 9                  |
| 200,000    | "      | "                  | 5                  | Do. 7 p.c. Pref.         | 135-137         | ..                  | 5 2 3                  | 523,500   | "      | "                  | 10                 | Do. C.                     | 234-236         | +1                  | 4 4 9                  |
| 492,270    | Stk.   | "                  | 7                  | Derby Con. Stk.          | 122-124         | ..                  | 4 8 9                  | 70,000    | 10     | May 27             | 7                  | South African.             | 11-114          | ..                  | 6 1 0                  |
| 55,000     | "      | "                  | 4                  | Do. Deb. Stk.            | 101-105         | ..                  | 3 10 2                 | 6,429,895 | Stk.   | Aug. 12            | 5/9/4              | South Met., 4 p.c. Ord.    | 120-122*        | ..                  | 4 9 7                  |
| 148,995    | "      | Apr. 1             | 5                  | East Hull 5 p.c. Ord.    | 96-98           | ..                  | 5 2 0                  | 1,895,445 | "      | July 14            | 3                  | Do. 3 p.c. Deb.            | 79-81           | ..                  | 3 14 1                 |
| 486,090    | 10     | July 14            | 12                 | European, Ltd.           | 23-24           | ..                  | 5 0 0                  | 203,823   | Stk.   | Mar. 16            | 8                  | South Shields Con. Stk.    | 15-158          | ..                  | 5 1 3                  |
| 354,060    | 10     | "                  | 12                 | Do. £7 ros. paid.        | 171-183         | ..                  | 4 18 8                 | 605,000   | Stk.   | Aug. 12            | 53                 | S'th Suburb'n Ord. 5 p.c.  | 10-12           | ..                  | 4 12 9                 |
| 16,179,445 | Stk.   | Aug. 12            | 43                 | Gas 4 p.c. Ord.          | 105-106*        | +3                  | 4 8 0                  | 60,000    | "      | "                  | 5                  | Do. 5 p.c. Pref.           | 120-122*        | ..                  | 4 2 0                  |
| 2,600,000  | "      | "                  | 33                 | light 3 p.c. max.        | 87-89*          | ..                  | 3 18 8                 | 117,058   | "      | July 14            | 5                  | Do. 5 p.c. Deb. Stk.       | 121-123         | +1                  | 4 1 4                  |
| 4,062,235  | "      | "                  | 4                  | and 4 p.c. Con. Pref.    | 102-104*        | ..                  | 3 16 1                 | 502,310   | Stk.   | May 12             | 5                  | Southampton Ord.           | 110-112         | ..                  | 4 9 3                  |
| 4,531,705  | "      | June 29            | 3                  | Coke 3 p.c. Con. Deb.    | 83-82           | ..                  | 3 13 2                 | 120,300   | Stk.   | Aug. 12            | 7                  | Tottenham A 5 p.c.         | 136-138         | ..                  | 5 1 5                  |
| 258,740    | Stk.   | Mar. 16            | 5                  | Hastings & St. L. 3 p.c. | 94-96           | +1                  | 5 4 2                  | 483,940   | "      | "                  | 53                 | and B 3 p.c. Deb.          | 111-111*        | ..                  | 4 17 4                 |
| 82,500     | "      | "                  | 63                 | Do. do. 5 p.c.           | 117-119         | ..                  | 5 9 3                  | 149,470   | "      | June 29            | 4                  | Edmonton 4 p.c. Deb.       | 57-59           | ..                  | 4 0 11                 |
| 70,000     | 10     | Apr. 29            | 11                 | Hongkong & China, Ltd.   | 17-173          | ..                  | 6 5 9                  | 182,380   | 10     | June 10            | 8                  | Tuscan, Ltd.               | 9-93            | ..                  | 8 8 6                  |
| 131,020    | Stk.   | Mar. 16            | 72                 | Ilford A and C           | 147-150         | +2                  | 4 18 4                 | 149,900   | 10     | July 1             | 5                  | Do. 5 p.c. Deb. Red.       | 97-99           | ..                  | 5 1 0                  |
| 65,780     | "      | "                  | 54                 | Do. B                    | 114-116         | ..                  | 5 1 3                  | 236,476   | Stk.   | Feb. 25            | 5                  | Tynemouth, 5 p.c. max.     | 113-115         | ..                  | 4 6 11                 |
| 65,500     | "      | June 29            | 4                  | Do. 4 p.c. Deb.          | 93-103          | ..                  | 4 0 0                  | 255,636   | Stk.   | Feb. 25            | 63                 | Wands-1 B 3 p.c.           | 139-141         | ..                  | 4 15 0                 |
|            |        |                    |                    |                          |                 |                     |                        | 85,766    | "      | June 29            | 3                  | worth 1 p.c. Deb. Stk.     | 73-75           | ..                  | 4 10 0                 |

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



plumbers throughout the city for the fitting-up of the fires under the supervision of the Gas Department.

The Forres Gaslight Company, Limited, have paid a dividend of 5 per cent. for the past year.

In another part of the "JOURNAL" will be found an account of a legal process between rival patentees of apparatus for the production of power gas. We do not know anything about the processes, and indeed the one party does not seem to know much about the process of the other, for the purpose of the litigation was to keep the process of the complainers from the knowledge of the others. But the fact that the parties consider their properties worth protecting by law is an indication that there is something of value in the production of power gas. When we consider what is being said in journalism this week about the propulsion of war vessels by means of power gas, the proposition is self-evident—that power-gas plant may in the near future become a most valuable possession.

Mr. John Smith is to take over the duties of Gas Manager at Stirling on Monday. On Tuesday evening last, he entertained the members of the gas-works staff and friends at Dumfries at dinner. In the course of the evening, Treasurer Wyper, in the name of the staff and others in Dumfries, presented Mr. Smith with a barometer and a pair of framed engravings, as a token of esteem and an earnest of their good wishes for his success in his new sphere. Mr. Smith returned thanks for the unlooked-for presentation, and expressed regret at his severance from the many friends he had met with in Dumfries.

### CURRENT SALES OF GAS PRODUCTS.

#### Sulphate of Ammonia.

LIVERPOOL, Aug. 27.

There has again been an active market during the past week, and all parcels offered have been eagerly competed for at still hardening values. New business direct from consumers has, however, been rather scarce, and the bulk of the buying has been for the covering of sales made by dealers previously. The closing quotations are £12 3s. 9d. to £12 5s. per ton f.o.b. Hull, £12 5s. to £12 6s. 3d. per ton f.o.b. Liverpool, and £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Leith. Although there has been some inquiry in the forward position, few first-hand sales have transpired; but it is reported that £12 7s. 6d. per ton was paid for delivery f.o.b. Leith over the early months of next year.

#### Nitrate of Soda.

The position of this article has become firmer; and the prices on spot have been advanced to 9s. 4½d. and 9s. 7½d. per cwt. for ordinary and refined qualities respectively.

#### Tar Products.

LONDON, Aug. 29.

The market for tar products has been very steady during the past week. Pitch has been very firm, and there has been a considerable

inquiry for forward delivery. Creosote remains steady. In benzols, there is a fair amount of inquiry for forward delivery, and manufacturers are firm in their ideas of price. Solvent naphtha remains about the same; but there is not a great amount of new business. Crude carbolic acid is still of very little interest.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d., ex works. Pitch, London, 37s. to 37s. 6d.; east coast, 37s. to 37s. 6d.; west coast, 35s. 6d. to 36s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 2d. to 1s. 3d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

#### Sulphate of Ammonia.

The market for this article is decidedly firm; and in some quarters the prices have improved slightly. To-day, Beckton prompt is quoted at £11 15s. to £11 16s. 3d. Outside London makes are £11; Hull, £12 3s. 9d.; Liverpool, £12 2s. 6d.; Leith, £12 7s. 6d.; and Middlesbrough, £12 3s. 9d.

### COAL TRADE REPORTS.

#### Northern Coal Trade.

There is a steady demand for coals, and the output is at the present time ample; so that the shipments are heavy, both of steam and gas coals. In steams, the tone of the market is quiet. Best Northumbrians are 9s. 10d. to 10s. per ton f.o.b., second-class steams about 9s., and steam smalls from 5s. 6d. to 6s. 9d., according to quality. This market still seems to feel the loss of contracts diverted to other coal-fields at the time of the stoppages in Northumberland in the spring. In gas coals, there is now a steady increase in the home consumption, so that the deliveries on the long contracts are being enlarged; and there is also a fairly good export. The production is, however, heavy, and meets the needs readily. Durham gas coals vary in price. The usual classes are from 9s. to 9s. 10½d. per ton f.o.b., according to quality; and "Wear" specials are from 10s. 4½d. to 10s. 6d. As to contracts, there has been the settlement of these over the winter and next year—some 38,000 tons—for Palermo, at about 9s. 9d. per ton f.o.b. A Danish company has also bought 20,000 to 25,000 tons of best gas coals, delivered at Marriagerford; and the price is said to be 14s. per ton. Other contracts are now in course of negotiation. As to coke, the market is generally steady; but the increasing output of gas

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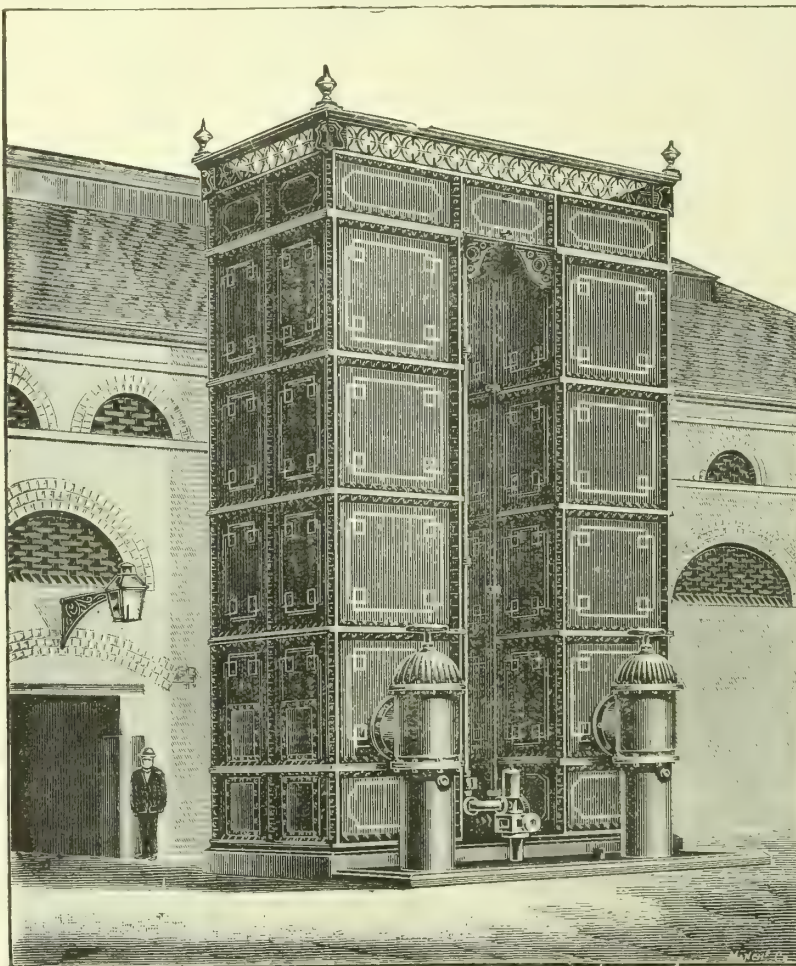
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CARDIFF,  
PERNAMBUCO,  
WELLINGBOROUGH,  
NEW MILLS,  
SNYDALE,  
MIDDLESBROUGH,  
ETRURIA,  
NORWICH,  
EAST HULL,  
KINGSTON-ON-  
THAMES,  
BRISTOL,  
WALKER AND  
WALLSEND,  
and other Works.



coke makes it easier. Good gas coke is quoted from 15s. to 15s. 6d. per ton f.o.b., according to time of delivery.

#### Scotch Coal Trade.

Trade is still slow; the foreign demand being poor, and with little prospect of improvement. There is a growing feeling among coal-owners in favour of a movement for the reduction of the minimum wage paid to miners, which, it is felt, is too high when account is taken of the prices obtainable for coal. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 340,091 tons—a decrease of 6014 tons upon the previous week, and of 22,245 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,298,323 tons—an increase of 910,027 tons upon the corresponding period.

#### Position of the St. David's Water and Gas Company.

The application by a debenture-holder for the appointment of a Receiver and Manager, which was made to the Vacation Judge (Sir Samuel Evans) on the 17th inst. (see *ante*, p. 329), was renewed last Wednesday. Counsel stated that the Secretary of the Company had now made an affidavit from which it appeared that the revenues were gradually increasing. On the last occasion, his Lordship raised the question whether he had jurisdiction to appoint a Manager of a statutory undertaking. Having considered the matter, Counsel said he could not ask the Court to appoint one; all he asked for was the appointment of a Receiver. His Lordship inquired how the inhabitants of St. David's would get their water; and Counsel replied that the Receiver would have power to make a subsequent application to the Court to enable further money to be raised so as to carry on the business of the Company. His Lordship appointed a Receiver, and directed that he should be at liberty to act forthwith.

**Reduction in Price at Blyth and Cowpen.**—At the half-yearly meeting of the Blyth and Cowpen Gas Company, the Chairman (Mr. William Thompson) said the profit and loss account showed a balance of £7948 available for appropriation; and the Directors felt justified in recommending that a dividend be paid at the rate of £3 7s. 6d. per cent., less income-tax. The payment of this dividend on the £65,704 capital of the Company would absorb a sum of £2086, leaving the comfortable sum of £5862 as a floating working balance. The quantity of gas made had been 54,286,000 cubic feet, an increase of 1,414,000 feet when compared with the corresponding period of last year. The financial position being so favourable, the Board had carefully considered the question of the charge for gas, and had decided that the price should be reduced 2d. per 1000 cubic feet. This reduction would apply to all consumers, and make the price 2s. 8d. per 1000 feet.

#### Unpleasant Experience of Mr. J. H. Brown, of Nottingham.

Mr. J. H. Brown, the Engineer and General Manager of the Nottingham Corporation Gas Department, who returned last Sunday from a motor cycle tour in France and Germany, had an unpleasant experience at Metz, where he was arrested as an English spy. He told a "Daily Chronicle" representative on Sunday night that he travelled ten days ago (*via* Boulogne and Paris) to Switzerland, and on Friday last commenced his return journey by riding from Basle through the Black Forest to Metz. He arrived in the German frontier town about seven in the evening, and, anxious to complete his journey quickly to attend a farewell service to a local minister at the Albert Hall, he entered a café and secured a guide. He then inquired as to the quickest way of reaching England, and chose a roundabout route by which he could join a train reaching Calais sooner than the ordinary express *via* Paris. This circumstance, combined with his travel-stained and torn garments, aroused suspicion; and suddenly two police officers appeared and placed him under arrest on suspicion of being an English spy. "So insolent were they," said Mr. Brown, "that had any policeman in England done half I should have hit him in the jaw. I told them as much, and it made them very cross. At the police station they searched every paper I had, demanded an explanation of a tear I had in my clothes, why I had travelled so fast, why I wanted to get back to England in such a hurry, and were suspicious of every little circumstance to a most ludicrous degree. After keeping me for six hours while they made every possible inquiry about me, I was liberated at two o'clock on Saturday morning."

**Bristol Public Lighting.**—During the last financial year, the Gas Lighting Department of the Bristol Corporation spent £23,355, which is equivalent to a rate of 3'55d. in the pound. The gas supplied cost £10,641, and £8021 was paid for wages. Electric lighting cost £12,026; representing 1'83d. in the pound.

**Reduction in Price at Barking.**—Presiding at the half-yearly meeting of the Barking Gas Company last Wednesday, at which a very satisfactory statement of accounts was presented, Mr. A. E. Humphreys-Owen expressed his pleasure at being able to place before the shareholders such evidence of continued prosperity, and also to announce that the price of gas had been reduced to 2s. 11d. per 1000 cubic feet. Maximum dividends were declared on each class of shares; and a hearty vote of thanks was accorded to the Directors and officials.

**Improved Public Lighting at Launceston.**—At their last meeting, the Launceston Town Council accepted a tender by the Gas Company for the lighting of the lamps. Mr. Proctor said they were to pay 3s. 3d. per 1000 cubic feet for all the gas consumed, and in addition the cost of lighting and extinguishing, £95. Mr. Hicks remarked that they hoped to save by the introduction of the new system of incandescent lighting. Some of the old lamps which had been dispensed with were a disgrace to the town. They had put up new lanterns and incandescent burners in their place.



## The EVER-INCREASING POPULARITY of the "MAIN" COOKERS

Has led to this old-established firm having to use Motor Lorries to cope with their present demand. ¶ The above illustration depicts three of the "Main" Lorries ready to start the day's deliveries, and to give an instance of the enterprise shown by this firm, Lorries Nos. 5 and 6 were actually constructed throughout at their Gothic Works, Edmonton. ¶ Full particulars of this firm's specialities will be sent on receipt of a post-card addressed to

**R. & A. MAIN, Ltd.,** 25, PRINCES STREET, OXFORD CIRCUS, W.



### Increase of Population in London Suburbs.

According to the recently issued annual report of the Medical Officer of Health for the County of Middlesex, the population of the county has risen from 792,314 at the time of the Census of 1901 to 1,123,328 at the end of June last year, or an increase of 331,014. The following figures show the extent of the growth in certain of the districts:—

| District.                      | 1901.   | 1909.   |
|--------------------------------|---------|---------|
| Acton . . . . .                | 37,744  | 56,000  |
| Chiswick . . . . .             | 29,809  | 37,059  |
| Ealing . . . . .               | 33,031  | 52,550  |
| Edmonton . . . . .             | 44,911  | 61,164  |
| Finchley . . . . .             | 42,738  | 57,453  |
| Hendon . . . . .               | 22,129  | 41,627  |
| Heston and Isleworth . . . . . | 21,685  | 34,219  |
| Hornsey . . . . .              | 30,863  | 35,672  |
| Tottenham . . . . .            | 72,056  | 92,839  |
| Willesden . . . . .            | 102,541 | 149,283 |
| Willesden . . . . .            | 114,811 | 150,145 |

It will be noticed that the population of Finchley has almost doubled; while increases of 50 per cent. have taken place in Hendon and Ealing. This necessarily means greatly increased business for the respective gas companies.

**Enfield Gas Company.**—At the half-yearly meeting of the Company to-day, the Directors will report that the balance of gross profit amounts to £6111, which sum is reduced by the net interest charges to £5495. They have transferred £875 to the credit of the reserve fund and £693 to the credit of the insurance fund; leaving £3930 available for distribution. They recommend a dividend at the rate of 5½ per cent. per annum on the consolidated ordinary stock (less income-tax), leaving £15 to add to the undivided profit previously accrued, augmenting this fund to £11,334.

**Barnsley Gas Company.**—Moving the adoption of the report and accounts at the annual meeting of the Barnsley Gas Company, the Chairman (Mr. E. G. Lancaster, J.P.) remarked that the Board were committed to a serious expenditure in connection with the provision of a new system of retorts, which they were advised would be more economical, and would relieve stokers of a good deal of hard work which they now had to do. The balance-sheet showed, after paying full dividends, a margin of £449. They had always promised, as soon as possible to return to the old system of discounts for prompt payment. They thought they would now be able to do this; and the discount they proposed, on the basis of last year's figure, would amount to £630. Some might think it was rash to give so much, with a margin of £449; but they would take the small risk, hoping, if the new retorts produced the expected result, that in the course of a few years they would not only be able to give the contemplated 2½ per cent. discount, but to increase it. The balance carried to profit and loss account was £8359, against £7788 the previous year; and this result was produced by reduced working expenses and the sale of more gas.

**Quality of Portsmouth Water.**—The Medical Officer of Health for Portsmouth has reported to the Corporation that the whole of the water supplied by the Portsmouth Water Company is being filtered; that the quality of the water is now second to none in the kingdom; and that its sparkling character is maintained, contrary to the opinion entertained by many that it would be destroyed by the filtration system in use.

**Aberystwyth Gas Company.**—In the report of this Company, of which Mr. Henry Woodall is the Managing-Director, for the half year ended the 30th of June last, the Directors express their pleasure in recording the continued success of the undertaking. The growth in the sale of gas, compared with the corresponding period of 1909, was at the rate of 4 per cent.; and the loss from leakage was reduced by 440,000 cubic feet. In compliance with a resolution passed at the annual meeting in February, the August meeting is discontinued; but the Directors have decided to pay the usual dividends at the rates of 12½ per cent. per annum on the original shares and £8 18s. 6d. per cent. per annum on the new shares, both less income-tax.

**Position of the British Coalite Company.**—A rumour having been in circulation that the British Coalite Company have closed down a portion of their works, a representative of the "Financial News" made inquiries at the Company's office, and was informed that this was the case. The following remarks appeared in our contemporary yesterday: "The rumour was taken as indicating a serious state of affairs; but officially it is said to do the reverse. A Managing-Director has been appointed, and this gentleman informed our representative that the staff is being reorganized to a certain extent, and that the plant is being put into shape for working on more continuous lines. That portion of the plant which is erected at Wednesfield, therefore, has been closed down; but, on the other hand, the Company is starting up at Barking 'so that,' said the Managing-Director, 'there is really not much truth in the rumour. It is rather favourable than otherwise.'"

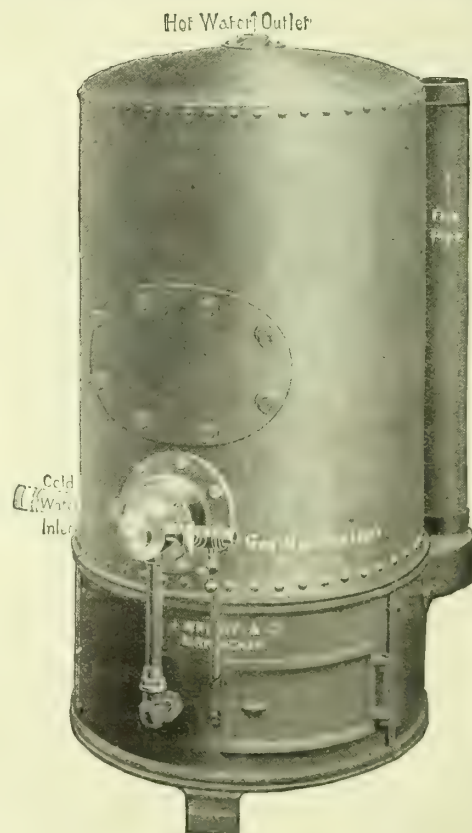
**Magistrate as Gas Shareholder.**—At the Old Street Police Court last Friday, Alfred Watt, a carman, was charged with stealing from a prepayment gas-meter 8s. 2d., the moneys of the Gaslight and Coke Company. When the charge was called, Mr. Cluer, the Magistrate, remarked that he was unable to decide the case, which must either go to the Sessions after the evidence had been heard or be put back for another Magistrate to hear. He regretted that the time and money of both the Company and the Courts should be wasted in this manner, but he personally was powerless, as he held, as trustee, some shares in the old West Ham Gas Company, which had been absorbed by the prosecuting Company. Some time since, at considerable loss, he had been compelled to dispose of some shares he had held in the latter Company, as the law with regard to a Magistrate having an interest in any company or undertaking connected with a charge before him was very explicit. The evidence showed that the prisoner had been employed to move some tenants from a house in Great Chart Street, and, during their temporary absence, he had broken open the gas-meter. The accused was remanded.

## The "SUN" Boiler.

The "SUN" is constructed on accurate scientific principles—all tending to ensure maximum effectiveness with a minimum gas consumption.

The "SUN" has a most important virtue—viz., a perfect working, non-capsule Thermostat—which prevents any delay and loss of efficiency in heating up the water.

And one more, hardly less in importance—Boiler and Tank in one, and right over the Burner—thus saving loss of heat in circulation, when hot water is not being drawn off.



**JOHN WRIGHT & CO.,  
Essex Works,  
BIRMINGHAM.**



**Sale of Shares.**—Mr. A. W. Tyrrell recently offered for sale, at the Red Lion Hotel, Basingstoke, £922 of consolidated ordinary 5 per cent. stock of the Basingstoke Gas Company. The £100 lots fetched prices varying from £106 to £104; the £50 lots were sold at from £53 to £52; the £25 lots realized from £26 to £25 10s.; and the remaining £22 of stock was sold for £23.

**The Price of Gas at Bolton.**—The Gas Committee of the Bolton Corporation, at their meeting last Friday, had again under consideration the question of the price of gas to consumers with prepayment meters. It was decided to re-affirm the resolution passed in the early part of July, fixing the charge at 1d. per 27 cubic feet. The local Trades Council had by deputation urged upon the Committee to give 30 cubic feet; but a resolution to this effect was defeated by a large majority at the last meeting of the Town Council.

**Winchester Gas and Water Supply.**—At the meeting of the Winchester Water and Gas Company last Friday, the Directors reported that the receipts from the sale of gas and water continued to be satisfactory. The balance of net revenue available for distribution was £5538; and the Directors recommended the payment of dividends on the preference and consolidated ordinary stock at the rate of 4 per cent. per annum, less income-tax, for the half year ended the 30th of June. The Directors mentioned that the Bill promoted by the South Hants Water Company had received the Royal Assent; and they expressed their pleasure in reporting that the protecting clauses which they were advised to require, had been accepted and incorporated in the Act. The Engineer and General Manager (Mr. H. C. Head) reported that all the Company's plant had been maintained in efficient condition.

**New Joint-Stock Companies Registered.**—A private Company, having the title of Duckham and Cloudsley, Limited, has been registered with a capital of £5000, in £1 shares, to acquire from Woodall and Duckham, Limited, an exclusive licence to use and vend certain existing inventions in relation to the carbonization of coal and other matters; also to acquire any information or rights relating to the production, treatment, storage, distribution, and use of gas, &c. The first Directors are A. M. Duckham and J. L. Cloudsley (both permanent). The registered office is at Palace Chambers, Westminster, S.W. The Oundle Gaslight and Coke Company (1910), Limited, has been registered with a capital of £4000 in £5 shares, to take over the business of the Oundle Gaslight and Coke Company. The Company has been registered without Articles of Association.

A project is on foot for laying a water-main 9½ miles long in Eger (Hungary). The cost of the work is estimated at 2,000,000 kronen, or about £83,300.

At Goring-on-Sea (Sussex), the Parish Council have determined to recommend to a parish meeting a lighting scheme for the parish, which will entail a charge upon land of 1½d., and on buildings of 4½d., in the pound.

The Directors of Messrs. Stewarts and Lloyds, Limited, have declared the following interim dividends for the half year ended the 30th of June: At the rate of 6 per cent. per annum on the preference shares; and at the rate of 10 per cent. per annum on the preferred ordinary shares.

At a Local Government Board inquiry, which was held consequent upon an application by the Wath-upon-Deane and Bolton Gas Board for sanction to borrow £17,296, it was stated that the total profit of the recently acquired undertaking for the fifteen months to March, 1910, amounted to over £3000. It was further explained that gas was sold at from 3s. 2d. to 3s. 9d. per 1000 cubic feet. The amount of the proposed loan included £2296 for land; the remainder of the money required being for plant, mains, services, &c.

## APPLICATIONS FOR LETTERS PATENT.

- 19,129.—ZAHN, O., "Gas-furnaces." Aug. 15.  
 19,155.—DR. C. OTTO AND CO., G. M. B. H., "Treating distillation gases for the recovery of tar and ammonia." Aug. 15.  
 19,175.—PATSCHE, A., "Gas-turbine." Aug. 15.  
 19,181.—SCHACHTEL, H., "Production of combustible gas." Aug. 15.  
 19,197.—WILLIAMS, B., "Combined coke quencher and conveyor." Aug. 15.  
 19,207.—CHANDLER, S., and ROBERT CORT AND SON, LTD., "Gas apparatus." Aug. 16.  
 19,218.—KELLY, J. T., "Pipe-unions." Aug. 16.  
 19,246.—ZECHNALL, L., "Bunsen burners." Aug. 16.  
 19,262.—DRABBLE, H., "Gas rings or burners." Aug. 16.  
 19,292.—COVENTRY, W., "Inverted burners." Aug. 17.  
 19,375.—JACKSON, J. P., "Gasometers." Aug. 18.  
 19,382.—SADLER, H. S., and ASHMORE, BENSON, PEASE, AND CO., LTD., "Purification of gas." Aug. 18.  
 19,414.—HANDS, G., and TURNER, F., "Inverted burners." Aug. 18.  
 19,419.—ANDERSON, D., "Controllers for gas." Aug. 18.  
 19,420.—ANDERSON, D., "Gas-lamps." Aug. 18.  
 19,421.—ANDERSON, D., "Cocks for gas." Aug. 18.  
 19,422.—PIGGOTT, F., "Artificial fuel." Aug. 18.  
 19,429.—SPROTT, E. W., "Pipe-connectors." Aug. 18.  
 19,443.—KOENIG, J., "Pipe-joints." Aug. 19.  
 19,488.—FLORY, T. W., "Gas hot-plates." Aug. 19.  
 19,524.—BLAKEY, J. W., A. G., & J., "Gas-burner." Aug. 20.  
 19,552.—DR. C. OTTO AND CO., G. M. B. H., "Obtaining directly ammonia from hot tar-free gases of distillation." Aug. 20.  
 19,555.—LALIBERTE, A. J., "Mixtures for increasing combustion." Aug. 20.  
 19,564.—SAVORY, C. B., "Ascertaining the specific gravity of fluids and vapours." Aug. 20.

Wait  
and  
See.

OUR New Season's Gas Fires, like the Incandescent Mantle, will create a new era in the Gas World.

A HIGHLY SCIENTIFIC FUEL, or patented construction, will also be a feature of our Winter Campaign.

RADIATORS have come in for an equal share of attention. Radical improvements have been effected, and an entirely new departure has been introduced.

*Full details will be placed before the Gas Engineers of the Kingdom very shortly. Each item will excel in the matter of*

MAINTENANCE.

LONDON  
Show-Rooms:

59, Queen Victoria St.,  
City.

MANCHESTER  
Show-Rooms:  
Victoria Arcade  
Deansgate.

DAVIS  
Gas Stove  
Co., Ltd.,  
LUTON.



The Directors of the Imperial Continental Gas Association recommend a dividend of  $4\frac{1}{2}$  per cent., less income-tax, for the half year ended the 30th of June, compared with 4 per cent., free of income-tax, for each of the eight preceding half years.

A dividend of 5 per cent. and a bonus of 2s. 6d. per share are recommended by the Directors of the British Gaslight Company, Limited, for the half year ended June 30. This time last year a similar dividend was announced; but there was no bonus.

We have received from the Bland Light Syndicate, Limited, their catalogue for 1910-11. It consists of 56 quarto pages, in which are shown the newest types of their inverted burners, suitable for ordinary

church, factory, and workshop lighting. There is also presented a very large collection of artistic globes, shades, and fittings, and lobby and outdoor lamps; a page being devoted to the "Blanlite" regenerative lamps for street lighting. Particulars are given of plant for high-pressure lighting, as well as of the "Telephos" distance lighters and accessories for Bland burners. On the front page of the wrapper is an effective representation of a Bland three-light pendant; the back page having as its centre-piece a reproduction of a photograph of what is called "a famous Eastern building" lighted entirely by Bland burners and "Blanlite" lamps. The place is not mentioned; but it is one where, notwithstanding the poet's assertion, "East meets West"—the Bland light being the connecting-link.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situation Vacant.

DRAUGHTSMEN. No. 5268.

### Situations Wanted.

GAS ENGINEER AND MANAGER. (Abroad). No. 5275.  
ENGINEER, MANAGER, OR HEAD DRAUGHTSMAN. No. 5277.  
METER INSPECTOR AND COLLECTOR. "Competent," Wellingborough.

### Plant for Disposal.

FILTER PRESS. Sutton (Surrey) Gas Company.

### Sale of Gas Stock.

WESTON-SUPER-MARE GASLIGHT COMPANY. Sept. 20.

### TENDERS FOR

#### Collecting Works and Conduit.

BAKU WATER-WORKS. Tenders by 14/27th October.

#### Coal.

RAWMARSH URBAN DISTRICT COUNCIL. Tenders by Sept. 10.

### Coke.

RAMSGATE CORPORATION. Tenders by Sept. 12.

### Lime.

STAINES AND EGHAM GAS COMPANY. Tenders by Sept. 9.

### Tar and Liquor.

STAINES AND EGHAM GAS COMPANY. Tenders by Sept. 9.

### Tar.

PADIHAM URBAN DISTRICT COUNCIL. Tenders by Sept. 7.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

### TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to  
WALTER KING, II, BOLT COURT, FLEET STREET, LONDON, E.C.  
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

### OXIDE OF IRON.

#### O'NEILL'S OXIDE

For GAS PURIFICATION.  
LARGEST SALE OF ANY OXIDE.

#### SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,  
PALMERSTON HOUSE,  
OLD BROAD STREET, LONDON, E.C.

#### WINKELMANN'S

#### "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.  
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

#### BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.  
Correspondence invited.

#### LUX'S GAS PURIFYING MASS.

See Advertisement on First White Page.  
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

#### READ HOLLIDAY AND SONS, LTD.,

HUDDERSFIELD,  
Are prepared to Supply  
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE  
in large Quantities.

ENQUIRIES SOLICITED.

#### BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 25, COLLEGE HILL,  
LONDON, E.C., and 25, BRIDGE END, LEEDS.

#### AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.  
Telegrams: "CHEMICALS."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.  
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.  
REPAIRS RECEIVE PROMPT ATTENTION.  
Telephones: 815 Oldham, and 2412 Hop, London.  
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

#### OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

#### DONALD M'INTOSH,

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#### DUTCH OXIDE OF IRON.

#### SPENT OXIDE PURCHASED IN ANY DISTRICT.

#### THE First Dutch Bogore Co., Ltd., NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, SUTTON, SURREY.

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

#### AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

#### M.H. (Methane Hydrogen) GAS PLANT, LTD., 19, GREAT WINCHESTER STREET, LONDON, E.C.

The M.H. GAS PLANT produces at will:—  
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.  
BLUE WATER GAS from Coke and Steam.  
CARBURETTED WATER GAS from Coke, Steam, and any Crude Oil.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

#### SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.  
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 6848.

### OXIDE OF IRON.

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SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

#### BALE & CHURCH,

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#### SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.

with which is amalgamated Wm. PEARCE & SONS, LTD., 36, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 841 AVENUE.

#### JOHN W. LEITCH AND COMPANY,

MILNSBRIDGE CHEMICAL WORKS,  
near HUDDERSFIELD.

The Manufacture of

PURE BENZOL FOR GAS ENRICHMENT  
a speciality.

#### J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

#### SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.  
Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."



**ROBERT DEMPSTER & SONS, Ltd.,**  
Contractors for Complete CARBONIZING  
PLANTS and every description of GAS APPARATUS  
and ELEVATING and CONVEYING PLANT, ROSE  
MOUNT IRON-WORKS, ELLAND.

### TAR WANTED.

Telephone: Central Manchester, 7002.  
Telegrams: "UPRIGHT."

Apply, **THOMAS HORROCKS,**  
Albert Chemical Works, BRADFORD,  
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent  
Naphtha, Carbolic, Sulphate of Ammonia.

### AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

**JOHN RADCLIFFE,** Chemical Engineer, EAST BARNET.

### "GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative  
of Naphthalene Deposits, and for the Automatic  
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.  
Manufactured and supplied by C. BOURNE, West  
Moor Chemical Works, KILLINGWORTH, or through his  
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-  
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National  
Telephone No. 2497.

### AMMONIA.

Consumers in any form are invited to correspond  
with **CHANCE AND HUNT, LTD.,** Chemical Manufac-  
turers, OLDBURY, WORCS.

### D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND  
CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON," Telephone: 2836 HOLBORN.

### PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS  
ACT, and Decisions thereunder," 1s.; "TRADE  
SECRETS v. PATENTS," 6d.; "DOCTRINE OF  
EQUIVALENTS, Mechanical and Chemical," 6d.;  
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent  
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-  
grams: "Patent London." Telephone: No. 243 Holborn.

### SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.  
**BROTHERTON AND CO., LTD.,** Chemical Manufacturers,  
Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKE-  
FIELD.

### GAS OILS.

### MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Re-  
fineries in America; also Petroleum Spirit for Gas  
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and  
11, OLD HALL STREET, LIVERPOOL.

### HYDRATED OXIDE OF IRON.

### PREPARED from Pure Iron.

Twice as Rich as Bog Ore.  
Gives no back Pressure.  
The Cheapest in the Market.

**READ HOLLIDAY AND SONS, LTD.,** HUDDERSFIELD.

### IT is Worth Your While to Buy Direct.

The RELIANCE LUBRICATING OIL COMPANY  
supply the best value in NON-CORROSIve LUBRI-  
CANTS—viz., Motor Wagon Oil, 1s.; Motor Car Oil,  
2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil,  
10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.;  
650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas  
Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.;  
Renown Engine Oil, 11½d.; and Astral Disinfectant,  
2s. 6d. per gallon. Barrels free, carriage paid. Solidified  
Oil, 25s. cwt.

The RELIANCE LUBRICATING OIL COMPANY, 19 & 20,  
Water Lane, Tower Street, LONDON, E.C.

### KRAMERS AND AARTS WATER- GAS PLANT.

**K. & A. WATER-GAS COMPANY, LTD.**

89, VICTORIA STREET, S.W.

### "HALLITE" Asbestos High-Pressure

Sheeting.

**HALLITE DOUGLAS, LIMITED,** 106, Leadenhall Street,  
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### SPENCER'S PATENT HURDLE GRIDS.

### THE very best Patent Grids for Holding

Oil Lightly.

See Illustrated Advertisement, Aug., 23, p. 548.

### GAS TAR wanted.

**BROTHERTON AND CO., LTD.,** Tar Distillers,  
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,  
SUNDERLAND, and WAKEFIELD.

### THE UNIVERSITY OF LEEDS.

DEPARTMENTS OF COAL GAS, FUEL, AND  
METALLURGY, AND ELECTRICAL, CIVIL,  
MECHANICAL, AND MINING ENGINEERING.

**THE Work of these Departments is**  
carried on in separate Blocks of Buildings  
specially equipped for Systematic Instruction.

Prospectus may be had free on Application from the  
Registrar.

The next Session begins on Oct. 4, 1910, on which day  
the Entrance Examination will be held at Ten a.m.  
and Two p.m.

**W. F. HUSBAND,**  
Registrar.

**GAS PLANT for Sale—We can always**  
offer NEW and SECOND-HAND GAS AP-  
PARATUS, including Retorts and Fittings, Condensers,  
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,  
Tanks, Valves, Connections, &c. Also a few COM-  
PLETE WORKS. Compare Prices and Particulars  
before ordering elsewhere.

**FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,**  
Thornhill, DEWSBURY.

### CORRESPONDENCE CLASSES.

### GAS Engineering and Gas Supply.

City and Guilds of London Institute.  
Teacher: **HERBERT LEES** (Silver Medallist,  
Assoc.M.Inst.C.E., Engineer and Manager of the Hex-  
ham Gas Company, Lecturer at Rutherford College,  
Newcastle-on-Tyne.

For Terms, &c., address ELVASTON ROAD, HEXHAM.

### JOHN RILEY & SONS, Chemical Manu-

facturers, Hapton, near Accrington, are MAKERS  
of Special SULPHURIC ACID, for Sulphate of Am-  
monia Making. Highest percentage of Sulphate of  
Ammonia obtained from the use of this Vitriol, which  
has now been used for upwards of 50 Years. References  
given to Gas Companies.

### WARNER & VAN DER BIESEN,

ZWOLLE, HOLLAND.

DIGGERS AND SUPPLIERS OF THE

### FINEST DUTCH BOG-ORE.

(Natural Oxide of Iron.)

Best Percentages. For lowest Quotations to any Port,  
Station, or direct into Works, please apply to—

LONDON OFFICES: 6, LEATHER LANE, E.C.

### CITY and Guilds Examinations in Gas

Engineering and Gas Supply. Students who  
have done badly at the recent Examinations should join  
Mr. Cranfield's Correspondence Classes for next Session.  
Assistance ample, individual, and private.

Write at once, 11, Avondale Place, HALIFAX.

### SATURATORS, Tanks, &c., made or

Repaired. Promptness with Efficiency guaran-  
teed. Own Plant optional. Any distance. References.  
**LEADBURNER,** 118, Galloway Road, LONDON, W.

### GAS Engineer and Manager (Age 32),

Experience over 17 Years in Erecting and  
Managing Gas-Works, desires APPOINTMENT  
Abroad. Would go out Erecting or Managing.

First-Class References, and any further Particulars  
from No. 5275, care of Mr. King, 11, Bolt Court, FLEET  
STREET, E.C.

### WANTED, a Position as Engineer,

MANAGER, or HEAD DRAUGHTSMAN to Gas  
or Water Works or Contracting Engineers. Thoroughly  
Competent. Energetic. Good References. Age 35  
Years. Moderate Salary. No objection to going Abroad.  
Address No. 5277, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### YOUNG Man, requires situation as

METER INSPECTOR and COLLECTOR. Able  
to advise consumers, thorough knowledge of Fitting;  
City and Guilds Certificate. Seven Years' experience  
in large and small Gas-Works. Excellent references.  
Address, COMPETENT, 100, Knox Road, Wellin-  
gborough, NORTHANTS.

### WANTED, immediately, Two or Three

DRAUGHTSMEN, fully Experienced in the  
Design of Modern Gas Plant.

Apply, by letter, Stating Age, Qualifications, and  
Salary required, to No. 5268, care of Mr. King, 11, Bolt  
Court, FLEET STREET, E.C.

### WANTED by a Firm of Ironfounders

and Chemical Engineers, with Established Trade  
among Chemical Manufacturers, to undertake the Sole  
Rights of Making and Selling Chemical Specialities in  
Great Britain.

Apply No. 5262, care of Mr. King, 11, Bolt Court,  
FLEET STREET, E.C.

### FOR SALE—Filter Press in Perfect

Condition. Self-Contained Engine and Pump.  
Apply to the SECRETARY, Gas Company, Sutton,  
SURREY.

### GASHOLDERS—16 ft., 24 ft., 26 ft., and

45 ft. Diameter GASHOLDERS, Cheap for im-  
mediate Sale. Re-erected in either Brick or New Steel  
Tanks Complete to Plan and Specification. Can be  
seen Temporarily Erected at our Works.

**FIRTH BLAKELEYS,** Thornhill, DEWSBURY.

### FOR DISPOSAL—Brick Plant com-

plete. Including 400,000 Place and Hard Stock  
BRICKS, 15s. to 25s. per Thousand f.o.r. Maidstone.  
12-H.P. Portable STEAM-ENGINE by Marshall, of  
Gainsborough, insured 90 lbs. Steam by National,  
nearly as good as when delivered from Workshops, £140.  
High-Pressure BOILER, new, insured 200 lbs. Steam.  
Suitable for 2-Ton Lorry, £20. 4-H.P. Horizontal  
STEAM-ENGINE, £5. 5-H.P. ditto, £6. Cheap 8-H.P.  
Portable STEAM-ENGINE £25. Offers solicited.  
Full Particulars on Application to **Wm. JOHNSON,**  
JUNR., New Hythe, Larkfield, KENT.

### PADIHAM URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

### THE above Council invite Tenders for

the Purchase of the Surplus TAR produced at  
their Gas-Works during the Twelve Months ending  
Sept. 30, 1911. The probable Quantity will be 360 Tons,  
and the Council have now direct communication from  
their Gas-Works to the Railway.

Sealed Tenders, endorsed "Tar," and addressed to  
**J. C. Waddington, Esq.,** Clerk to the Council, to be  
delivered at the Council Offices, Padiham, before Twelve  
o'clock noon on the 7th day of September, 1910.

**A. J. HARRISON,**  
Engineer and Manager.

### STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

### LIME.

### THE Directors of the above Company

are prepared to receive TENDERS for the Supply  
of about 130 Tons of LIME, suitable for Gas Purifica-  
tion, during the Twelve Months ending Sept. 30, 1911.  
Forms of Tender may be had on Application.

### TAR and AMMONIACAL LIQUOR.

TENDERS are invited also for the Purchase of the  
Surplus COAL TAR, CARBURETTED WATER-GAS  
TAR, and AMMONIACAL LIQUOR, for One Year  
commencing on the 1st of October next.

Coal Tar, at per Gallon, pumped into Buyer's Tank-  
Barges alongside the Company's Thames-side  
Wharf at Egham.

Carburetted Water-Gas Tar, at per Gallon, pumped  
into Buyer's Casks and loaded on to Buyer's  
Barge alongside Wharf.

Ammoniacal Liquor, at per 1000 Gallons, at 8-oz.,  
9-oz., and 10-oz. Twaddell, pumped into Buyer's  
Barge, as before stated.

The Directors reserve the right to accept any Tender  
for Tar and Liquor separately.

The highest or any Tender not necessarily accepted.  
Tenders, endorsed "Lime," "Tar," and "Liquor"  
respectively, and addressed to the Directors, must be  
delivered not later than Friday, the 9th of September  
next.

**GEO. H. SAYERS,**  
Secretary.

The Causeway, Staines,  
Aug. 20, 1910.

### BAKU WATER-WORKS.

CONTRACT No. 1.

### COLLECTING WORKS AND CONDUIT.

### TENDERS are invited for the Execution

of the Collecting Works, consisting of 13  
TUBE WELLS of 1000 mm. diameter, with a  
COLLECTING SYPHON of 400 mm. to 750 mm. di-  
ameter and 2245 m. in length, and of the CONDUIT to  
Baku, consisting of:

A MASONRY CONDUIT, 120 cm. by 170 cm., 137  
kilometres in length.

Ditto, 100 and 120 cm. by 150 cm., 17 kilometres  
in length.

INVERTED IRON SYPHONS, 1200 mm. diameter,  
10 kilometres in length.

Ditto, and PUMPING MAIN, 800 mm. diameter,  
22 kilometres in length.

A TUNNEL, 810 m. in length.

With all Accessory Works, and including all Supply  
and Delivery of Materials.

The Plans, Sections, and Drawings, and the Specifi-  
cation and Bills of Quantities and Schedule of Prices,  
can be seen during Office hours at the City Water-  
Works Office, in the Town Hall, in Baku, and in the  
Office of the Engineer-in-Chief, **W. H. LINDLEY,**  
M.Inst.C.E., 29, BLITTERSDOREN PLATZ, FRANKFURT  
A/M., at which Offices all further Information can be  
obtained.

The Specification, Bill of Quantities, and Schedule of  
Prices, and the Form of Tender, can be obtained at the  
above-named places in three copies, on payment of 21s.

A Copy of the General Design will be furnished on  
Application to the Uprava (Municipal Administration)  
at Baku on payment of £8.

Trial Shafts have been sunk along the line and can  
be inspected, as well as the collection of samples taken  
from the same and stored at the Baku Office, where  
also the results of all further Examinations can be  
seen.

Tenders will be received either for the whole of the  
work or for sections of the same.

The Tenders made out on the Forms supplied, must  
be delivered, post paid or by hand in sealed Envelopes,  
at the Uprava in Baku, not later than Noon on the  
14/27th October, 1910, endorsed as follows: "Water-  
Works of the City of Baku. Contract No. 1—  
Tender for the Collecting Works and Conduit."

The Tenders will, at the time above stated, be opened  
publicly in the presence of the Representatives of  
Tendering Firms.

Tenders for the whole of the work must be accom-  
panied by a receipt from the Treasury of the City of  
Baku, certifying the deposit of the specified caution  
money to the amount of 250,000 Rbl.; Tenders for  
sections of the work by the same to the amount of at  
least 2½ per cent. of the sum total of the Tender.

The Tenders remain binding for the Contractors  
during the Three Calendar Months after the date of  
opening.

City of Baku 5 per cent. Bonds will be accepted  
by the City at the price of £100 per £100 Bond  
as Deposit by those making Tender.

The Mayor, **N. W. RAJEWSKI.**

Baku.



# RAWMARSH URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

**THE Council are prepared to receive**  
Separate TENDERS for the Supply of 2500 or 5000 Tons of Screened or Unscreened GAS COAL, to be delivered free at the Gas-Works, Parkgate, from Oct. 1, 1910, to March 31, 1911, or from Oct. 1, 1910, to Sept. 30, 1911.

Specification and Form of Tender may be obtained on Application to Mr. E. O. Watson, Gas-Works, Parkgate.

Tenders, endorsed "Tender for Gas Coal," to be sent to me the undersigned on or before Saturday, the 10th of September next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,

J. W. BELLAMY,

Clerk to the Council.

Council Offices, Rawmarsh,  
Aug. 26, 1910.

## RAMSGATE CORPORATION. (GAS AND WATER DEPARTMENT.)

**THE Committee invite Tenders for the**  
Purchase of the whole of their Surplus COKE (estimated at from 1500 to 2500 Tons) or for part, in quantities of not less than 200 Tons per Annum, from the 1st of October, 1910, to the 30th of September, 1911, delivered f.o.r. or barge Ramsgate, or free into Carts at the Gas-Works, Ramsgate—purchaser in any case to pay Dues.

Further Particulars, together with Conditions and Form of Tender, may be obtained from the undersigned.

Tenders to be sent in not later than Noon on Monday, Sept. 12, 1910, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, endorsed "Tender for Coke."

The Committee do not bind themselves to accept the highest or any Tender.

WM. THOMSON,  
Engineer and Manager.

Gas and Water Offices,  
Boundary Road, Ramsgate,  
August, 1910.

## SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

### GAS STOCK.

## SALE OF DEBENTURE STOCK AND ORDINARY STOCK IN THE

WESTON-SUPER-MARE GASLIGHT COMPANY.

**LALONDE BROS. & PARHAM** have received Instructions from the Weston-super-Mare Gaslight Company to SELL BY AUCTION, under the Provisions of the Weston-super-Mare Gas Act, 1901, at their Rooms, West Street, Weston-super-Mare, on Tuesday, the 20th of September, 1910, at Six for Seven o'clock in the Evening, subject to Conditions of Sale,

£2000

FOUR PER CENT. PERPETUAL DEBENTURE  
STOCK and

£3000

NEW FIVE PER CENT. MAXIMUM ORDINARY  
STOCK

of and in the above-named Company, in Lots of the nominal value of £50 each.

The Stocks will be Sold and Registered in the Books of the Company Free of every Expense to the Purchasers thereof.

For further Particulars and Conditions of Sale Apply to the AUCTIONEERS, High Street and Station Road, WESTON-SUPER-MARE, and 7, Royal Promenade, BRISTOL; to J. H. GRAY, Secretary to the WESTON-SUPER-MARE GASLIGHT COMPANY; or to J. H. & F. W. BERE, Solicitors, WESTON-SUPER-MARE.

**THOMAS DUXBURY & CO.,**  
16, DEANSGATE, MANCHESTER,  
Gas Engineers' Agents and Contractors for  
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND  
ALL OTHER GAS APPARATUS.

*Inquiries Solicited.*

Telegrams: "DARWINIAN, MANCHESTER,"  
Telephone 1806.

## **ALL the BOYS CALORIMETERS**

which have been in daily use in  
all the Official Testing-Stations in  
London for the last Three Years

WERE MADE BY

**JOHN J. GRIFFIN & SONS,**

— LIMITED —

**KINGSWAY, LONDON, W.C.**

Those desiring to obtain Gas Calorimeters  
as used in the Official Testing Places  
should see that the apparatus bears the  
name of the Original makers.

*Descriptive Catalogue on Application.*

## **KOPPERS' PATENT CHAMBER OVENS.**

Results obtained which have never been Surpassed by any other System of Carbonization.  
Plants at Work and under Construction for the production of **18,000,000** cubic feet of Gas per Day.

*See our large Advertisement appearing in alternate issues of the "JOURNAL."*

**The KOPPERS'**  
**COKE OVEN AND BYE-PRODUCT CO.,**  
301, Glossop Road, SHEFFIELD.

**JAMES OAKES & CO.,**  
**ALFRETON IRON-WORKS, DERBYSHIRE,**

AND

**Wenlock Iron Wharf, 21 & 22, Wharf Road,  
CITY ROAD, LONDON, N.**

Manufacture and keep in Stock at their Works  
(also large Stock in London)

PIPES and CONNECTIONS,  $1\frac{1}{2}$  to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

**NOTE.**—Makers of **HORSLEY SYPHONS.** These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

## **NEWBATTLE CANNEL.**

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO  
**THE LOTHIAN COAL COMPANY,**  
LIMITED,  
NEWBATTLE COLLIERIES,  
NEWTONGRANGE, MIDLOTHIAN.

## **BIRTLEY IRON COMPANY,**

ESTABLISHED 1820,

Owners of the Birtley Iron Works and  
Pelaw Main Collieries,

**GENERAL ENGINEERS & IRONFOUNDERS.**

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: **BIRTLEY, CO. DURHAM.**

Newcastle-on-Tyne Offices: **MILBURN HOUSE.**

## **HEATHCOTE GAS COAL**

from the

**GRASSMOOR COLLIERIES,  
CHESTERFIELD.**

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality  
of Coke.

Maintains a High Standard in Residuals.

**THOMAS TURTON  
AND SONS, LIMITED,**

**SHEAF WORKS, SHEFFIELD,**

MANUFACTURERS OF

**FILES OF BEST QUALITY  
FOR ENGINEERS.**

**STEEL OF ALL DESCRIPTIONS.**

SCREW STOCKS, TAPS AND DIES,  
SPANNERS, RATCHET BRACES, LIFTING JACKS  
ANVILS, VICES,  
AND ENGINEERS' TOOLS GENERALLY.

London Office:

**90, CANNON STREET, E.C.**



SHOP LIGHT.

**"OVEE" INVERTED ALUMINIUM BURNERS & SHADES  
DO NOT CORRODE.**

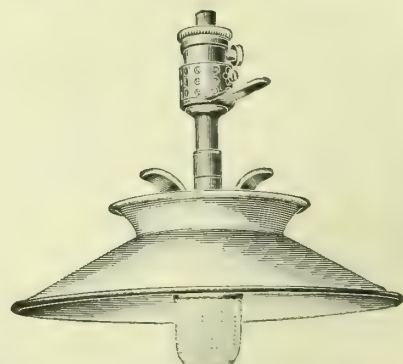
Patent Gas Adjuster. Best Air Regulation.

120 C.P. 3.8 Cubic Feet.

Write:

**"OVEE" LIGHT CO.,**

**52, Corporation St., MANCHESTER.**



FACTORY LIGHT.





LARGEST MANUFACTURERS in the UNITED KINGDOM

of GAS-RETORTS,

Horizontal or Inclined;  
also Makers of Segmental  
Retorts of all Sections.

PATENTEES OF

Machine-Flanged  
RETORTS.

DIBDALE WORKS,

Telegraphic Address:  
MACHINE, LOWER GORNAL."

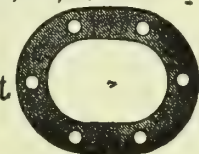
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Retorts and other Fire-Clay  
Goods carefully packed for export.

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SPECIAL BRICKS  
& BLOCKS of every  
description for GENE-  
RATOR and REGENERATOR  
FURNACES.

Large Stocks of Bricks of all sizes,  
Burs, Boiler Seating Blocks and Covers,  
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"ABC" Code and UNICODE used for Telegrams and Cablegrams.

## GRANTON GAS-WORKS

OF THE EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS,  
Their DESIGN, CONSTRUCTION, and EQUIPMENT,  
with Illustrations, Plates, and Details of Costs,  
BY W. R. HERRING, M.Inst.C.E., &c.

Bound in Cloth, price 16s., free delivery in United Kingdom.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

GAS-WORKS can Sell

ALL their COKE

in their own District

At HIGHER PRICES

By Adopting the COALEXLD PROCESS.

For Particulars, apply to COALEXLD, LIMITED, LANCASTER.



OUR DISCOUNT SYSTEM GAINS  
GROUND DAY BY DAY.

Greatly increases Sale of Gas.

Particulars and fullest description on  
application.

T. G. MARSH,  
28, Deansgate, MANCHESTER.

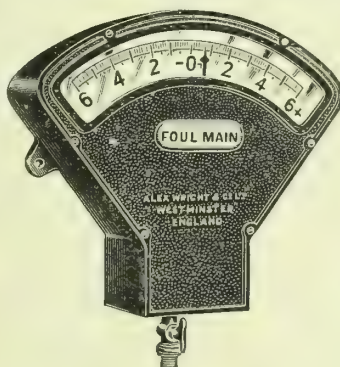
"READ YOUR PRESSURE BY THE POINTER"

OF THE

SIMMANCE-ABADY

"DEAD BEAT"

INDICATOR.



Many Ranges of Vac. & Pressure.

No Tubes or Scales to Break.

SOLE MAKERS:

ALEX. WRIGHT & CO., Ltd., WESTMINSTER.

CLAYTON SON & CO.  
LIMITED  
Pepper Rd. Branch, Hunslet, Leeds.



Interior View of Works  
Employed in the Manufacture of  
WELDED STEEL MAINS  
for WATERWORKS Etc.

## CAST-IRON PIPES FOR GAS, WATER, & STEAM,

also VALVES of all descriptions.

R. LAIDLAW & SON, LTD.,

ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,  
And LAMBHILL FOUNDRY, GLASGOW.  
OFFICE: 147, MILTON STREET, GLASGOW.



## THE LADDITE MANTLE

"the Star of the Mantle World," still holds the field for Strength and Light, as users have proved for themselves. The Company have recently quadrupled their powers of production to meet the great demand. Facts speak for themselves.

The Company are now prepared to negotiate large contracts, and guarantee prompt deliveries.

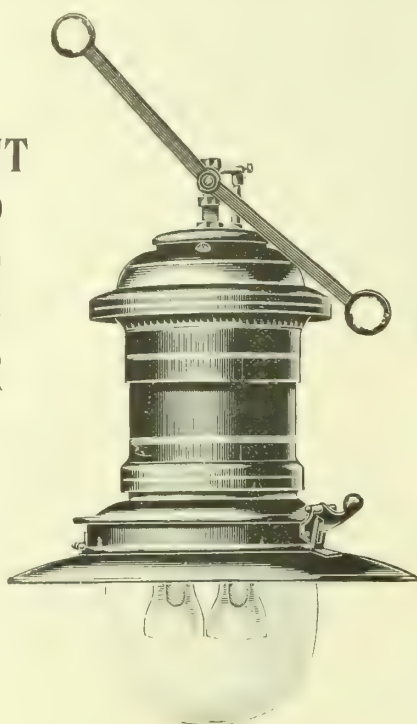
AWARDED GOLD MEDAL, FRANCO-BRITISH EXHIBITION.

General Offices and Works:

THE LADDITE INCANDESCENT MANTLE CO., LTD., PENRHYN ROAD, KINGSTON-ON-THAMES.



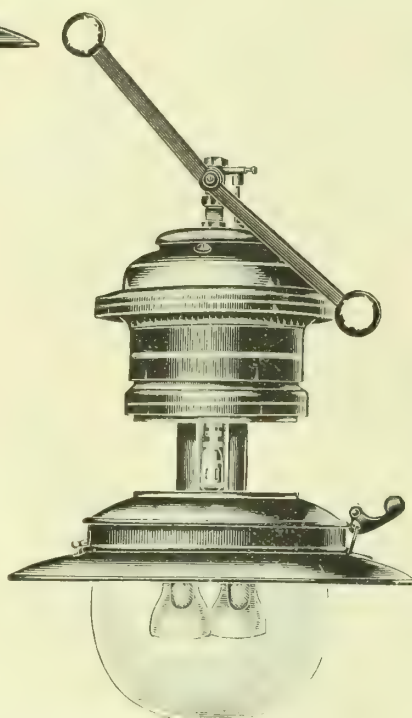
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**STRONG** High-Power  
Lamp with Lift-up  
Shutter for easy access to  
inner parts. Separate ad-  
justment to each burner.

Flashing Bye-Pass.

ALL PARTS INTERCHANGEABLE.



Showing Lift-up Shutter.

**MARKETABLE AND PROFITABLE  
PRICES,**

*With Clear Bowls and Inner Chimneys of guaranteed Jena  
make, including Mantles.*

Length overall = 2-lt. 25 in., 3-lt. 28 in., 4-lt. 33 in.

Outdoor Pattern, finished in Green and Gold.

Indoor, White and Gold.

BALL & SOCKET JOINT EXTRA.

APPROVED BY LEADING CORPORATIONS.

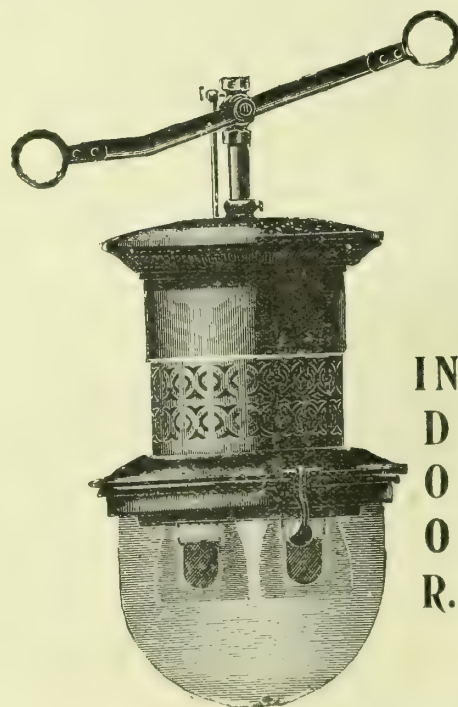
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# MILNE'S 1910 VIADUCT LAMP.

**ALL BRITISH.**

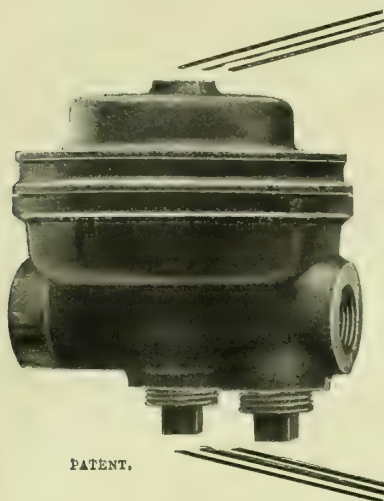
**WIND AND RAIN  
PROOF.**

Made with Welded Joints  
and of Double-Enamelled  
Steel.



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## Of interest to all!

"A CHAT ABOUT GAS GOVERNORS" will be sent on request to all interested in the improvement of the Gas service. It shows how, by the use of a safe and simple little device, viz., the

## FOSTER GAS GOVERNOR,

more light and better light is obtained from incandescent mantles, and gas stoves are made to give greater and uniform heating, making cooking quite a pleasure. The FOSTER GAS GOVERNOR, too, saves up to 40 per cent. of the Gas now consumed. It is inexpensive and never needs attention—points that will commend themselves to all consumers. Every engineer or dealer should investigate this apparatus. It appeals to all.

Write TO-DAY Please. Mind! TO-DAY.

**FOSTER ARC LAMP & ENG. CO., LTD.,**  
Works: Morden Road, Merton, London, S.W.

## GEORGE WILSON, COVENTRY.

Wet and Dry Gas Meter Manufacturer.

## PREPAYMENT METERS for Pennies, Shillings, or any other Coin.

Sole Agent for Scotland: DANIEL MACFIE, 1, North St. Andrew Street, EDINBURGH.

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|------------------------------------------------------------|----------------------------------|------------------------------|-----------------------------------------------------------|-------------------------------------------------|------------------------------|-------------------------------------------|
| <p>LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.</p> | <p>CONDENSERS VARIOUS TYPES.</p> | <p>GAS AND WATER VALVES.</p> | <p>ROOFING STRUCTURAL WORK M.S. &amp; C.I. PURIFIERS.</p> | <p>GAS EXHAUSTER &amp; GAS ENGINE COMBINED.</p> | <p>ROTARY GAS EXHAUSTER.</p> | <p>GASOMETER AND C.I. OR STEEL TANKS.</p> |
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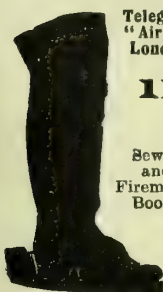
**HANNA, DONALD & WILSON, PAISLEY,**  
ENGINEERS & CONTRACTORS.  
ADMIRALTY LIST. WAR OFFICE LIST. COLONIAL AGENTS. ETC.

Workmanship and Materials  
of the Highest  
Quality.

# PECKETT'S LOCOMOTIVES.

**PECKETT & SONS,**  
ATLAS LOCOMOTIVE WORKS, BRISTOL.

Built to any  
Specification or Gauge.



Telegrams:  
"Airproof,  
London."

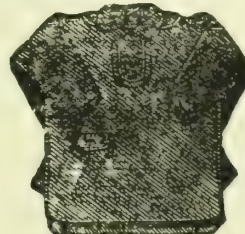
## THOMAS BUGDEN & CO.,

India-Rubber and Airproof Manufacturers and General Contractors,

116-118, GOSWELL ROAD, LONDON, E.C.

Largest Manufacturers of Gas  
Main Bags.

Telephone:  
743 City.



Sewer  
and  
Fireman's  
Boots.

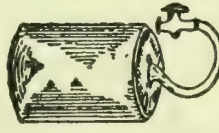


Gas Bags for repairing Mains.  
All Seams Stitched and Taped.

### Patentees of the DENMAR BAG,

Impervious to Main Liquor and  
Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses,  
Sewer Boots, Tar Hose, Stokers' Mitts,  
Bellows, &c.



Gas Bags for repairing  
Mains. All Seams  
Stitched and Taped.

Contractors' and Miners  
Jackets.

# THE WIGAN COAL & IRON CO., LIM<sup>TD.</sup>

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

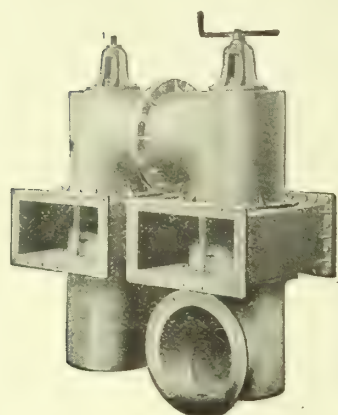
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER  
Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address:  
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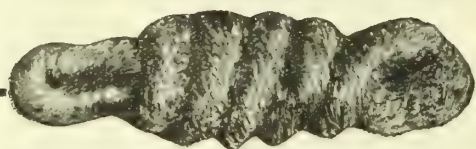
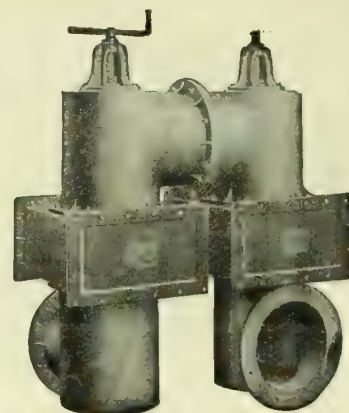
## MILBOURNE'S PATENT Purifier Valves

fixed inside or outside the Purifiers.

### C. & W. WALKER, LTD.,

110, Cannon Street,  
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MIDLAND IRON-WORKS,  
DONNINGTON, SALOP.



## LEAD WOOL

Is sent out in Skeins all ready for use.  
Every Skein of equal weight and length.  
The Lead Wool joint is built up evenly all the way through.  
Lead Wool requires no melting and can be used in water without risk.

Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33½ per cent. less.

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

Telegrams: "STRENGTH, SNODLAND." Telephone 199 SNODLAND.

## ARROL-FOULIS

Stoking Machinery

## HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

WILL DISCHARGE A RETORT IN ONE OPERATION

LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,  
GLASGOW.

[See Illustrated Advertisement, Aug. 16, p. 438.]

## STREET LIGHTING. CONVERSIONS

*Inverted Adaptations to fit any  
Size Lantern.*



MAXIMUM LIGHT

FOR A

MINIMUM  
CONSUMPTION.

ANGLE BURNERS.

NO INNER CHIMNEYS OR  
GLOBES REQUIRED.

Samples for Trial on  
Application.

Write at once for Particulars and  
Prices to—

MOFFAT'S LIMITED,

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### Memo.

## MOBBERLEY & PERRY OF STOURBRIDGE LIMITED,

are receiving large repeat orders for Home and Abroad for  
their special quality of Gas Retorts, Fire-Bricks, &c.



**JOHN BROWN & CO., LTD., SHEFFIELD,**

Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

**ALDWARKE MAIN GAS COAL**

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820'20.

**VERY FREE FROM IMPURITIES.**

TELEGRAMS: "ATLAS SHEFFIELD."

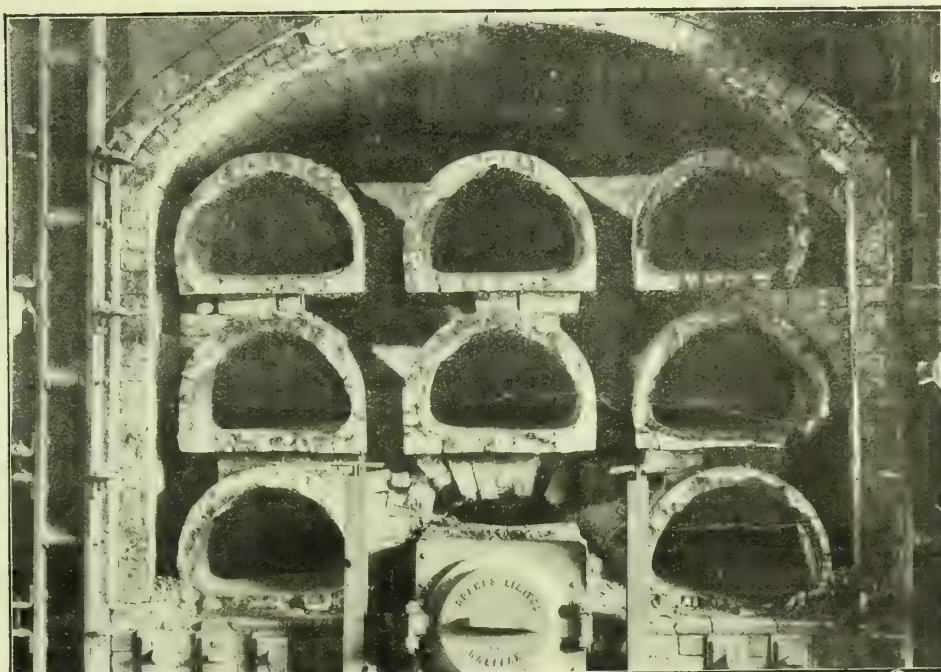
**YET ANOTHER RECORD.**

**2323 DAYS' WORK.**

All our Retorts  
are Patent  
Machine made.

Horizontal,  
Inclined,  
Vertical.

Special Patent  
Expanding Dies  
for making  
Taper Retorts  
at one  
operation.



Bricks, Tiles,  
and Blocks  
for all Types of  
Settings.

Specials.

Silica Bricks.

Alumina  
Bricks.

Non-Con.  
Cement.

**REPORT.**—"This Bed worked for 2323 days at high heats, and is still in very fair condition. Working results were exceptionally good."

**The LEEDS FIRECLAY CO., Ltd.**

Telegrams:  
"FIRECLAY, WORTLEY, LEEDS."

**WORTLEY, LEEDS, ENGLAND.**

Telephones:  
610, 612, 1649, 2322, Leeds.

**SAML. CUTLER & SONS, MILLWALL, LONDON,**

And at 39, VICTORIA STREET, WESTMINSTER, S.W.

**CARBURETTED WATER-GAS PLANT.**

**MAXIMUM EFFICIENCY GUARANTEED.**

**Inspection of Working Plants Invited.**



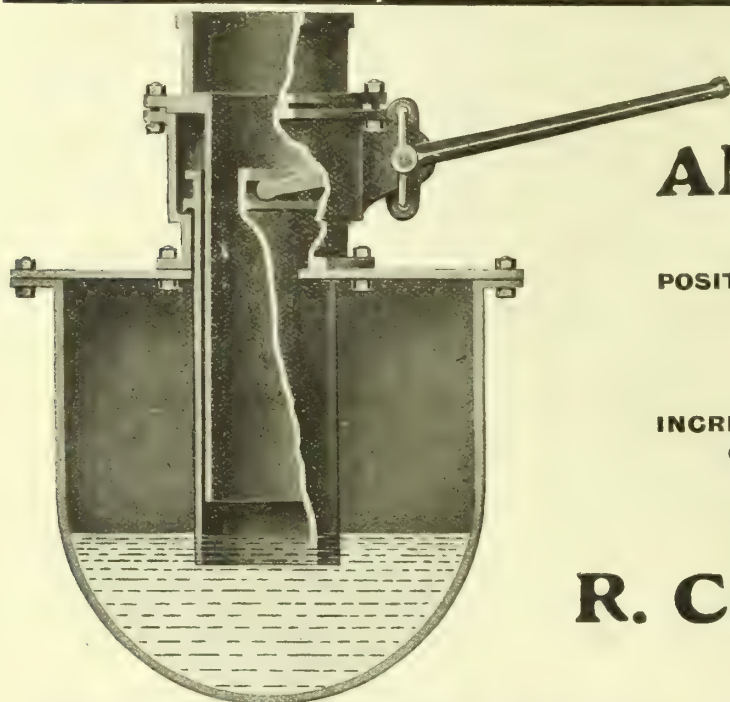
# SMOKELESS COAL.

The British Coalite Company having failed in their proceedings against us, we are now prepared to grant **Licenses**, both **at Home and Abroad**, on Reasonable Terms, to Corporations, Gas Companies, and others, for the Manufacture under our Patents of

## SMOKELESS COAL, GAS, BYE-PRODUCTS, &c.

By our methods, results superior to other processes can be obtained.

**THE SCOTTISH SMOKELESS COAL SYNDICATE.**  
LIMITED,  
116, Hope Street, GLASGOW.



### CORT'S

PATENT

### ANTI-DIP VALVE.

#### IMPORTANT POINTS:—

POSITIVE IN ACTION,  
ABSOLUTELY SAFE,  
ALWAYS FULL BORE.

#### WE GUARANTEE

INCREASED MAKE PER TON,  
GREATER ILLUMINATING POWER,  
SATISFACTION, &c.

Write for fullest Particulars to—

**R. CORT & SON, Ltd.,**  
READING.

# BARRY, HENRY, & CO.,

— LIMITED. —

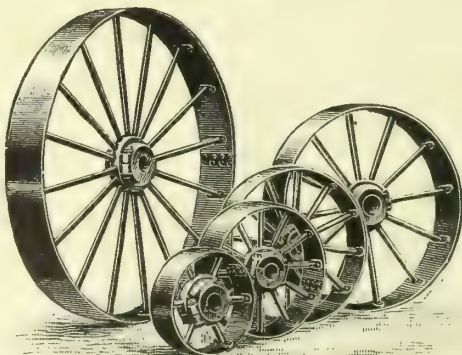
*Specialities:*

#### TRANSMISSION

OF

#### POWER.

Rope & Belt Pulleys,  
Spur & Bevel Wheels,  
Shafting & Couplings,  
Pedestals & Fixings.



WORKS:

**ABERDEEN,**  
SCOTLAND.

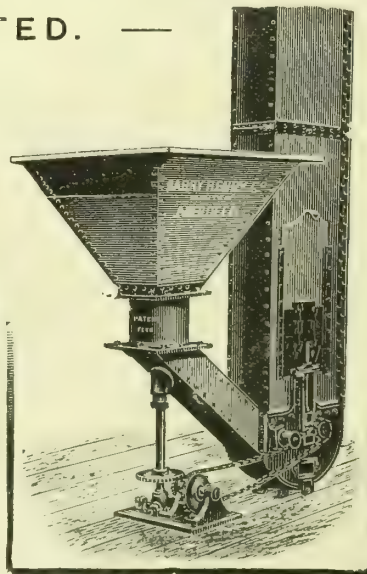
*Specialities:*

#### TRANSMISSION

OF

#### MATERIALS.

Conveyors,  
Elevators,  
Grinding Machinery,  
Motors.



AND

**64, MARK LANE,**  
LONDON, E.C.



# Welsbach

## LIGHT

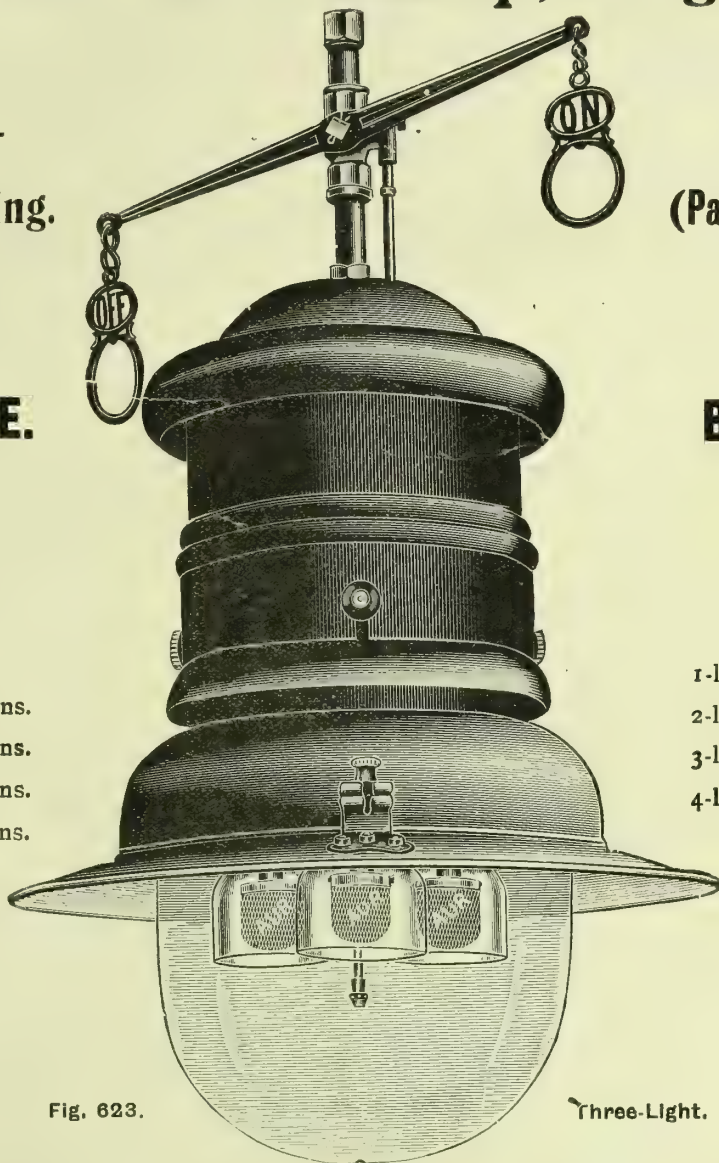
### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

|         |       |              |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

|         |       |              |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in.  |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

|         | Gas per hour. | C.P. | Steel. | Copper Case. |         | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet        | 125  | 30/-   | 5/- extra.   | 3-light | 12 feet       | 400  | 52/6   | 6/- extra.   |
| 2-light | 8 feet        | 260  | 47/6   | 6/- extra.   | 4-light | 16 feet       | 550  | 72/6   | 9/- extra.   |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

|                               | 1-Light. | 2-Light. | 3-Light. | 4-Light. |                            | 1-Light. | 2-Light. | 3-Light.          | 4-Light.     |
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| Clear Glass Globes, each      | 2/3      | 5/9      | 5/9      | 9/-      | Wired Globes, extra        | each     | 2/-      | 2/-               | 2/9 3/6      |
| " " " In Case lots per dozen. | 19/6     | 57/9     | 57/9     | 93/-     | Parabolic Reflector, extra | "        | 3/6      | 6/-               | 7/6 Not made |
| Case contains                 | 80       | 18       | 18       | 12       | Welsbach Mantles, each     |          | 6d.      | subject as usual. |              |

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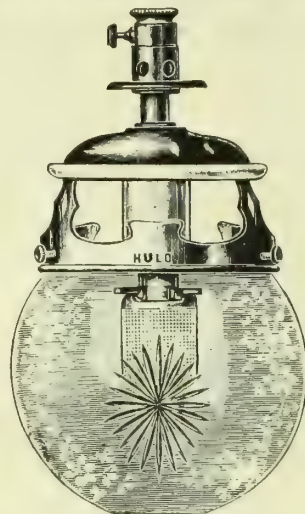
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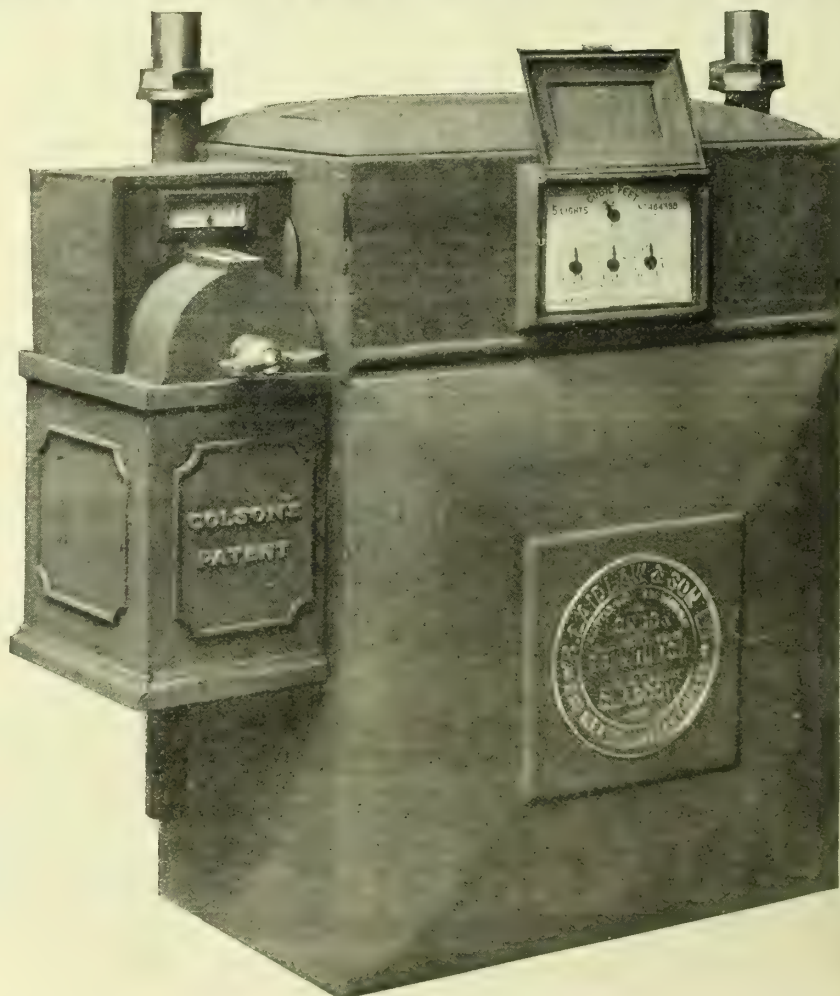
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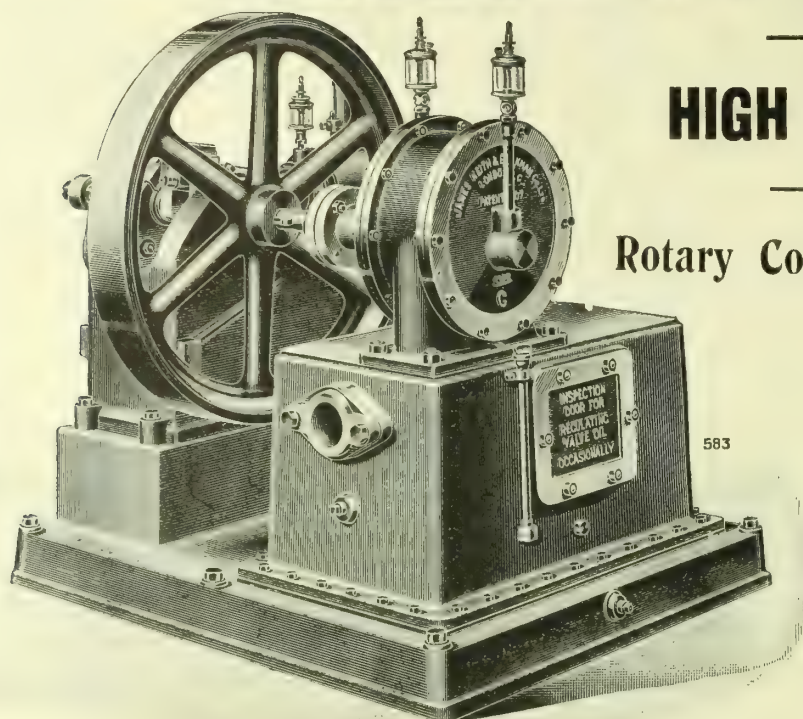
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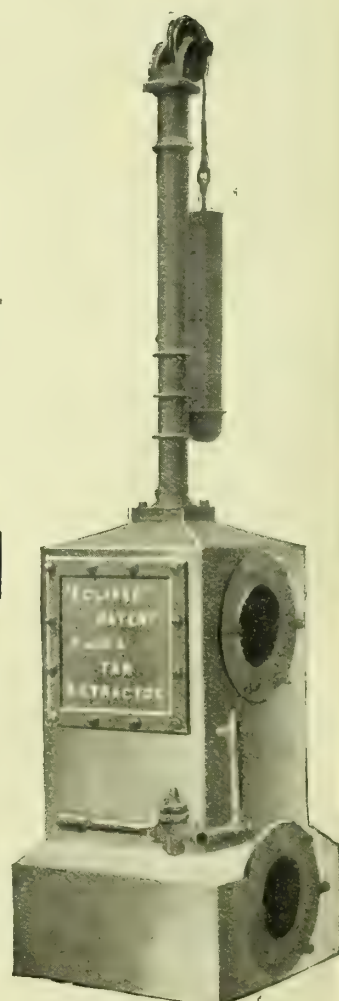
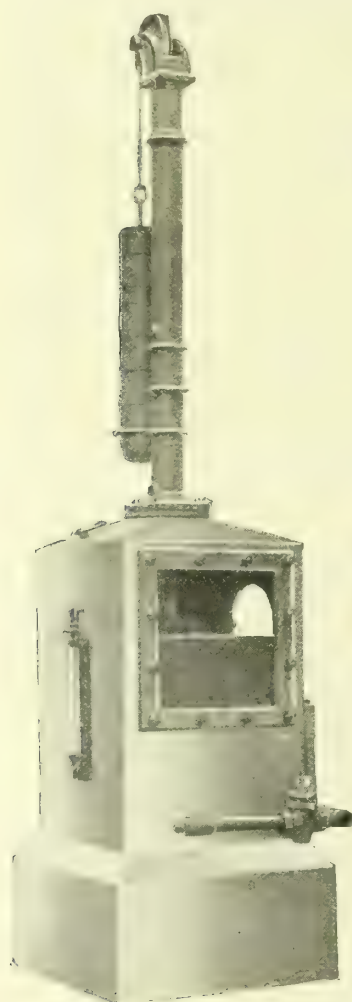
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Vol. CXI. No. 2469.]

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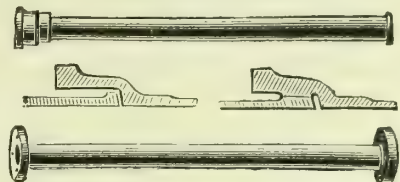
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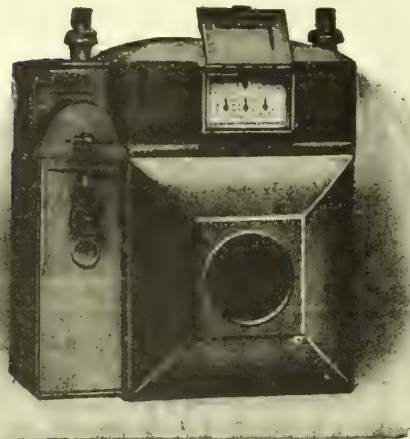


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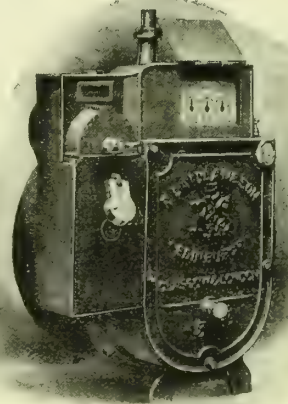


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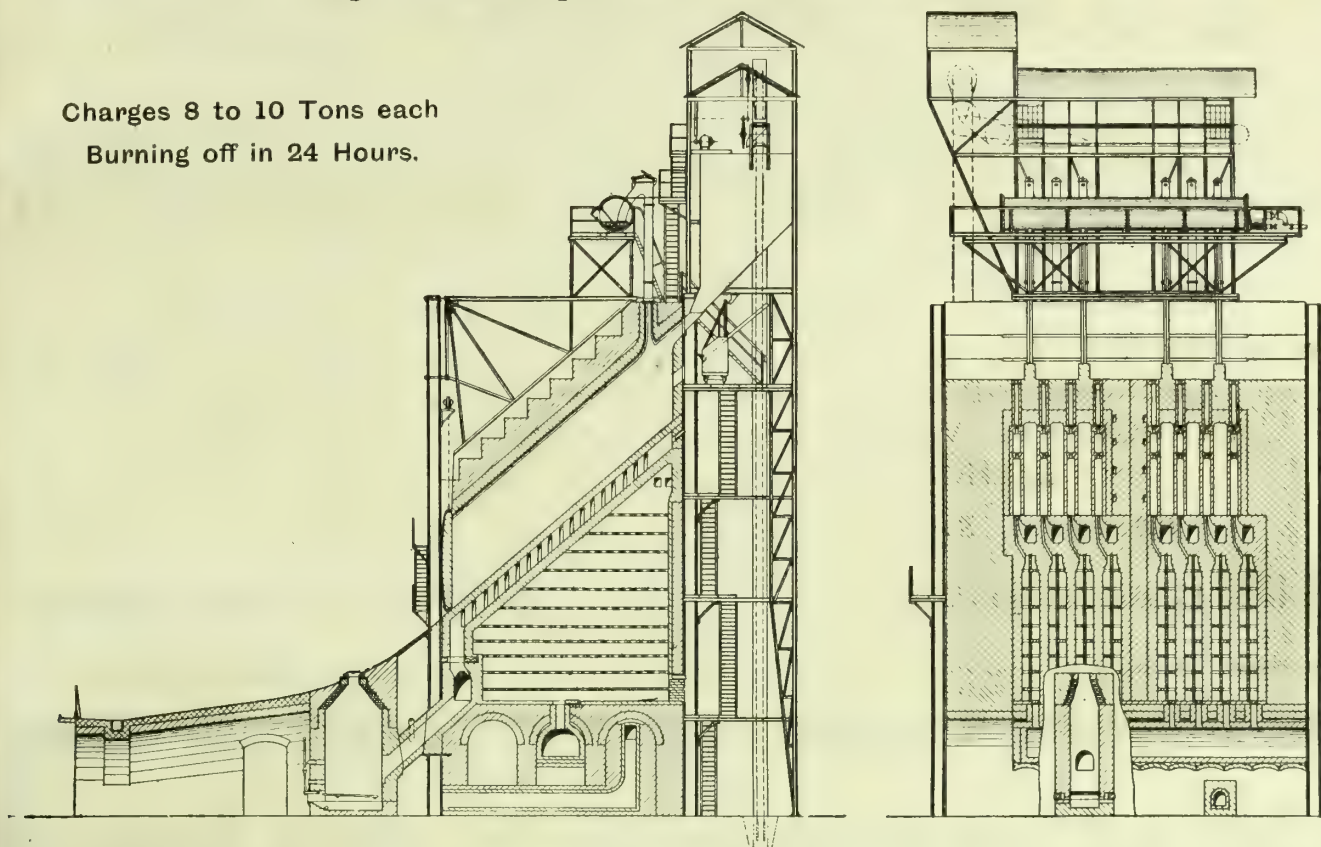
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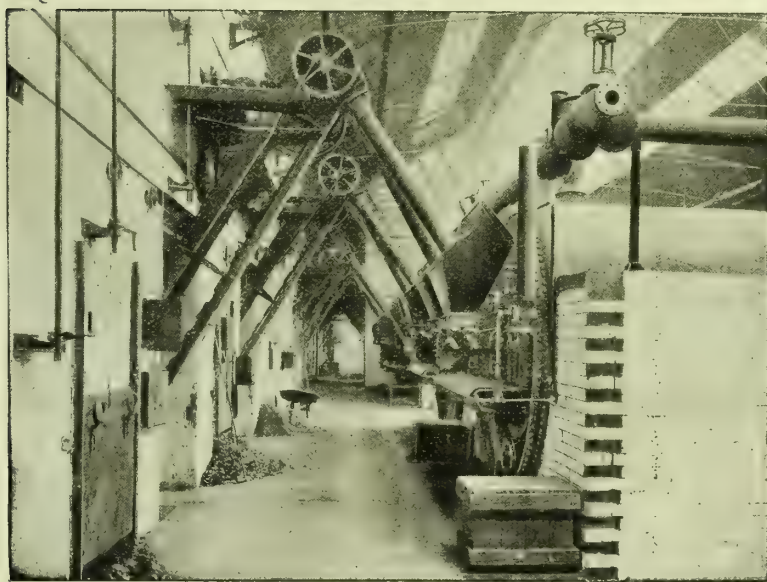
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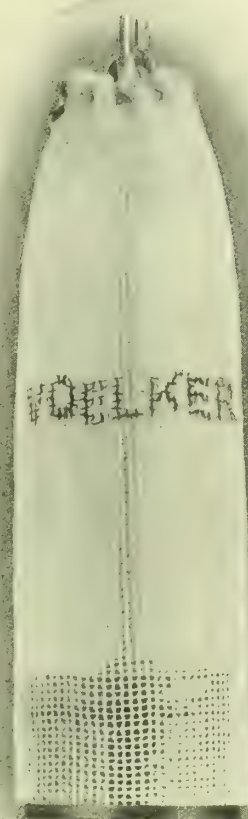
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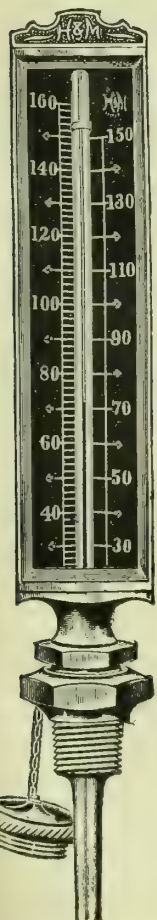
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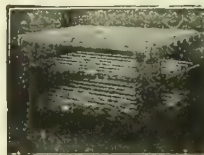


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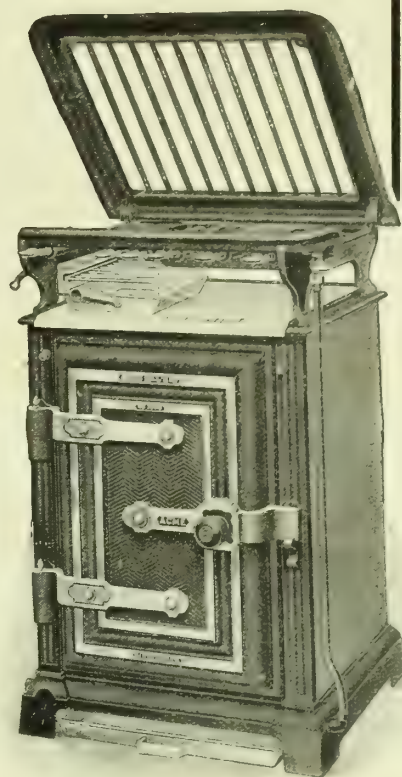
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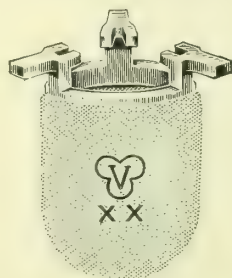
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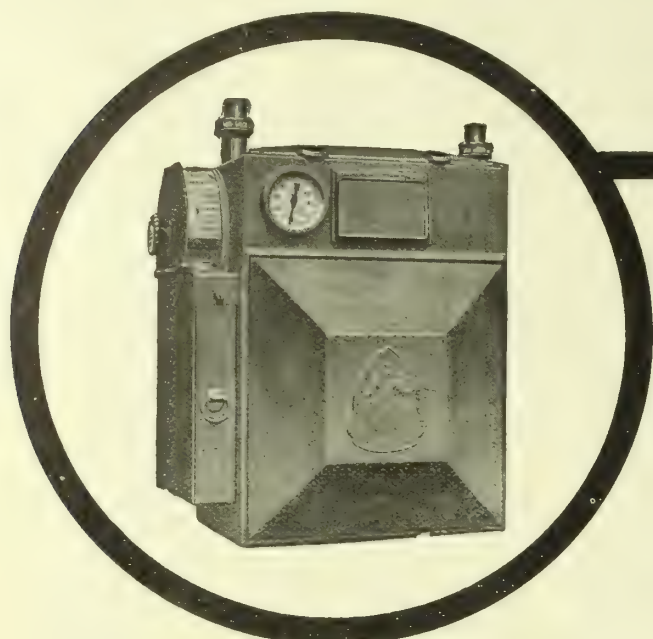
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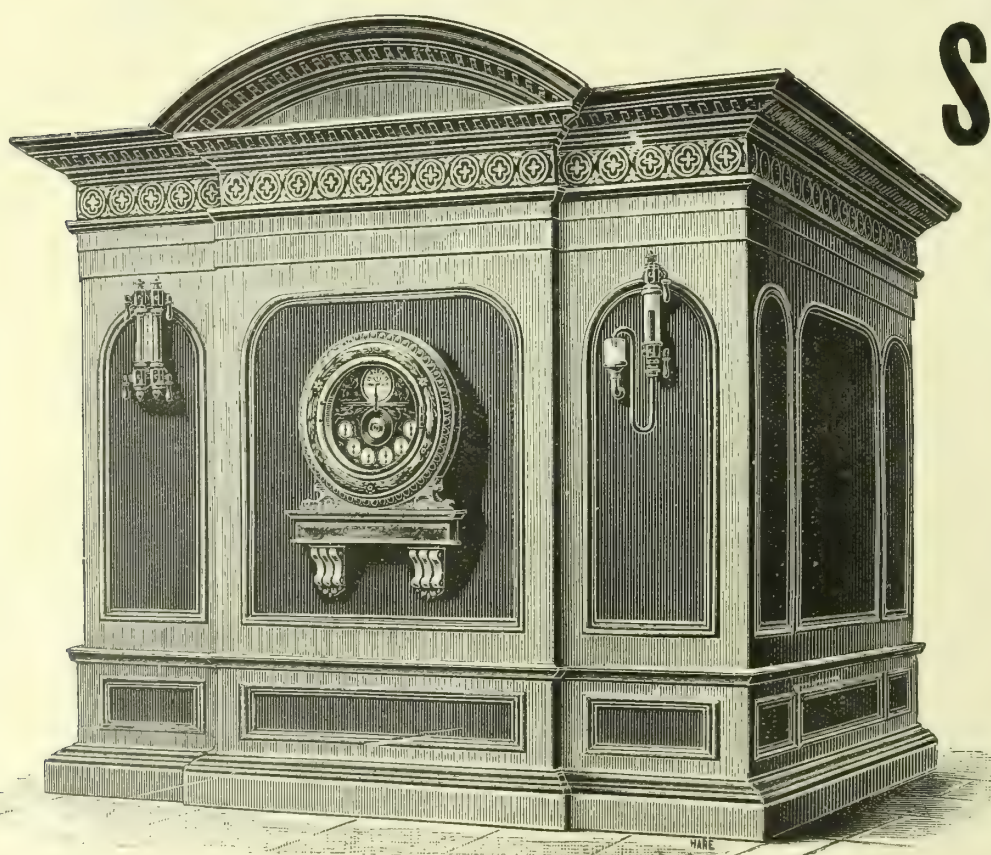
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# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES—GAS, &c.

### Greater Protection and Latitude for the Industry.

MATTERS of current interest have postponed until now a review of the salient features of the parliamentary session's work in connection with the gas industry—work that is yet uncompleted pending the confirmation by the House of Commons of the jointly promoted Standard Burner Bills, which have had such a triumphant march through both Houses to the point at which they now stand, despite an opposition that has stopped short at nothing—not even at insinuation of what is tantamount to robbery and jobbery—to secure their overthrow. However, every session now solidifies the position of the gas industry in the matter of legislation which helps to shape its conditions to fulfil its obvious destiny. This session has been no exception to the rule; and if the Standard Burner Bills receive the Royal Assent before the close of the year (upon which event there is not the slightest misgiving on our part), the session will stand out with unusual prominence among those in which work has been accomplished conducive to the forwarding of the material interests of the industry. Parliament to-day prescribes, with the greatest freedom, 14-candle gas tested by the "Metropolitan" No. 2 burner. It has given Middlesbrough this year, as it gave Bury last year, the right to a standard of 12-candle power. These are local authority gas supplies; and there is parliamentary recognition in this and other ways that illuminating power *per se* is a moribund quality on which to found a standard. The time, we opine, is not far distant when Parliament will treat with favour suggestions for the complete supersession of that standard by a calorific power one. But again this session, in the cases of Farnham and the Standard Burner Bills, Parliament has shown that it will not impose a dual test upon the industry. Local authorities interested as competitors would manacle gas companies in this manner if they had their will; and cheap gas service to their communities could go to the wall for aught they care. Fortunately, Parliament will have none of it. It stands determinedly between local authority selfishness and the public interests; and there is something to be thankful for in the evidences of this that have been presented during late sessions. A case in point was the effort of the Brighton Corporation to impose restrictions upon the Gas Company in respect of the use of carburetted water gas. At the instance of the Corporation, Dr. Haldane (who was a member of the Home Office Committee that reported in favour of restriction twelve years ago) was called; and, while he claimed a moral effect from that report, he recognized a prudent consideration by gas suppliers of their obligations to the public, and changed circumstances which, in his view, made restriction a matter of less importance than formerly. His blessing was not in the form expected by the Corporation; and Parliament did not concede what the Corporation wanted.

But, on the other hand, Parliament does see that local authorities—always ready enough to impose restriction upon, and obstruct with conditions, their competitors—themselves are not immaculate, and not without need for restriction and stronger conditions in their trading. Unfortunately, however, there are no bodies in existence, other than Parliament, that can, without considerable private expense and trouble, make any very effective effort in putting upon them statutory restraint, unless extra-territorial authorities, within whose district the trading is carried on, oppose them. Parliament has also recognized this; and Parliament is acting accordingly. And not before it is time. Last session this was shown in the limitations imposed upon gas profit appropriation; and this session there has been a further step in a deliberate refusal to allow the Corporation of Glasgow to use profits made by the gas undertaking for the relief of the rates. Whatever profits are made, after all financial obligations are discharged, are to be devoted to the

improvement of the service of the undertaking to the community. But the Gas Department are to have the liberty of making differential charges for gas for different purposes, as is necessary under the competitive circumstances of the time. The Commission under the Private Legislation Procedure (Scotland) Act, who considered the Kirkcaldy Order, also declined to allow a provision to stand relating to the appropriation of the surplus gas profits to the burgh general assessment. Again this session, in the interests of the liberty and protection of the gas industry, there have been several additions, in Bills and Orders, to the Heywood and Mountain Ash stand-by clause precedents. The Home Office and the Local Government Board seem, however, to have a preference for the Mountain Ash model, which only gives protection to town gas supply against private gas plants; while the Heywood precedent gives protection likewise against electricity. In the Rhondda Bill, the promoters gave up electricity in deference to the views of the Local Government Board; but, in favour of the Warrington Gas Department, Parliament has allowed electricity to stand in conjunction with private gas plants. We fail to see the slightest reason why any distinction should be made between electricity and private gas plants, when a town-gas supply is put in merely as a protection against a business competitor; for the capital expended in making the provision, and the work entailed in meter inspection and so forth, are the same whether business results or not.

Another direction in which Parliament has made recognition of the necessity for some increased power on the part of gas companies has been in creating fresh precedents for the redemption of obsolete and unproductive capital. Eleven years ago, Sir James Rankin's Committee recommended that efforts should be made by companies having obsolete capital to wipe it out by means of a sinking fund, or otherwise. But, until this session, only the Gaslight and Coke Company had taken the power for redeeming capital (up to a million pounds) by half-yearly appropriations from revenue. Now the Brighton Gas Company have secured the right to extinguish £57,000 of capital (unrepresented through works abandonment) by half-yearly appropriations of £1800 from revenue. This is not what the Company asked for in their Bill; but it answers the requirements. In the case of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company, by the amalgamation of a number of comparatively small Essex concerns, a redemption fund has also been allowed, up to a certain defined limit. But this is a matter that can be gone into in greater detail when the Acts themselves, with the exact clauses, are under review.

We will not, in this glance at the session's work, enter into the question of the Standard Burner Bills, and of the persistent efforts made to destroy them at every point of their advance. It has, however, been a pleasure to know that the support given to the Bills, by special articles in these columns in February and March last, and the comments upon the proceedings and upon the singularly vexatious and vindictive antagonism to the measures, have been in complete accord with the whole technical view of the gas industry—with isolated exceptions. The decisions of the Lords and Commons Committees, unqualified as they were, crowned all the effort that has been put forward on behalf of the Bills and of the progress of the industry. The Committees saw clearly through the obfuscating veil that the opposition tried to draw over the real ends of justice and progress that the Bills are destined to serve. The measures alone have made the session of historic interest for the gas industry; and all who have taken part in their promotion, and have worked for their success, have the knowledge of having been engaged in an excellent cause.

At one time there was reason to complain of the attitude Parliament was taking in connection with the industry; but now there is much indication of a more open appreciation on the part of Parliament (for which, more than to any other man, we are indebted to the late Sir George Livesey) of



the facts that the industry has been, and is, passing through a transition period, and that greater liberty and greater protection of the interests of the industry are the most certain means to the best service to the community, and that surely is what all domestic legislation of the kind should be designed to promote. The prediction of Sir Henry Kimber, the Chairman of the Commons Committee, who considered the Standard Burner Bills—that the session's work has carried us far on the road to a revision of the general legislation affecting the gas industry—is no doubt quite true. We hope it has, providing that, before legislation, there is full and impartial inquiry into the position of the industry in respect of the lines of its development, and the ends it has to serve, and in respect, too, of the injury inflicted by the actions and tactics of supervising local authorities who are also business competitors. The gas industry is now in the mood, and it has the men and the material, to seriously enter upon a discussion, before a thoroughly impartial and intelligent tribunal, of the lines of revision of its general legislation. The sooner that such discussion comes now, the better in our opinion.

### A False Foundation.

OUR electrical friends are not conducting their defence of the loss of the Westminster lighting contract in anything like a courageous or fair manner. Nothing more dishonourable than the calculations made by them, and published in the Daily Press, to show that the Gaslight and Coke Company have undertaken this lighting at a concrete loss, has ever been seen in the controversies of the two industries. If the calculations are not dishonourable, then they have been made in absolute ignorance of the true facts of the case in relation to the type of lamp that is going to be employed in the lighting of the considerable part of Westminster that is covered by the contract. Yet we cannot bring ourselves to think that men of the position of Mr. E. Willmot Seale, the Secretary of the Charing Cross (West-end and City) Electric Supply Company, Limited, and the Editor of the "Electrician" can claim that (though they may simulate) they have no knowledge of the efficiencies of the new high-pressure type of inverted lamp such as will be employed. If they have not this knowledge, then most willingly we withdraw the term "dishonourable," and substitute the words inexcusable ignorance. But, for either the one or the other, both Mr. Seale and the "Electrician" ought, at this time of day, to be thoroughly ashamed. A letter by Mr. Seale that has had widespread publication was inserted in the "JOURNAL" last week; and, as an addendum to it, there appeared an explanation as to how he arrived at the figure of 10½d. per 1000 cubic feet as the one that the Gaslight and Coke Company must be charging for the gas to be consumed under this lighting contract. In a previous issue (as mentioned in the "Electric Supply Memoranda" last week), the Editor of the electrical paper already named, by some subtle process of computation, found that the Company were only charging 5½d. per 1000 cubic feet!

However, what both Mr. Seale and the Editor of the "Electrician" have done is to take an altogether wrong basis for their calculations; and we cannot, with all the publication that has been made, conclude that this has not been done designedly. They have referred to a report by Mr. W. H. Bradley, City Engineer of Westminster, in which he gives the consumption of a nominal 1000-candle power high-pressure lamp as 30 cubic feet. But the lamp he was alluding to, as we have before pointed out for the edification of our grievously misinformed or dishonest electrical friends, is of the old type, and is not the new form of inverted high-pressure lamp. The old type of vertical burner lamp only had an efficiency of about 30 candles per cubic foot of gas consumed; while the new type lamp (such as is to be fitted in Westminster) has an efficiency of 60 candles per cubic foot. The result of taking the old basis and old type of lamp is that Mr. Seale finds that a 3000-candle power lamp would consume 90 cubic feet of gas per hour, or, on a lighting scale of 3940 hours per annum, a total consumption of 354,600 cubic feet. Now, as a matter of fact, the 3000-candle power high-pressure inverted lamps such as are to be used in Westminster, will each only consume 50 cubic feet of gas per hour; so each lamp will only demand 197,000 cubic feet of gas in the 3940 hours, and not 354,600 cubic feet as stated by Mr. Seale—a difference of 157,600 cubic feet of gas! It is to be hoped that those who have been responsible for this attempt to mislead the public by

a distortion of facts will do their best to make amends by rectifying their figures with equal prominence.

Then, by a very crude process of calculation, Mr. Seale arrives at the astonishing statement that the cost of gas manufactured by the Gaslight and Coke Company is 1s. 8½d. per 1000 cubic feet, and the cost per 1000 cubic feet of gas sold is 1s. 10d. Therefore, by his processes of reckoning and reasoning, we may take it that the Company are losing 11½d. per 1000 cubic feet on all the gas that will be consumed for high-pressure lighting under the Westminster contract. The calculations are interesting as testifying to the length in absurdity to which the uninitiated in gas statistics can go. We should advise Mr. Seale to study carefully the standard work known as "Field's Gas Analysis;" and therein he will find the truth of the matter. The last issue is for the entire year 1909. In that year, the net cost of coal used, less residuals, per 1000 cubic feet of gas sold, amounted to 5½d.; and the other manufacturing charges (including 3·87d. for wear and tear), came to 6·34d. Therefore (including the 3·87d. for wear and tear) the net cost of gas into the holders is only 11·88d. per 1000 cubic feet sold. It is absurd, in connection with public lighting, to take into account the average distribution charges as shown by the accounts, amounting to 5·24d. per 1000 cubic feet sold, as this is almost completely made up of the expense incurred in the private supply of gas, embracing service, meter, and stove repairs, and wear and tear; and in his calculations Mr. Seale fails to deduct from these expenses, the rental received from the ordinary and prepayment consumers. He had better sit down quietly, and revise his calculations, and give the public the benefit of them. It is a pity he rushed into print in the rash manner that he did, and presented to the public such indefensible foundations for his contentions.

There is one other matter to which Mr. Seale incidentally alludes, and that is the capital expenditure involved in providing the small diameter steel mains that are being laid in connection with this high-pressure distribution. High-pressure public lighting is only a means to an end. High-pressure gas supply is a development of the ordinary business of a gas undertaking; and it is the intention that these high-pressure mains shall have other profit-producing tributaries besides the public lighting. The London Electric Supply Companies cannot plead ignorance as to what is being done in the neighbourhood of Fleet Street in the matter of private business in high-pressure gas supply; nor of what is being done from local gas-compressing stations in the way of parade lighting. One of the very first changes that will take place in connection with the high-pressure gas system in the West-end (we know this on good authority) will be to take out the special compressing plant at the Victoria Station of the London, Brighton, and South Coast Railway, and draw a supply direct from the new general high-pressure system. The high-pressure system is the means by which gas undertakings can, and will, compete with electric flame arc lighting; and all the sophistry, misapprehension, dishonesty, or whatever is the right epithet to apply to certain statements and calculations contained in the epistolary efforts of our electrical competitors, will not stay the proper development of gas supply on the lines necessary to maintain a superior position in the competition of the times. The gas industry is not yet bereft of business acumen, as the electrical industry knows to its cost; and there is no hesitation in the gas industry to spend capital in order to follow the natural lines of expanding business capacity. Mr. Seale, of course, never heard of electrical undertakings that have considerable lengths of cables—laid at enormous expense—to which there are few connections other than a modest number of street-lamps.

### The Value of Conference—Security in Enterprise.

THIS is the month of many congresses and conferences; and above them all stands the meeting of the British Association for the Advancement of Science. There are many who are sceptical as to the value of this annual fixture. We are not with them. It must necessarily be, where the subject-matter that engages attention is so varied, that much of the torrential rhetoric that we have annually at this meeting will not appeal to every individual. But the mere fact that the meeting does not minister to our individual fancies, inclinations, or mental pursuits, is not a sufficient reason for an unqualified, general condemnation. The Association has provided a platform for our philosophers, for the classical work of the giants in science, in a manner that no other



organization has done. It is an institution that has a link, too, with the popular mind; and the annual proceedings course through channels that are not open to the ordinary scientific society. It is, consequently, impossible to tell the value of such an organization as an instigator of good; we cannot tell what a force it is in the stimulation it gives, individually and collectively, in scientific and human affairs. In some of the papers we may trace the hand of the visionary, or the man with a crank; and much that is in them may be worthless, and instantly pass away into oblivion. But in the President's Address, and in those of the Chairmen of the sections, we have the luminous views of men of the first order in their respective departments of scientific, technical, social, economic, or other work. Although high in rank, their views are not necessarily to be accepted as conclusive, or as the last word. Such men as these, however, are not usually blind zealots; they are themselves searchers after the truth. And their aim is to set before their hearers and their peers the position of things as they see and find them. Professor Bonney, the President for this year, treated in his address of a subject that he has made much his own, but which does not possess any direct interest for pages devoted to an industry such as that of gas. He refrained in his address from drawing any definite conclusion from certain hypotheses that he presented; and in calling attention to the omission, he made remarks which presents to us one direction in which presidents and contributors to the proceedings of scientific and other bodies are in the position to do most valuable work without submitting arbitrary conclusions from something as yet unproved. "There are," he said, "stages 'in the development of a scientific idea when the best service we can do it is by attempting to separate facts from 'fancies, and by remembering that if hypotheses yet on 'their trial are treated as axioms, the result will often bring 'disaster, like building a tower on a foundation of sand.'" There is a lamentable accumulation of verification of the truth contained in the latter words. Our scientific and other organizations have before them infinite work, progress in which means the greater prosperity of industries, and through industries of the peoples of the world.

An association covering such diverse fields of thought and research has the effect of providing, as it were, intercommunication between those fields. Much in one region of scientific, technical, or economic work may be discovered that would be of considerable value to the workers in quite another region; but its good in the latter may be lost through sheer ignorance as to what has been transpiring elsewhere. In industry fresh discovery has often had the limited application provided by the industry of its birth; while had the workers in other industries been aware of it, beneficial application might possibly have been considerably extended. The British Association does not eliminate, by its work, the danger of this curtailment of the fruitful application of discovery; but it has effect in this direction by the distribution of information and the stimulation that it exerts through the intercourse it provides. If we descend from the scientific and technical to the economic for illustration of the advantage of this general intercourse, much suggestive thought for the administrators of all industries whatever their kind may be found in the address of Sir A. Llewellyn Smith to the Economic and Statistic Section of the Association. He dealt with some of the causes of unemployment, examination of which led him to the favourable contemplation of that polemical subject of a national contributory scheme of insurance against unemployment—a scheme to be universal in its operation within the limits of a large group of trades. This was the main theme of the address. But we pass it by here, and just quote from it two axiomatic phrases that can be applied to all industries, and not least to that of gas manufacture and supply. "One significant economic tendency of the present day is 'the growing recognition of the importance of security and 'regularity in all operations of industry and commerce.'" That is one; another is: "Security is an essential condition 'of all industrial and commercial development.'" There are maxims in these two sentences that should be posted up in the administrative rooms of every industrial enterprise, and not by any means least in those of every gas undertaking in the country. With them before administrators, it would be but natural to apply the question to every line of activity of the enterprise, In what way will security in it be best promoted? There we have a fundamental thought for all technical and commercial enterprise, and upon it one could dilate to any extent. It would, however, all work

out to the one conclusion, that security is best served by the most broad-minded and liberal policy, in regard to both the undertaking's local activities and those which are collectively undertaken for the good of the industry at large. In relation to the plans for the protection and commercial expansion of the gas industry that are currently occupying consideration, let each one remember that "Security is an 'essential condition of all industrial and commercial expansion.'" If these words could be driven home, there would be no doubt as to co-operation—such as was outlined recently in Mr. J. W. Helps's Presidential Address to the Institution of Gas Engineers—becoming one of the dominating factors in our industrial welfare and development.

Various subjects of specific interest to our readers have been dealt with during the meeting of the Association; but reference to them may be postponed. One of them is a report—reproduced this week—by Professor W. A. Bone, in which he gives a valuable digest of the results of the principal researches upon the chemical aspects of gaseous combustion during the past thirty years. In the final part of the report, he treats of the influence of hot surfaces upon combustion, which, it will be remembered, was the cardinal feature to gas engineers and chemists of his lecture to the Institution of Gas Engineers in 1908.

### Standardization of Gas Supply.

A FAVOURABLE and sympathetic article by an "Engineering Correspondent" (signing himself "A.C."), on "Standardization of Gas Supply," has appeared in the "Illuminating Engineer." It outlined in a very fair manner (though here and there a little looseness is perceptible), the events and progress of the gas industry in the manufacture and the utilization of the primary product, that have led up to the claim, while illuminating power is the standard of quality, for a universally applicable standard test-burner such as we have in the "Metropolitan" No. 2. It is freely acknowledged that this burner is a great improvement on its predecessor; and the reason for this view is that it will bring about uniformity in the method of testing gas. "This 'is of the greatest possible importance to the industry, to 'the consumer, and to the manufacturers of gas plant; for 'the adoption of this burner 'of a certain, definite' [*sic*] 'consumption, will convey to the simplest mind a clear 'understanding as to what the value of the gas is, and will 'give to the manufacturers of gas plant the power to 'standardize their apparatus, with resultant economies in 'the cost of production.'" This requires qualification. The No. 2 burner is the best for the purposes of the industry and of the consumers, so long as Parliament adheres to illuminating power as the standard of quality. But in view of the present uses of gas, it does not denote what is the real value of gas to the consumers. We shall have to wait for the calorific power standard for that. But may we make a suggestion to the "Illuminating Engineer"? It looks, we believe, upon this proposal as a "rational" one; and its own policy in matters appertaining to illuminating agents is one of impartiality. This being so, our monthly contemporary can do a service by taking part in impressing upon those misguided local authorities who are owners of electricity supply concerns, but not of gas undertakings, and who have shown a readiness to oppose that which stands for progress in gas supply, that they are not doing the best for their communities by opposing the "rational proposals" of their competitors, more especially seeing that local authorities with gas-works (including such an important Corporation as that of Manchester) have been among the first to adopt these "rational proposals." The opposition of those interested in putting obstacles in the way of the progress of private enterprise in gas supply causes endless and unnecessary expense, which falls upon the consumers of gas, who are the constituents of the local authorities. There is one correction that should be made in the article of "A.C." It is that the three Standard Burner Bills were promoted not by only eight Companies, but by a number representing nearly fifty gas-supply areas.

### An Appeal to the Juniors.

As the holidays, especially for people residing north of the Tweed, are now practically over, officials of Associations are beginning to prepare for the work of the approaching session; and one of the first to show signs of activity is Mr. W. Geddes,



Hon. Secretary and Treasurer of the Eastern District Division of the Scottish Junior Gas Association, who has sent us his syllabus for 1910-11, which will be found in another part of the "JOURNAL." Useful as the Association has proved to be, the Council consider that it might be rendered much more so by an increase in the membership; and with this end in view Mr. Geddes has sent to a number of managers who are not at present upon the roll, but whose works are within the area covered by the Association, a letter setting forth its aims and objects, accompanied by an earnest appeal to them to assist it by becoming members themselves and by bringing it to the notice of those under their charge. The objects of the Association are fully stated in the letter. It is pointed out that before the formation of the Association in 1904, there was no organization in Scotland to which those occupying junior positions in the gas industry were admitted, and in which their interests were specially provided for. This want the Association supplied, without in any way superseding or supplanting the Senior Associations. Since its inception, the members have had before them papers from their own number which have given rise to useful discussions, and lectures from gentlemen eminent in the gas profession. Moreover, visits have been paid to gas-works, collieries, oil-works, meter-works, fire-brick works, &c.; thus increasing the practical knowledge of the members, who also have at their command a library consisting of about thirty standard works. The value of such an organization to juniors does not need emphasizing. The syllabus given elsewhere promises an interesting and instructive session; and it is to be hoped that a large additional number of members will be able to profit by participating in it as the result of the present appeal. The small membership fee of 5s. per annum should certainly not be a deterrent. What has been said in regard to one division of the particular Association concerned applies in large measure to the other, and also to the similar organizations south of the Tweed. They afford to the junior members of the profession opportunities not only of acquiring knowledge but of showing its possession.

### Australian Gas Matters.

One aspect of labour troubles of the kind which terminate in the ceasing of work was revealed by Mr. G. J. Cohen, the Chairman of the Australian Gas Company, when addressing the annual meeting of shareholders in Sydney—that is, the question of cost to the consumers. The disastrous Australian coal strike, which is now a matter of history, resulted in enormously high prices having to be paid for such supplies of coal as were procurable. The Board, under the circumstances, reconciled themselves to the necessity of meeting large demands in the way of additional outlay; but the losses eventually proved heavier than even they had anticipated. The total sum which the Company lost in this manner is put at over £70,000; but in spite of this heavy handicap, the price of gas was not raised. This is a point in the Company's favour which the customers should remember; and another fact which should not be lost sight of is that, notwithstanding the difficulties experienced in securing sufficient quantities of coal, the gas supply was not allowed to fail. Fortunately, owing to the strong financial position of the undertaking, it has been found possible (by making a substantial call upon the reserve fund) to maintain the dividend at the usual rate; but this does not render any less deplorable the big outlay of money of which the strike was the direct cause. Turning to the Company's own business, it is pleasing to note that during the past half year the increase in consumption amounted to nearly 8 per cent.; and that, in order that the undertaking may be in a position to cope with the anticipated output of next winter, it has been found necessary to make arrangements for increasing the plant at the manufacturing stations. The larger consumption has been the consequence of a substantial addition to the number of consumers on the books—the present total being 92,644. As will be noticed from our report of the meeting, the day consumption of gas is equal to about 46 per cent. of the total deliveries.

### The Miners' Unsettlement.

When the papers are filled with references to labour unsettlement, it is pretty safe to assume that affairs in the South Wales coalfield will be found to have a place in the statements made. The present occasion, when the eyes of the industrial world have suddenly been drawn to the lock-out of the boiler-makers in the shipbuilding yards—a drastic action by which the

employers are seeking to impress on the men the obvious fact that an agreement solemnly entered into should be binding on both parties to it, and not only on one—affords no exception to the rule. The business of the great shipbuilding firms of the North is to be temporarily disorganized; and sections of the Welsh miners are also busy in endeavours to paralyze their own trade. The difficulty which is now perceived so clearly in connection with this colliery district, and the likelihood of which cropping up at some time or another has long been foreseen by many who have watched the course of events, is that of the men getting out of hand with their own leaders. Last month reference was made to the restiveness shown by the men under the policy of the Executive of their own Federation. At that time the Federation had had to decline financial assistance to certain miners owing to the manner in which their unemployment had been brought about; and from a statement made to a Press representative a few days ago by Mr. D. A. Thomas, M.P., it seems that matters are becoming more disturbed as time goes on. Alluding to certain miners who are on strike, Mr. Thomas says: "I am certainly not going to beg the men to return to work. I have fought their battles for them so often inside and outside the Conciliation Board that they ought to have no doubt of my mental attitude towards them. I am tired of all this bickering, and I certainly shall not go out of my way on the present occasion to secure peace which seems impossible of any permanency under existing conditions. The men seem to be as much at war with their own leaders as with the employers; and, as they appear unwilling to carry out the agreement entered into on their behalf only a few months ago, they must abide by the consequences. Time will tell what these consequences may be. I can only add that the employers are heartily tired of all these local bothers." This is significant; and equally so is the assertion of Mr. W. Abraham, M.P., that this kind of indiscipline will sap the whole fabric of national negotiations and agreements, because it must in the long run destroy that confidence in the authority of the parties without which every agreement is so much waste paper. This, of course, is at the root of the whole matter. The trouble in South Wales is largely, on the surface, the old one of the non-Unionist, and the desirability of including him "in the fold." But in reality the question to be solved is between the Unionists and their own Federation. If the masters cannot rely upon the employees keeping strictly to agreements entered into with their accredited (for the time being, at least) representatives, the whole structure of conciliation which has been so laboriously built up must of necessity fall to the ground, and the owners must seek other and less pleasant means of enforcing their views.

### The Contract for Glover-West Vertical Retorts at Sydney.

The details of the contract for the Australian Gaslight Company of Sydney (New South Wales) have been finally agreed and settled by Messrs. William Coward and Co., their London Agents, with the West Gas Improvement Company, Limited; and preparation for the retort-house at Mortlake—in which the instalment of West-Glover vertical retorts is to be erected, as already mentioned in our pages—has been put in hand. There will be 56 retorts comprised in this section, in benches of eight each, worked with all the experience of the system on the part of the inventors gained from their earlier essays. The coal in use in the Sydney works is vastly superior to some that has been used with success for verticals in England; and it may be expected that excellent results will ensue. There is an impression in the "old country" that the colonies are to some extent behind the times in carbonization and distribution; but Messrs. Coward and Co., who are the Agents for a number of gas undertakings in both Australia and New Zealand, assure us this is not the case; and that they are now engaged in supplying every sort of the latest inventions and appliances in all departments of gas manufacture—not only as the outcome of their own suggestion, but as the result of the knowledge, even in the most distant of our dependencies, and of the educated opinion of engineers who have studied the problem of coal gas making and distribution in its present advanced and scientific form. With the above installation at Sydney will be a new supply of mechanical coal-breakers worked by electricity, amply sufficient to deal with the coal, which is in exceptionally large blocks; and the works, when the present enlarged appliances are carried out, will be in the front rank of such undertakings, and second to none in the realization of the most up-to-date methods.

Alderman William Groom, the Chairman of the Harwich Gas Company, and eight times Mayor of the borough, whose death was announced in the "JOURNAL" for the 7th of June last, left estate valued at £68,059 gross, with net personalty returned at £55,353.



## GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 670.)

BUSINESS on the Stock Exchange last week was quite quiet and destitute of any strongly marked feature. The end of the long account was reached at last, to the general satisfaction. In spite of the dormant character of the week, there was a fairly good tendency throughout. On the opening day, preparations for the settlement repressed active new business; but the tone, on the whole, was pretty good. Consols were no better; but Rails were firm. The American market, too, was stronger on a good lead being given from New York. There were bright spots in the speculative lines also. Tuesday was much the same—quiet but firm. Consols were unchanged; but Rails showed rising prices. Americans looked doubtful towards the close. On Wednesday, the adjustment of the settlement gave rise to no complications. Gilt-edged lines were firm; Rails rather less so. Americans swayed about uncertainly. Business on Thursday was at a low ebb; but there were some advances in prices, aided in a measure by the Bank rate remaining unchanged. Consols were put up, and Rails were firm; but Americans were depressed. Markets were almost quite idle on Friday; and some little realization tended to flatten prices. Consols lost their advance of the previous day, and Rails were annoyed by the labour trouble in the North. The Markets were thinly attended on Saturday. New York was closed and could administer no spur; and things closed pretty much the same as they opened. In the Money Market, rates were easy at first, but afterwards they hardened, only again to give way before the end of the week. Business in the Gas Market was quiet, but not more so than might be expected at the end of August. Changes in quotation (except variations *ex div.*) were few. All were, however, uniformly upward; and prices were very firm. In Gaslight and Coke issues, the ordinary was quite steady at from 105½ to 106. In the secured issues, the maximum realized 87½ and 88, the preference 103¾ and 104, and the debenture 80¾. South Metropolitan was quiet and unchanged, with transactions ranging from 120½ free to 122. The debenture was done at 79½. In Commercials, there was one deal in the 4 per cent. at 105¾. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 82¾ and 83 (a rise of 1), Brentford old at 249, British at 44½ and 44¾, and South Suburban at 121½. On the local Exchange, Chester realized 110 (a rise of ½), and Liverpool debenture 105¾. In the Continental companies, Imperial was unchanged at from 184½ to 185¾, Union made from 95 to 96½, and European fully-paid from 23½ to 23¾. Among the undertakings of the remoter world, Primitiva was done at 7½ and 7¾ (a rise of ½), ditto preference at from 51½ to 51¾, and River Plate debenture at 97½ and 98¾.

## ELECTRICITY SUPPLY MEMORANDA.

**Alleged Ignorance of the Manufacturers of Electrical Appliances—Omniscient Marylebone—Reflections of Parliamentary Promotions—Persistent Cloud—Depreciation and Income-Tax.**

"FOOLS all of you." That is the sum and substance of the criticism of the manufacturers of electric cooking and heating apparatus that has appeared in letters in the electrical press from the side of the purveyors of electricity, following up the article and letter respectively of Mr. M. Farrer and "Iconoclast," to which reference was made in the "Memoranda" for Aug. 23. The nescience of the domestic electrical apparatus manufacturers, we are asked to believe, is appalling. They know nothing of the requirements of the users of such apparatus; and they go on, happily or otherwise, making goods for which there is no request or sale, and which will not accomplish what is required. The reward for their good but ignorant intentions can only come in the great hereafter. One can but think, from the strain of the criticism of these manufacturers that they—many though they may be, including their staffs and workpeople—know nothing of the requirements of users of such appliances because they do not employ them themselves. Of all people manufacturers surely use their own appliances, if only for the purpose of showing belief in them, and gaining some experience. If they do not, perhaps they show wisdom in refusing to gain experience by personal use, expense, and annoyance. We have really much sympathy for the manufacturer of such appliances, and, in the great breadth and depth of our sympathetic nature, there is profound sorrow that the purveyors of electricity have been so ready to saddle these makers with all the blame for the impotence of electricity to compete in cooking and heating on level ground with gas. The limitations of the manufacturer are great, his difficulties are many, and, as "Meteor" of "domestic electrification" fame truly says, no man in connection with this subject of the production of electrical cooking and heating apparatus "is yet in a position to suggest a lightning reformation."

One or two persons have had the temerity to look at the subject, and print their views, from the standpoint of the much-abused manufacturer; and it is seen from what they say that the critics do not give the manufacturers much assistance by practical suggestions, or afford much aid towards cheapening the cost of turning out the apparatus. To get to the lowest possible cost

in use, electrical cooking and heating appliances must be made in anything but a cheap and nasty manner. Cooking-ovens, for instance, must be well-jacketed, so as to show no appreciable loss from radiation, and due regard must be paid to the regulation of the heat; and altogether their design and construction must be of an infinitely more elaborate character than in the case of gas cooking-stoves. Mr. C. H. Archer, one writer from the side of the manufacturers, goes so far as to say that he "does not think it will ever be possible to manufacture electric cooking-stoves at the same cost as gas cooking-stoves." We are not surprised at this. Similar home-truths have been uttered by Mr. M. Farrer, one of the writers who has let loose upon all the insane writing there has been in our electrical contemporaries on this subject of equality in cost and efficiency with gas in cooking and heating. He observes that, while electrical cooking is in the "experimental stage," one "can hardly expect manufacturers to compete in price with the gas-stove, which can be turned out in thousands to a standard design." All things in the electrical line require a long experimental career. Yet another misfortune of such electrical appliances, pointed out by Mr. Farrer, is that one "cannot turn out a standard article which is right for use without alteration on any electricity supply in the United Kingdom."

We had expected that the article and letter that started this correspondence would have brought down a perfect avalanche of abuse upon the authors for their colossal impudence in letting the cat out of the bag. But nothing of the kind. The want of economy and of inefficiency is generally admitted. We use the word "generally" advisedly, for in one quarter there is not agreement. With one accord, however, the manufacturer is made the scapegoat. But why the electrical industry and the manufacturers did not in their distress turn to Marylebone for advice, we cannot divine. There is no difficulty there. Oh, no! There has been; but then (according to a letter by Mr. H. H. Holmes) the wise ones of the Marylebone Electricity Department have shown at least one manufacturer how to construct an electric oven, and now they have one which, with electricity at 1d. per unit, can cook as cheaply as a gas-oven with gas at 2s. 8d. per 1000 cubic feet. Something like 31 cubic feet at that price can be bought for 1d., and will give about 15,000 B.Th.U. We wonder where the difference between this figure and the B.Th.U.'s obtainable by using a unit of electricity goes to. Evidently, taking Mr. Holmes seriously, there is very great disorder in the economy of things in the gas industry. We have not observed since the appearance of the letter from Marylebone that there has been any fund started for commemorating the eminent services to the electrical industry of Messrs. Seabrook and Holmes, or should it be Holmes and Seabrook? That is a serious oversight, which ought immediately to be remedied.

A review of the Private Bill Legislation of the session in the "Electrical Review" shows distinctly the trend of things electrical in this country. Fresh legislation in which electricity is concerned now deals almost exclusively with tramways and railways. The promotions in the still unexpired session of Parliament that treated of ordinary town supply were very small eggs, and but few in number. Our contemporary ascribes this state of things to the feverish activity of some years ago which, it says, was bound to be followed by a period of comparative stagnation. There was no question, during the "feverish activity," of a long period of stagnation succeeding. The "feverish activity" was due to an inordinate belief, built upon the shallowest of grounds, in the future primary illuminating agent of this country being electricity, and to the local authorities, large and small, being misled into thinking that electricity supplied the means by which profits could be diverted from the gas industry to be (so said) used for the relief of rates, but, more correctly stated, for pandering to their own love for prodigality at other people's expense. They were also, in numbers of towns, easily misguided into putting down works, at heavy capital expenditure, on a scale that has been proved to be largely in excess of requirements, and made still more so by the advent of electric and gas lamps of greater economy than those in existence when the electricity works were started. Had gas stood still, and effected no progress in widening the relations of gas consumption and efficiency, the electricity industry would have progressed by leaps and bounds with their metallic filament lamps. The excessive plants at the generating stations that excited imaginations allowed to be constructed—in many towns purely residential—would have been long since insufficient for the demand; success would have led to the throwing out of fresh cables from the distribution system into new districts; and year by year additional powers would have had to be sought from Parliament to enable this to be done. But the "best-laid schemes of mice and men"—and these were not of the best laid—"gang aft a-gley," with the result, as our contemporary remarks, "both electrical companies and municipal bodies have been content to mark-time, and the result is reflected in the Committee rooms of Parliament." We do not see any particular appositeness about the use of the term "content" in this connection, seeing that the position in which electricity suppliers at present stand is a compulsory one. Excepting powers for tramways and railways, the session's promotions look somewhat of the weakening order.

The "marking-time" is not only seen in large portions of the electricity-supply industry, but in the electrical apparatus making industry. The cloud continues that has rested over the latter for so long. At one time there was talk of rifts in the cloud, and of rays that inspired hope. But these were purely chimerical; and, in places in the manufacturing industry to-day, there is a positive



note of despondency. The manufacturing companies that have done best latterly are those whose operations have a broad and diverse basis—like the General Electric Company, whose business extends to telephones, the manufacture of Osram lamps, and in many other directions. But take Crompton and Co., they had a loss last year, after providing for depreciation and repairs, of £20,493; and this is placed at the door of the keen competition that exists for the work that is going. In order to keep life in their establishment, the Company have had to take business at mere works' cost, and have had to exercise rigid economy in every direction of administration. Take Edmundson's as a further example, they are reducing their capital, at the expense of wiping out their reserves. Though a net profit of £10,768 was made last year, this is being carried forward. The Company are financially interested in a number of electricity supply companies; and these have only presented a "fairly general" improvement, while two of them, Bromley and Scarborough, have shown an actual decline in profits. Partly accounting for the "fairly general" improvement have been the inclement weather and the lower coal prices. But these are unreliable conditions—in fact, coal prices have been already ascending. While, too, it is considered by those upon whom the administration of the Company's affairs depends that the metallic filament lamp has come as a boon and a blessing to the industry, the Chairman of the Company thinks its adoption will be more gradual in private residences than it has been in the case of shops. He is a philosophic man; and his experience ought to enable him to judge. But, regarding shops, the adoption of the metallic filament lamp has been more in the direction of the eviction by it of the carbon filament type than of any fresh equipment. Generally speaking, the shares of electrical manufacturing concerns, under the present conditions, will not appeal to investors.

One of the subjects that has of late been troubling the gas industry has been that of the allowance for depreciation in assessing for income-tax; and it has been noticed, with a certain amount of wonderment, not unmixed with resentment at the preferential treatment, that the Inland Revenue authorities have shown special favour to electricity supply undertakings. Why there should be this difference is not apparent; but it exists. A case in point is the Hammersmith electric supply undertaking. It appears from a statement in one of our electrical contemporaries, that for some time past negotiations have been proceeding between the Borough Council and the Inland Revenue authorities with the view to obtaining an alteration in the basis of assessment of the profits of the undertaking for income-tax. The facts, as stated, are these: Up to 1904-5 it was the practice to allow from the gross profits a fixed sum of £2500 to cover depreciation of machinery and plant. This was considered insufficient, and a claim was made for a larger allowance. The upshot is that it has been arranged to allow each year fixed percentages on the capital outlay on mains and machinery of 3 per cent. and 5 per cent. respectively. No income-tax has been paid since 1904-5; but for the three years ended March, 1908, £1920 5s. 4d. has been set aside to meet the liability. On the basis now arranged, the income-tax payable in respect of these years will be £1298 14s., or £621 11s. 4d. less than the amount provided. What the Inland Revenue authorities have allowed here is what they seek to disallow in the case of gas undertakings.

## PERSONAL.

On the evening of Monday of last week, Mr. J. D. SMITH entertained the staff and workpeople in the Stirling Gas-Works to supper. Mr. J. Johnston, the oldest employee, in the name of the staff congratulated Mr. Smith on his appointment to the important position of Manager at Belfast, and presented him with a roll-top desk as a token of esteem. Mr. Smith appropriately returned thanks.

## OBITUARY.

The "Journal für Gasbeleuchtung" reports the death on the 15th ult., after a long and painful illness, of Herr G. F. SCHAAR, Manager of the Thuringian Gas Company, of Leipzig. Deceased was the founder of a well-known German calendar for gas and water engineers, which he edited for many years, and which still goes by his name.

The death is announced of Alderman LEONARD WILD, who for some years was Chairman of the Gas Committee of the Bolton Corporation. He was in his 85th year, and had been a member of the Town Council ever since 1893. At the funeral, the Gas Committee of the Corporation were represented by Councillor Webster (the Chairman), Alderman J. Seddon, and Councillors Gee and Sharples.

The death occurred last Tuesday at North Ormesby, Middlesbrough, at the age of 65, of Mr. JAMES HANKS, a well-known resident on Teesside. He was a brick manufacturer at South Bank, and for many years took a keen interest in public life. He was Chairman of the South Bank and Normanby Gas and Coke Company, Limited, and a Director of the North Ormesby Gas Company. In 1903 he was made a Justice of the Peace for the North Riding.

## AN ENGINEERING EXHIBITION

Now Being Held at Olympia.

At the present time Olympia is the scene of yet another exhibition (which will remain open until the 26th inst.), at which are to be seen a large number of things that are of special interest to those connected with naval, mercantile marine, and general engineering and machinery. With so wide a scope, it may be confidently predicted that the show will draw a very large number of visitors; and, indeed, there is much to be seen that will appeal, not only to engineers, but to the general public. A representative collection of models of ships is on view; and there are demonstrations with apparatus designed for rescue work in mines and foul atmospheres, as well as for deep-sea diving. Buyers and users of machinery and power tools, too, have an opportunity presented to them of examining at leisure the latest labour-saving appliances for the equipment of workshops and factories. The patrons of the exhibition and the members of the Advisory Council represent every side of the engineering industries, and include many really influential names. It may be remarked that arrangements have been made for several engineering and technical societies to hold meetings at Olympia during the period of the exhibition—among them, the Junior Institution of Engineers to-day, the Society of Engineers on the 21st inst., and the Association of Engineers-in-Charge on the 24th inst. The educational side has not been neglected; and facilities which are certain to be appreciated are offered to students connected with the various engineering institutions, technical institutes, &c., to visit the exhibition under the guidance of experts. Arrangements have also been made for the admission at specially reduced rates of workmen and employees connected with the principal dockyards, works, and engineering establishments. The present exhibition is the third of the series. The first in 1906 would appear to have consisted principally of a display of machine tools; at the second, in 1907, the heavier side of the engineering industries was represented on a larger scale; while now the scope has been still further enlarged by the inclusion of marine engineering work. The President of the exhibition is Sir David Gill, K.C.B., LL.D., D.Sc., F.R.S., President of the Institution of Marine Engineers; while the Organizing Manager is Mr. F. W. Bridges.

The opening ceremony was performed last Thursday by the Marquis of Graham, who delivered an address which was much enjoyed by the large company present. He remarked that nowadays a man who wanted to become a thorough engineer must have a knowledge of many sciences; and he then went on to dwell upon the services rendered by the profession to the world at large. Our very existence to-day, he pointed out, depended almost entirely upon the machinery which was the outcome of the brains of engineers. In proposing a vote of thanks to the Marquis, Captain H. Riall Sankey, alluding to the remark that an engineer needed a knowledge of many sciences, expressed the opinion that if a man wanted to get on he should stick to one thing; and, in seconding the vote, Mr. W. F. Reid, the President of the Society of Chemical Industry, drew attention to the many directions in which the chemist was of constant assistance to the engineer.

A luncheon followed, at which there was some little speech-making. The toast of "Success to the Naval, Mercantile Marine, and General Engineering and Machinery Exhibition," was proposed by the Hon. John McCall, M.D., Agent-General for Tasmania, and responded to by Captain Sankey, who pointed out that the idea of the organizers was not merely to make a show, but to bring manufacturers and their clients into closer touch. "The Engineering Industries" was submitted by Mr. J. W. Helps, ex-President of the Institution of Gas Engineers, who remarked that when he was asked to propose this toast his first thought was that it was an error of judgment to place it in the hands of a gas engineer. After a little consideration, however, he realized that the error was not so apparent as it had at first seemed, because the gas industry had perhaps taken as much advantage as any other of engineering progress. This could be seen if they compared the state of things which existed twenty or thirty years ago with what was to be found now in well-equipped gas-works. The progress that had been made in engineering matters in gas-works within this period had been not only very striking, but almost startling. Twenty years or so ago, the labour was manual, and mechanical appliances in this connection were conspicuous by their absence; but now all this had been altered. There was machinery for stoking, and dealing with the coal and coke; and thereby the cost of gas production had been greatly decreased. Therefore, gas engineers were foresighted enough to fully appreciate the progress made in engineering during recent years. With regard to motive power, in his own works he had gas-engines, electricity, steam, hydraulic power, and compressed air; and when they considered this and all the splendid machinery that was in use in gas making, &c., they would realize the truth of his assertion that gas engineers had not been behind anyone in taking advantage of the great modern advances in engineering. Going back to 1889, he found that, to produce the whole of the gas that was made in his own works, they employed 112 men; and notwithstanding the fact that during the ensuing twenty years the output of gas had increased by somewhere about 250 per cent., the number of men engaged in



manufacturing it had only grown to 189. This was a very striking fact; and the increased adoption of machinery had enabled the work to be done, not only far more economically, but with much less arduous labour on the part of the men employed. It was urged, he knew, that the introduction of machinery had had a lot to do with the great amount of unemployment which was prevalent in this country. In connection with his own industry, he could refute this idea, because, while the introduction of machinery had undoubtedly enabled them to make gas and to sell it at a much cheaper rate than was formerly possible, still this cheapening of the cost had caused gas to be used for many purposes that were impossible before; and in looking after the distribution of this greater quantity of gas and in attending to the wants of the customers, a far greater number of men were employed than used to be the case. Taking his own Company, in 1889 the average weekly number of men employed in the distribution department was only 33; whereas in 1909 this number had increased to 241. So that putting the manufacturing and distribution departments together, it would be found that the actual number of men who were employed now, in spite of the altered methods of manufacture, was absolutely *pro rata* with the increased output of gas. In reply, Mr. Mark Robinson remarked that nowadays there was no industry in the country which was not indebted to mechanical engineering. Referring to the Brussels Exhibition, he said the how which we made was not that which England ought to make. Those who had great businesses, and had perhaps made great fortunes from them, should remember that they owed something to their country, and should come forward on such occasions to a greater extent than they seemed inclined to do. However, the Humphrey gas-pump was one exhibit of which they should all be proud. He himself believed that the internal combustion engine was going to do very great things in the future.

So far as the exhibits themselves are concerned, though there is, of course, much that is of interest to all mechanical engineers, there is not a great deal that appeals to persons identified with gas and water works more than to those connected with other commercial undertakings. The generally appreciated naval department and the excellent show of machine tools naturally account for a very considerable proportion of the space filled up. Gas lighting itself is worthily represented by the Tilley High-Pressure Gas Syndicate, of Kingsland Road, who have a large stand brilliantly lighted by incandescent lamps furnished with gas on their system—which, as they remark, was “invented with a view to supplying a widespread demand for a better and more economical means of illumination, suitable for both small and large users of gas.” The compressors, which are extremely compact, and automatic in action, are shown in three types—belt-driven, electric-driven, and water-driven. Appliances for the utilization of acetylene gas in various ways are exhibited by the Acetylene Illuminating Company, the Imperial Light, Limited, the Thorn and Hoddle Acetylene Company, and Messrs. C. C. Wakefield and Co.; while the petrol air-gas plant of the Praed Patent Safety Gaslight Company is also to be seen in action. As for gas-engines, these are shown by Messrs. E. S. Hindley and Sons, of Queen Victoria Street, E.C. (a 75 B.H.P. vertical three-cylinder gas-engine for direct coupling to an electric generator, centrifugal pumps, &c.), and Messrs. Kynoch, of Birmingham (a 100 H.P. gas-engine, which is seen running, in addition to some other plant).

A stand which was securing a considerable amount of attention at the time of our visit was that of the Cambridge Scientific Instrument Company, who make an imposing display of pyrometers, thermometers, Méker burners, and furnaces, &c. Most of the apparatus is shown in operation; it being possible, for instance, to watch the method of taking readings of furnace temperatures by means of the Féry radiation pyrometer. Many of the visitors, too, walked out into the yard to inspect the Babcock and Wilcox patent portable type water-tube boiler, which has been fitted up for the purpose of supplying steam for driving machinery in the exhibition. The Lea Recorder Company, of Deansgate, Manchester, have in action one of Lea's patent combined indicating, recording, and integrating instruments of the latest pattern, which is engaged in measuring the discharge of one of the pumps on the Worthington Pump Company's stand. Messrs. Wallach Bros., of Finsbury Square, among many other things, show their “Ever Trusty” whitewashing machines; and Messrs. Gwynnes, Limited, of Hammersmith, some pumping-engines. Elsewhere there is to be seen the Kennedy bending machine, invented by one of the employees of Messrs. John Barker and Co., of Kensington, to bend tubing, but which it has been found is suitable for manipulating metal generally. There are indicators for steam and gas engines on the stand of the Crosby Steam Gauge and Valve Company, of Queen Victoria Street; and the “Fournier” thermo instruments (by means of which any degrees of temperature, humidity, and ventilation can be indicated, recorded, or regulated at any distance), at that of Messrs. F. Mellin and Co., of Kilburn. Another stand which attracted notice was that of Messrs. George Kent, Limited, of High Holborn, where meters of various kinds—including the Venturi principle—are a feature. One ingenious piece of mechanism is an alarm for indicating the occurrence of a burst in a water-main; the alarm consisting of a bell which rings continuously for several minutes on any pre-arranged reduction of pressure taking place. Finally, it may be mentioned that the British Oxygen Company, of Elverton Street, S.W., give, among others, daily demonstrations of oxy-acetylene and oxy-coal-gas welding.

## SCIENTISTS' VIEWS ON GASEOUS EXPLOSIONS.

### Discussion on the Third Report of the Gaseous Explosions Committee of the British Association.

WE give in another part of the “JOURNAL” (p. 640) the full text of the third report of the British Association Committee on Gaseous Explosions, which was presented by Professor Bertram Hopkinson, one of the Secretaries of the Committee, in the Engineering Section last Friday.

Before the discussion of the report was commenced,

Professor H. B. DIXON submitted a short sketch of some work he has carried out recently on the photography of the firing of gases by adiabatic compression, and exhibited some photographs of this character. The experiments were directed to showing that the general opinion that gases ignite by detonation is not correct, but that with ordinary gas-engine mixtures the flame spreads gradually; and the photographs brought this out well. Another point dealt with was the pre-flame period; and in these experiments a carbon disulphide oxygen mixture was employed. The resultant photographs showed a quite considerable period between the ignition and the flame. Other photographs demonstrated that sound waves in the tube could be photographed; and these also showed almost an absence of sound waves after the gas was ignited. Perhaps, said Professor Dixon in conclusion, some opinions would be expressed as to whether conduction and radiation losses were likely to arise in his experiments, and likewise whether loss of heat could happen while the gases were being heated up.

Mr. DUGALD CLERK, speaking on this point, said that experiments he had carried out showed there would be considerable loss of heat during compression; but though this increased with the piston speed, it did not increase in proportion to the increase of the piston speed. For this reason, he thought it possible that the real temperatures shown by Professor Dixon were higher than those he had given. He eulogized the work of Professor Dixon and Professor Hopkinson in connection with the phenomena of gaseous explosions, and also the work of the Committee. For a long time considerable doubt had, he said, existed concerning many facts relating to the internal combustion engine; but the work of the Committee was gradually clearing them up. For instance, it was now definitely settled that the specific heat of the working fluid increased with temperature. The Committee's work had also shown that radiation losses were larger than they had thought—a question upon which there could not now be much doubt, in view of the remarkable manner in which the experiments of Professors Hopkinson and Callendar coincided. Their original views upon the transparency of the flame had to be modified; for they now knew that it was transparent to its own radiation. Upon several other points also, the experimental work now going on rather pointed to the danger of applying the laws governing the loss of heat in a fixed and closed vessel to a vessel which contained a moving piston. The advantage of investigations being carried on by a committee was that it enabled much more rapid progress to be made than when the work was left to individuals.

Mr. H. E. WIMPERIS emphasized the great practical importance of definite information as to what extent the glowing gas is transparent to its own radiation. He pointed out that gas-engines are rapidly increasing in size; and this fact alone, he said, called for further investigation of the matter.

Dr. E. G. COKER thought the results of Professors Hopkinson and Callendar were not quite in agreement as to the degree of transparency of the flame to its own radiation. He believed the lateral extension of the flame was the main cause of the difference. Another interesting matter was that the activity of the radiation was very much increased at the point of dissociation. The question of turbulence was also of considerable importance.

Captain H. RIAL SANKEY referred to the polishing of cylinders and pistons, and mentioned that Messrs. Sulzer had been in the habit of doing this. The Committee's experiments upon radiation had been in a comparatively small vessel, and what was really wanted was to arrive at results obtained in an actual gas-engine cylinder.

Dr. ROSENHAIN, referring to the experiments of Professors Hopkinson and Callendar, pointed out certain differences in the methods adopted. Professor Callendar had, he said, used a number of flames a short distance apart; while Professor Hopkinson employed a continuous mass of flame. Consequently, with the Callendar experiments, the factor of reflection due to the radiation from the first flame did not arise in the case of the Hopkinson experiments. He also suggested the possibility of introducing vapour into the combustion chamber which would absorb the radiant heat, and so obviate some of the losses which had been referred to in this connection.

Sir WILLIAM WHITE, K.C.B., in a short speech, referred to the recent articles in the Daily Press regarding gas-driven warships, and remarked that if the writers only understood the practical difficulties in the way of such a naval development, they would realize that it was a long way off.

Professor HOPKINSON, in reply, thought the factor which had contributed most largely to the variation in the results obtained by Professor Callendar and himself was the difference in the size of flame adopted.



## THE BRITISH ASSOCIATION AND GASEOUS COMBUSTION.

### Discussion on Dr. Bone's Report.

IN another part of the "JOURNAL" (p. 648) will be found the full text of the report presented by Dr. Bone, on the subject of "Gaseous Combustion," at a joint meeting of the Physical Science and Chemistry Sections of the British Association last Friday. It led to an interesting discussion, the principal features of which are given below.

Dr. BONE, in laying the general results of his report before the meeting, said it had been prepared mainly in order to get the views of the physicists upon the problems which had now to be solved. For instance, on the influence of moisture upon combustion there was much disagreement, even between the chemists themselves. In fact, he did not think there had been a question during the past twenty years on which there had been so much diversity of view; and they had not yet arrived even at a partial agreement. Dr. Bone somewhat amplified Section VI. of his report, which dealt with the influence of hot surfaces upon combustion. He said he had reason to believe that in the firing of furnaces, and so forth, the surfaces played a very important part in the development of concentration of the heat. There was no doubt whatever that hot surfaces did accelerate combustion as they accelerated other changes in gaseous systems. It had long been known among technologists that surfaces accelerated dissociation. The subject was developed very considerably on its experimental side during the first thirty years after Davy's death; but, for some reason or other, interest in it waned, and was not revived again till about fifteen years ago, when some German workers took it up and tried to develop it on its theoretical side. In the experimental inquiry, it was necessary to prosecute the experiment under conditions where surface combustion was not interfered with by combustion taking place in the main body of the gas; otherwise the effects were too complex for analysis. They were therefore limited at present to the investigation of the phenomenon below the ignition-point. In this connection, Dr. Bone threw upon the screen some micro-photographs of silver gauze before and after it had been hydrogenized. It was shown that after such a surface had been used for surface combustions, and repeatedly accelerated by exposure to hydrogen, the surface had the appearance of being completely frosted; showing that the combustion had been due to actual association of the gas with the surface. Apparently only the hydrogen and the surface were concerned; but whether this was so at high temperatures it would be rash to say. It might be that the position would be reversed. With people who had investigated combustion at high temperatures, it seemed that there were some results which indicated that the oxygen also began to exercise an effect; but this at present could not be stated quite definitely. One fact recently found with regard to surface combustion must be considered in connection with the influence of moisture. Professor Dixon found thirty years ago that dry carbonic oxide and oxygen were not inflammable. He (the speaker) found that carbonic oxide, thoroughly dried, accelerates surface combustion in a very marked degree. If they took a mixture of carbonic oxide and oxygen, and saturated it with (say)  $1\frac{1}{2}$  per cent. of moisture, a certain value would be obtained—i.e., a certain amount of gas would disappear in a given time. If this mixture were thoroughly dried, it would be found that the value obtained before was about doubled. In other words, the removal of the trace of moisture had the effect of very greatly accelerating the action of the surface in bringing about the combustion of the carbonic oxide. He had also found that these metal surfaces became electrically charged while surface combustion is proceeding. There was a very distinct electrical charge on the surface when combustion commenced, and, so far as could be ascertained at present, this charging-up synchronized with the beginning of the surface combustion. He thought this was roughly true, though it was difficult to determine when combustion occurred. With regard to the influence of the surfaces in this connection, there were indications that it was connected with the well-known property of surfaces giving off charged particles when highly heated.

### Discussion.

Professor Sir J. J. THOMSON, F.R.S., in opening the discussion, first referred to the velocity of propagation of explosive waves. In dealing with this subject, he pointed out that the meeting was not merely considering separate atoms and molecules, as there were much smaller and much more rapidly moving bodies than the atoms and molecules of an ordinary gas to be taken account of. It was quite possible that these moved forward in front of the explosive wave, prepared the gas in front of it for the explosion, and put it in a condition in which it was ionized, and in which the chemical processes might occur much more rapidly than in a gas that was quite unsophisticated, and had not been under the influence of these particles. If this were the case, he thought they could stop these particles moving by producing a magnetic field, as they would be unable to get across it. It would be very interesting for experiments to be carried out to ascertain whether, if the tubes in which these explosive waves were studied were placed in a strong magnetic field, any influence would be produced

upon the velocity of the propagation of the wave or upon the velocity with which the explosions were prosecuted. In regard to the influence of moisture upon combustion, if there were small particles of water present, they would certainly diminish the attraction between any electrified bodies in their neighbourhood. But whether the effect of this dissociation was sufficient to explain what the chemists observed in this connection, he did not know, as he had made very few experiments as to the effect of moisture upon chemical combination. In the course of the past year, some work had been carried out in connection with the presence of small quantities of moisture in gases; and this had considerable bearing on the question, which was also allied to that of hot surfaces. The negatively charged constituent in a gas was a very much smaller mass, and moved with very much greater velocity, than the positive, when it was first produced. But if they took any ordinary gas, and attempted to measure the velocities of the positive and negative constituents, it would be found that the difference was only a few per cents. During the past year certain work at Oxford and in Germany had demonstrated the fact that if the gas were dried—say, by liquid air—there was an immense disproportion between the velocities of the positive and negative. With dried gas, the velocity of the negative might be 100 times that of the positive; and to produce this difference, there was only required an amount of moisture comparable with that needed in chemical combination. This result must have a very considerable bearing on what was an almost identical problem—viz., the combination of different gases. The effect of hot surfaces on the rate of recombination was a subject of very great importance to the physicist, because in recent years very many interesting points had been discovered regarding the emission of positive and negative electricity from heated surfaces. He should like to know whether Dr. Bone had found his heated surface become positively or negatively electrified, either before or during combination. It was a very important matter from the point of view of the physicist, because if it became positively electrified it would mean that the surface had been giving out large quantities of negative electricity. It was known that many surfaces did this. For instance, lime, if heated, gave out an enormous stream of negative electricity. On the other hand, most metals, when heated to these moderate temperatures, gave out an excess of positive electricity. Therefore, from the physical point of view, it was essential that they should know whether in Dr. Bone's case the electrification was positive or negative.

Dr. BONE: It was negative.

Professor THOMSON said, that being so, he should rather doubt whether the positive ions would stick to the oxygen. It was not generally found that the presence of these gases had much effect upon the positive constituents. It was the negative ones that showed this extraordinary variation and difference of behaviour if minute impurities were mixed with them. He very much wished that chemists would study the peculiar behaviour of these oxides. Experiments with a piece of lime or a piece of barium oxide would show an immense stream of electricity coming out at high temperature; and anyone making the experiment must be impressed by the importance of the phenomenon. At present he did not think there was any decided answer as to where the energy came from to project these negative particles in such an amount and with such velocity. Was there the possibility of the formation of two oxides, and oscillation between one and the other, giving a liberation of energy which would be available for producing these streams of negative particles? He believed that there were two oxides of barium which might possibly behave in this way; and he was not sure whether chemists recognized corresponding oxides of calcium. There must be some source for this energy; and it was possible that there might be some kind of formation of different oxides which would liberate different amounts of energy. Surface effects had been studied a good deal lately in connection with the influence of ultra-violet light upon metals, and the conclusion was being arrived at that the greater part of the difference in this effect was due to the differences in the gas sticking to the surface. The surfaces were closed with layers of electrified gas; and it could easily be seen that, if there were a positive layer in front, this would tend to prevent the emission of the positive. With negative in front, the tendency was to facilitate the emission of the positive, and the effects obtained with ultra-violet light pointed to the fact that a great deal of the behaviour of the surfaces was due to the formation of a kind of support for layers of electrified gas. He had no doubt this would be found to play a very considerable part in the phenomena of combustion.

Sir OLIVER LODGE emphasized the importance of Sir Joseph Thomson's suggestion with regard to the application of a magnetic field to an explosion tube. The photographs of Professor Dixon showed that the compression wave was overtaking the flame wave somewhere; and then it would seem that there was a new explosion or a new kind of chemical combination set up which reinforced the original flame, and formed a fresh nucleus of disturbance. If this were so, it would seem that a different chemical action was going on at this point. The velocity of sound had been mentioned in connection with these gases. But this was not a very definite quantity in these cases; it was influenced so much by the explosive actions going on. A bullet produced a compression wave when it hit the air. An explosion might do something of the same kind; and the velocity of sound might be trebled according to the temperature of the gas. In a Diesel engine, the compression of air could produce ignition—



*i.e.*, it produced very high temperature. The velocity of sound varied as the square root of the absolute temperature. The effect of surfaces upon combustion was of intense interest. It was the action of more or less cool surfaces that was responsible for so much of our smoke. The effect of the surfaces becoming charged was quite new to him; and he hoped it would be investigated. It might be that the positively charged ions given off from the surface were blown away, and thereby left the surface negatively charged.

Professor HAROLD B. DIXON, dealing with the effect of moisture, expressed the view that there were cases where they must look to some action between two or probably three constituents of the gases; and he instanced the case of an explosion of a mixture of hydrogen and chlorine. He said it was clear that there was no obvious chemical action taking place between two of the constituents which started the explosion. They must consider the whole three together; and he thought there was possibly some action of the electrons to be considered. He had experimented with hydrogen and chlorine, and found that the drier it was, the more quickly it exploded. He had tried one experiment with regard to the negative particles sent out by ignition. He dried the oxygen and hydrogen very thoroughly, and used them in tubes dried and undried. After photographing the two flames from the starting-point, he found no difference in the spread of them. Both were fired by a spark, and both spread in the same way. He had also tried the experiment of putting gases in a magnetic field; but he could not detect any difference. At the same time, it would be interesting to carry out the experiment with Professor Thomson's apparatus, and follow it photographically. Perhaps Sir Joseph would tell him how he concentrated

the magnetic field so as to draw away the electrons as they were produced.

Professor SMITHELLS thought a point had been reached in the investigation of this subject where the assistance of the physicist was indispensable. Physicists studying Dr. Bone's report would be surprised at the completeness with which the chemical aspect of the phenomenon had been studied. It was difficult to see whether chemistry pure and simple could advance farther. What was wanted now was more information upon the molecular transactions that were taking place.

Professor H. E. ARMSTRONG remarked that little or no progress would be made until chemists and physicists could look at the problem with equal interest. He challenged the opinions of the physicists as to the possibility of any action whatsoever taking place between two molecules neither of which was an electrolyte. He wished to insist upon the need of the presence of an electrolyte as a member of the system within which the action took place; and he advocated the need of dirty water for this purpose.

Sir J. J. THOMSON said physicists had been much perplexed by what chemists meant by an electrolyte.

Professor ARMSTRONG: An electrolyte is a substance which carries a current and is decomposed in it.

Sir J. J. THOMSON: Anything can do that.

Professor ARMSTRONG: No. Can pure water carry a current?

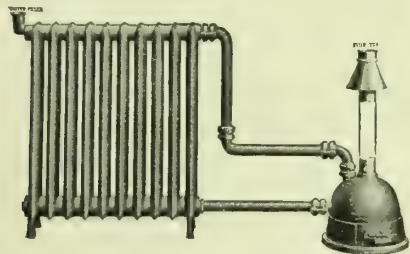
Sir J. J. THOMSON: Yes.

Professor ARMSTRONG insisted that it could not, and he asked for proof. Continuing, he said that the chemists and the physicists were not in agreement upon the fundamental points, and it was these they would have to discuss.

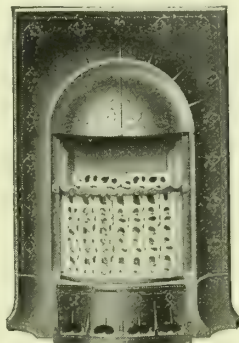
Professor BONE briefly replied to the remarks made.

## SOME WELL-KNOWN GAS-FIRES AND A NEW PATENT BOILER.

AMONG the specialities of Messrs. Arden Hill and Co. this year, a noticeable feature is their new patent gas-heated boiler, the "Domas," an illustration of which is given below. It is a small but efficient apparatus, specially designed for the heating of garages, greenhouses, schools, living-rooms, and all places suitable for hot-water heating. It creates an entirely new type, which, owing to its very low gas consumption and effective heating, has overcome all difficulties in the way of the adoption of this method on the score of expense.



"Domas" Boiler "Auto" Radiator.

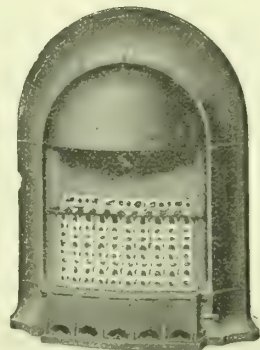


The "Thorium."

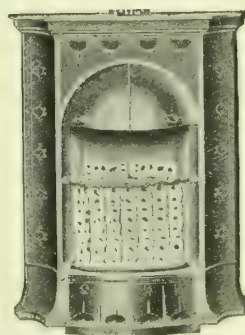
The firm are also looking forward to a busy season with their fine range of "Thermo" fronted stoves, some of which are shown. Prominent among them is the "Versailles." This high-grade fire embodies a novel departure in gas-fire construction in the shape of the wide-fire principle. The "Versailles" provides the same amount of radiating surface as the coal-fire it replaces, and so removes one of the chief disadvantages under which heating by gas hitherto laboured. The patent "Thermo" principle effects this with a proportionally low gas consumption. The series of interchangeable stoves—the "Radium," "Thorium," and "Cerium"—became popular immediately after their introduction; and they are now found on the hiring-lists of a large and increasing number of gas undertakings. The fact that all the removable parts of the firm's stoves are absolutely interchangeable, and therefore common to all, renders them a very desirable group of fires for hiring-out.



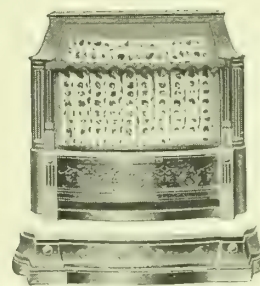
The "Versailles."



The "Radium."



The "Cerium."



The "Adept."

Another fire which deserves mention here is the "Adept." This basket-fire, brought up to date, has commanded a wide measure of success, due in part to the embodying of so novel a feature as the patent adjustable grate front. This is much appreciated by consumers, as it is made so as to be readily adjusted at any level, from  $3\frac{1}{2}$  inches up to  $5\frac{1}{2}$  inches, and so hides from view the often somewhat unsightly ashpan opening of the coal-grate.

### Scottish Junior Gas Association (Eastern District).

We have received from the Hon. Secretary and Treasurer of the Eastern District Division of the Association (Mr. W. Geddes, of Granton) the syllabus for the ensuing session, which will open on the 24th inst., at the Heriot Watt College, Edinburgh, under the presidency of Mr. Walter Dunlop, of Kirkcaldy. Ordinary meetings will be held on Nov. 12, 1910, and Jan. 7, 1911; and the annual general meeting—the last of the session—has been fixed for the 18th of March. Visits have been arranged for the following dates: Oct. 15, to the works of Messrs. Henry Balfour and Co. and the gas-works at Leven (Fife); Dec. 10, to Messrs. James Dougall and Sons' Fire-Brick Works, Bonnybridge; Jan. 21, 1911, to the Fife Coal Company's Colliery; and Feb. 25 (jointly with the members of the Western District Division), to the Airdrie Gas-Works.

In connection with the meeting of the British Association in Sheffield, the honorary degree of Doctor of Science has been conferred upon Sir Oliver Lodge, F.R.S., Sir William Crookes, F.R.S., and Sir William Ramsay, K.C.B. The last-named gentleman is President of the Association for the ensuing year; and the annual meeting will be held at Portsmouth.

Among the exhibitors in the destroyed British Section of the Brussels Exhibition who have expressed their willingness, if space can be found for them, to participate in the new section, which is to be opened in the Salle des Fêtes, are the Cambridge Scientific Instrument Company, Messrs. Fletcher, Russell, and Co., the Gaslight and Coke Company, the Glenboig Union Fire-Clay Company, and the South Metropolitan Gas Company. The last-named Company had an interesting exhibit in the shape of a large model in pitch of the Matterhorn, the snow being represented by sulphate of ammonia.



## GASEOUS EXPLOSIONS.

### Third Report of the British Association Committee.

Before Section G., at Friday's session of the meeting of the British Association, which was held in Sheffield last week, the Committee appointed for the investigation of gaseous explosions, with more special reference to temperatures, presented their third report.

The members of the Committee are Sir William H. Preece (Chairman), Mr. Dugald Clerk and Professor Bertram Hopkinson (Joint Secretaries), Professors Bone, Burstall, Callendar, Coker, Dalby, and Dixon, Dr. Glazebrook, Professors Petavel, Smithells, and Watson, Dr. Harker, Lieut.-Colonel Holden, Captain Sankey, Mr. D. L. Chapman, and Mr. H. E. Wimperis. The Committee recommended that they be re-appointed, and ask for a grant of £100. The first report was given in the "JOURNAL" Vol. CIII., pp. 719, 793; and the second, in Vol. CVII., pp. 766, 834. Six meetings of the Committee have been held—one each at the Universities of Leeds, Manchester, and Cambridge, one at the Imperial College of Science and Technology, and two at No. 57, Lincoln's Inn Fields, by the kindness of Mr. Dugald Clerk. In accordance with previous practice, notes dealing with their current work have been presented for discussion by members of the Committee, as follows: No. 14, Dissociation (A. Smithells and W. A. Bone); No. 15, Ignition Temperatures of Gases (H. B. Dixon); No. 16, Modern Theories of Gases (Sir W. H. Preece); No. 17, Radiation from Flames (H. L. Callendar); and No. 18, Radiation in a Gaseous Explosion (B. Hopkinson).

The report—accompanied by three appendices, on radiation from flames, on radiation in a gaseous explosion, and abstracts of papers relating to Siemens' furnaces—is as follows.

#### INTRODUCTION.

During the session 1909-10, the experimental work by members of the Committee, to which allusion was made in the second report (1909), has been continued. Mr. Dugald Clerk's measurements of the volumetric heats of air and carbonic acid at ordinary temperatures by the method of adiabatic compression have yielded results in close accordance with those obtained by Swann. The method of division of heat-loss employed by Mr. Clerk in reducing the results was the same as that which he used in his original high-temperature experiments. The correctness of the results obtained at the lower temperatures by this method, goes far to justify its application to the compression and expansion of highly-heated gas. An account of these experiments will shortly be published, and will be quickly followed, it is hoped, by an account of further work on the compression of flame and heated gases on which Mr. Clerk is already engaged. Professor Hopkinson has published a paper on the radiation in a gaseous explosion, to which more particular reference is made later in this report.

A series of experiments on the temperatures of ignition of hydrogen and oxygen produced by adiabatic compression (according to the suggestion of Professor Nernst) has been carried out by Professor H. B. Dixon. It was found necessary to check the descent of the piston mechanically when the "ignition-point" was reached, instead of allowing the flame itself to stop the movement, as in Falk's experiments. With quickly-igniting mixtures, such as electrolytic gas, there is little difference between the results obtained with a freely moving and with a checked piston; but with slowly-igniting mixtures, such as mixtures of hydrogen and air and mixtures with a large excess of oxygen or of hydrogen, there is a considerable difference between the two methods. Thus, while the compression necessary to fire electrolytic gas agrees closely with that found by Falk, the addition of oxygen was found to lower the ignition-point continuously, so far as the experiments were carried. Using the value of  $\gamma$  deduced from Joly's experiments, Professor Dixon finds that the ignition-point of electrolytic gas is  $557^{\circ}\text{C}$ ., which is in close agreement with the ignition-temperature determined by Dixon and Coward last year.

Professor Dalby is communicating to the Association an account of his measurements by means of an orifice of the air-supply to a gas-engine. This work, while not bearing directly on the matters under discussion by the Committee, will be of considerable assistance to those who have to experiment on gas-engines and desire to determine the proportion of air in the charge. Professor Coker has made, and will shortly publish, further measurements of the temperatures in a gas-engine cylinder. The Committee hope to be able to discuss Professor Coker's experiments at greater length next year. The Committee are not aware of any important publications on the Continent or in America (during the past year) which bear directly on their work, though mention should be made of a valuable paper by Hans Schmidt dealing with the radiation from a bunsen flame.

#### ON THE RADIATION FROM GASES.

In the first and second reports of the Committee, reference was made to the part played by radiation in the cooling of the products of an explosion, and to its bearing on the measurements of volumetric and specific heat with which those reports were principally concerned. The general question of radiation from heated gases has, however, from the point of view of the Committee, an interest and importance of its own which are sufficient

to justify a detailed study of it in its wider aspects. Radiation plays a part comparable with that of the conduction in determining the heat-flow from the gas to the cylinder walls in the gas-engine; and it is this flow of heat which is the most important peculiarity of the gas-engine, and to which are chiefly due the leading characteristics of its design. Even to the un instructed eye, the most obvious features about large internal combustion engines are the arrangements for cooling, and the great size and weight for a given power which is necessitated mainly by these arrangements. The difficulties which the designer has to meet are due in the main to the stresses set up by the temperature gradients, which are necessary to sustain the flow of heat. In the present state of the art, it is probable that the most important service which science could render to the gas-engine constructor would be to establish definitely the principles upon which depends the heat-flow from hot gases into cold metal with which they are in contact, and thus enable him to predict the effect on heat-flow of changes in the temperature, density, or composition of the charge, and in the state of the cylinder walls.

The Committee do not propose in this report to deal with the whole of this large question, but will confine their attention to one important factor in heat-flow—namely, radiation. The subject is a wide one, which has excited much attention among physicists and chemists; and on several important points agreement has not been reached. No attempt will, therefore be made to do more than state shortly the experimental facts, and define the issues which have been raised in regard to the explanation of these facts.

#### PRACTICAL EFFECTS OF RADIATION.

It is believed that the first instance in which radiation from a flame was used in an industrial process, with knowledge of its importance, was the regenerative glass-furnace of Frederick Siemens, which he described at the Iron and Steel Institute in 1184. Here the combustible gas was burnt in a separate chamber, and the hot products of combustion were led into the furnace. The objects to be heated were placed on the floor of the furnace, out of contact with the stream of flame which flowed above them. They would therefore receive heat only by radiation; and it was supposed that this radiation came in a large measure from the flame. Siemens, however, was of opinion (in 1884) that the radiation was due to incandescent particles of carbon, and that there was little radiation from a non-luminous flame.\*

In 1890, Robert von Helmholtz measured the radiation from a non-luminous coal-gas flame 6 mm. diameter, and found it to be about 5 per cent. of the heat of combustion. The radiation from a luminous flame was greater, but not very much greater—rising to a maximum of  $11\frac{1}{2}$  per cent. for an ethylene flame. Discussing the Siemens furnace in the light of these results, R. von Helmholtz calculated that radiation from the flame in the furnace could only account for a small fraction of the actual heat transmission. He pointed out, however, that a large flame would probably radiate energy at a greater rate than a small one. But while admitting that for this reason gaseous radiation might play a part in the transmission of heat, he suggested that a more important agent was radiation from the roof of the furnace, which received heat by direct contact with the hot gas, and so reached a very high temperature. He showed by calculation that a comparatively small excess of temperature in the roof over that of the floor would cause a sufficient flow of heat.

But though the discussions on the Siemens furnace and the work of Helmholtz show that the idea that a flame, even if non-luminous, might radiate large amounts of heat, was a familiar one to many people twenty years ago, its possible importance in causing loss of heat during and after a gaseous explosion and in determining the heat-flow in a gas-engine does not appear to have been appreciated till quite recently. Professor Callendar was probably the first to draw attention to its significance in this connection. In the discussion on a paper about explosions, read before the Royal Society in 1906, he said that he had found a non-luminous bunsen flame to radiate 15 to 20 per cent. of its heat of combustion, and expressed the opinion that the loss from this cause in a closed-vessel explosion would be of the same order. Professor Callendar's note dealing with this matter is published in full in Appendix A; and it is only necessary to state here that he was led to study the subject by his work on the efficiency of the petrol motor.

There are, in fact, several points about the behaviour of gas-engines which suggest the importance of radiation as a cooling agent. The particular matter which attracted Callendar's attention was the effect of speed on thermal efficiency. His experiments showed that a part of the loss of efficiency in an internal combustion motor, as compared with the corresponding air-cycle, was independent of the speed at which the engine was run. The loss of heat per cycle could, to a first approximation, be represented by an expression of the type  $A + \frac{B}{n}$ , where  $n$  is the number of revolutions per minute and A and B are constants. The term A represents a constant loss of heat per explosion, and among the many causes contributing to this constant loss of heat, radiation from the flame is probably important.

Another phenomenon which is difficult to explain, except as the result of radiation, is the effect of strength of mixture on heat-loss.

\* Captain Sankey has prepared an abstract of papers relating to the Siemens furnace. See Appendix C.



The following table shows some results which were obtained by Hopkinson upon a 40-H.P. gas-engine.

|                                                    |        |                |
|----------------------------------------------------|--------|----------------|
| Percentage of gas in cylinder contents.            | 8.5    | 11.0 per cent. |
| Total heat-loss per minute                         | 1510   | 2300 B.Th.U.   |
| Total heat-loss as percentage of total heat supply | 29     | 34 per cent.   |
| Temperature of piston                              | 300°C. | 430°C.         |

It will be observed that the proportion of heat-loss to the walls increases very materially as the strength of mixture is increased. If the transfer of heat were wholly due to conduction, it might be expected, apart from the disturbing influence of speed of ignition, which in this case was not very important, that the percentage of heat-loss would rather diminish with increase of charge, because the temperature with the stronger mixture should be relatively less on account of the increase of volumetric heat. Increased temperature of piston and valves would work in the same direction. The existence of radiation, however, which increases more rapidly in proportion to the temperature, would account for the increased heat-flow. The practical importance of questions of this kind is illustrated by these figures, from which it appears that the piston is 50 per cent. hotter, though the charge of gas is only increased 30 per cent.

More direct evidence of the importance of radiation is furnished by experiments on the effect of the surface of the walls. In the second report of the Committee, reference was made to the belief which is widely spread among those who are concerned with the practical design and operation of gas-engines, that polishing the interior of the combustion chamber tends to increase efficiency. Some experiments were also quoted in which it was found that lining an explosion vessel with bright tinfoil perceptibly retarded the cooling of the products. More recently an explosion vessel has been plated with silver on the inner surface; and the results have been compared after exploding identical mixtures—first, when the lining was highly polished; and, secondly, when it was blackened over with lamp-black. It was found that by highly polishing the interior of the vessel, the maximum pressure reached could be increased 3 per cent., and the subsequent rate of cooling during its earlier stages reduced by about one-third. These experiments leave no doubt of the reality and of the practical importance of radiation as a factor in determining heat-loss in the gas-engine.

Reference may also be made to the part played by radiation in determining the heat-flow in a boiler. Attention was drawn to this by Dalby in a recent report to the Institution of Mechanical Engineers. The circumstances in this case are widely different from those usually obtaining in the gas-engine; but the instance serves to emphasize the importance to the engineer of the questions which will be discussed in this report.

#### AMOUNT OF THE RADIATION FROM FLAME.

R. von Helmholtz appears to have been the first to attempt the accurate measurement of the radiation emitted by a flame. He found that a "solid" flame 6mm. diameter, burning coal-gas, radiated about 5 per cent. of the total heat of combustion. A carbon monoxide flame radiated about 8 per cent.; and a hydrogen flame, about 3 per cent. On account of the smallness of the flame, his experiments have not much application to the problem of the gas-engine. The size of the flame affects the matter in two ways. In the first place, a large flame radiates more per unit of area than a small one, because a flame is to a great extent transparent even to its own radiation; so that radiation is received, not only from molecules at the surface of the flame, but also from those at a depth within it. This matter will be further dealt with in another section of this report. The second point is that the cooling of the gas is slower in a large flame than in a small one. The radiation originates in the vibration of the carbonic acid, and steam molecules; and the life of one of these molecules as a radiating body extends from the moment of its formation to the time when its vibrational energy has been destroyed by radiation and by collision with colder molecules—such as those of the air surrounding the flame. The smaller the flame, the more rapid will be the extinction of the vibrations, and the less, therefore, the total amount of radiation per molecule. The products of explosion in a closed vessel or in a gas-engine differ considerably in this respect from any open flame, however large, which it is possible to produce; for they are not subject to cooling by mixture with the outside air. Moreover, the density of the gas is very much greater.

Callendar has repeated some of Helmholtz's experiments on a larger scale, and has found that the radiation in a non-luminous coal-gas flame, 30 mm. in diameter, may amount to 15 per cent. of the whole heat of combustion. Further reference will be made to Callendar's work under the heading of "Transparency."

Hopkinson has recently made measurements of the radiation emitted in the course of an explosion in a closed vessel and subsequent cooling. A bolometer made of blackened platinum strip was placed outside a window of fluorite in the walls of the explosion vessel. The electrical resistance of this bolometer was recorded by means of a reflecting galvanometer throwing a spot of light on a revolving drum; and an optical indicator traced simultaneously a record of the pressure on the same drum. He found that the total heat radiated during an explosion of a 15 per cent. mixture of coal gas and air and subsequent cooling, amounted to over 22 per cent. of the whole heat of combustion. The radiation which had been received at the moment of maximum pressure amounted to 3 per cent.; and it continued, although at a

diminishing rate, for a long period. Radiation was still perceptible half a second after maximum pressure, when the gas temperature had fallen to 1000° C.

#### NATURE AND ORIGIN OF THE RADIATION FROM FLAMES.

In the gas-engine cylinder and in explosion experiments, we are usually concerned with flames in which there is some excess of air. A mixture of similar composition burnt at atmospheric pressure would give an almost non-luminous flame; in the gas-engine, there is more luminosity on account of the greater density. There is, however, no reason to suppose that the radiation in the gas-engine cylinder differs materially as regards its quality or origin from that emitted by an open flame.

A very complete analysis of the radiation from different kinds of flame was made by Julius; and his experiments leave no doubt that the radiation is almost wholly due to the carbonic acid and steam molecules. He examined the spectrum of the flame by means of a rock-salt prism; and he found that in all flames producing both carbonic acid and steam, most of the radiation was concentrated into two bands, the wave-lengths of which are, respectively, 4.4  $\mu$  and 2.8  $\mu$ . In a pure hydrogen flame, the 4.4 band disappears completely, but the other remains; and in the pure carbonic oxide flame the 2.8 band disappears, the other remaining. These results are independent of the nature of the combustible gas; the spectrum depending solely on the products of combustion.

A confirmation of the statement that the radiation from these flames originates in the carbonic acid and water molecules only, was furnished in the course of the work by R. von Helmholtz, to which reference has been made above. He measured the amount of radiation per litre of gas consumed, as emitted by flames of given size burning, respectively, hydrogen, carbon monoxide, and certain compound gases, such as methane, giving both carbonic acid and steam. The supply of air was adjusted in each case so that the flame was just non-luminous. His results are best given in his own words; but it should be stated that he worked with a small flame about 6 mm. diameter, and measured the radiation with a bolometer, taking the steady change of its resistance as a measure of the amount of radiation falling upon it.

According to the experiments of Julius described in the first chapter, the quality of the radiation of flames depends only on the nature of the burnt, and not on that of the burning, gases. It is relevant to inquire whether the quantity of radiation is also dependent on the mass of the products of combustion. I have calculated in the second and third columns below how many litres of water and carbonic acid respectively arise theoretically from each litre of combustible gas. I then assume that for every litre of water produced as much radiation is sent out as corresponds to the radiating power of a hydrogen flame—for this gas yields 1 litre of water per litre of combustible—and that in a corresponding way the radiation from 1 litre of carbonic acid would be determined by the radiating power of the carbonic oxide flame; and I can then calculate the radiation from the non-luminous flames of methane, ethylene, and coal gas.

| Gas.                | Litres.           |                   | F         |             |
|---------------------|-------------------|-------------------|-----------|-------------|
|                     | H <sub>2</sub> O. | CO <sub>2</sub> . | Observed. | Calculated. |
| Hydrogen . . . .    | 1                 | 0                 | 74        | —           |
| Carbon monoxide . . | 0                 | 1                 | 177       | —           |
| Marsh gas . . . .   | 2                 | 1                 | 327       | 325         |
| Ethylene . . . .    | 2                 | 2                 | 510       | 502         |
| Coal gas . . . .    | 1.2               | 0.5               | 181       | 179         |

The correspondence between the calculated numbers with the radiation from a flame which has just been rendered non-luminous surprised me the more since the latter is conditioned, in some measure, by the volume of air mixed with the gas; and this is very different for the three non-luminous flames. On this account, it cannot be asserted that this agreement is not accidental. Moreover, the number of observations is much too small. Nevertheless, the experiment seems worthy of record, and will be followed up further.

With regard to the last remarks, it is to be noted that the fact that the flame was just rendered non-luminous shows that the air was in each case in approximately the proportion required for complete combustion. The heating value of such a mixture is much the same for all the gases in the above table; and the temperatures of the flames would be still more nearly the same, the higher heating value of a carbonic oxide mixture being partly neutralized by the high specific heat of the products. The agreement is certainly more than a coincidence. W. T. David, from a comparison of the radiation emitted in the steam and carbonic oxide bands respectively in a coal gas and air explosion, infers that carbonic acid radiates about two-and-a-half times as much as steam per unit of volume. This result (obtained in ignorance of Helmholtz's estimate) agrees with it almost exactly.

Cold carbonic acid shows a strong absorption band at the same point of the spectrum as the emission band given by a flame in which carbonic acid is produced; and water-vapour powerfully absorbs the radiation from a hydrogen flame.

As stated above, it is most probable that the radiation in an explosion also consists almost entirely of the same two bands as are emitted by the bunsen flame. A complete analysis of the radiation from an explosion has not been made; but Hopkinson and David found, using a recording bolometer, that the radiation is almost completely stopped by a water-cell, and that it is largely stopped by a glass plate. It follows that the luminosity of the



flame in an explosion or in a gas-engine accounts for but little of the energy which it radiates.

#### MOLECULAR THEORY OF RADIATION FROM GASES.

Much difference of opinion exists as to the physical interpretation of the facts described in the preceding sections. The issues in this controversy can conveniently be stated in terms of the molecular theory; and it is, therefore, desirable to give a short account of this theory. But it will be apparent that the issues are not merely of theoretical interest, but are in large measure issues of fact capable of being tested by experiment, and that the answers to important practical questions may depend on the manner in which they are settled.

According to the kinetic theory, the energy of a gas must be referred partly to translational motion of the molecules as a whole, and partly to motions of some sort internal to the molecules. The translational motion is that which causes the pressure of the gas; and, in the case of gases for which  $\frac{pv}{\theta}$  is constant (with

which alone we are concerned in this discussion), the translational energy per unit of volume is equal in absolute measure to one-and-a-half times the pressure. This part of the energy may conveniently be called "pressure energy." It amounts to nearly three calories per gramme-molecule, or to 12 feet-pounds per cubic foot per degree C.

The other part of the energy produces no external physical effect except radiation; and at ordinary temperatures, when there is no radiation, its existence and amount are inferred from the fact that, when work is done or heat put into the gas, the corresponding increase in pressure energy amounts to only a fraction of the whole. The internal motions to which this suppressed energy corresponds may be pictured as of a mechanical nature, such as the vibrations of spring-connected masses, or as rotation about the centre of gravity of the molecule. But there is not the same reason as exists in the case of the translational energy for supposing they are really of this character. They may be, and, indeed, probably are, electrical phenomena, at any rate in part. Any radiation from the gas must take its origin in this internal motion; and so much of the motion as gives rise to radiation must be of a periodic character, and have a frequency equal to that of the radiation emitted. It will be convenient to call the whole energy which is internal to the molecule "atomic energy," and that part of it which gives rise to radiation may be called "vibrational energy." The vibrational energy may be imagined as due to high frequency vibrations within the molecule, and the rest of the atomic energy as due to slower movements—perhaps rotations of the molecule as a whole—which do not produce any disturbance in the æther. This remaining energy may conveniently be called "rotational;" it being understood that the motion to which it corresponds is not necessarily physical rotation, but is some internal motion which gives no external physical effects.

When the gas is in a steady state, the various kinds of energy will bear definite ratios to one another, dependent on the temperature and pressure. It may be expected, however, that after any sudden change of temperature or pressure, the gas will not at once reach the steady state of equilibrium corresponding to the new conditions. For instance, it may be that, in the rapid compression of a gas, the work done goes at first mainly to increasing the translational energy. If, in such case, the compression be arrested, and if there be no loss of heat, this form of energy will be found in excess; and a certain time, though possibly a very short time, will elapse before the excess is transformed by collisions into atomic energy, and the state of equilibrium attained. This change would be manifest as a fall of temperature or of pressure without any change of energy.

If, on the other hand, the gas be heated by combustion, the first effect is undoubtedly an increase in the energy of those molecules, and of those only, which have been formed as the result of the combustion; and it is probable that in the first instance the energy of the newly-formed molecules is mainly in the atomic form. Before equilibrium can be attained, there must be a process of adjustment, in the course of which the energy of the new molecules will be shared in part with inert molecules—e.g., the nitrogen in an air-gas explosion—while the translational form of energy will increase at the expense of the atomic energy. The final state of equilibrium reached will be the same at the same temperature, whether the gas was heated in the first instance by combustion or by compression. The assumption that this is the case is involved in any statement of volumetric heat as a definite physical quantity. The pressure energy in the final state of equilibrium is certainly shared equally between the different kinds of molecules; but the atomic energy is not necessarily equally shared. It is known, for example, that the steam molecules, after an explosion of hydrogen and air, carry, on the average, more energy than do the nitrogen molecules, though the pressure energy is the same.

The process of attaining equilibrium after an explosion, which has just been described, would (if heat loss were arrested) result in a rise of temperature; and in the ordinary case of rapid cooling it would retard the cooling. It would, therefore, be indistinguishable as regards pressure or temperature effects from continued combustion or after-burning.

Stated in terms of the molecular theory, the first question as to which there is difference of opinion is whether the radiation from a flame arises from gas which is in equilibrium, or whether it comes from molecules which still possess a larger share than they will ultimately (in the equilibrium state) be entitled to, of

the atomic energy which resulted from their formation. If the products of combustion of a non-luminous bunsen flame were heated—say, by passing through a hot tube—to the average temperature of the flame (taken to be equal to that of a solid body of moderate extent immersed in it), would they emit substantially the same amount of radiation? In order to clear the ground for the discussion of this question, it will be convenient, first, to state two or three points about which there will probably be general agreement. First, there is here no question of the origin of luminosity, for the luminous part of the radiation from the flame possesses practically no energy. Secondly, the radiation, whether in the heated gas or in the flame, arises almost entirely from the compound constituents carbonic acid and water; in neither case does any come from the molecules of nitrogen or of excess oxygen. And, thirdly, the powerful absorption of cold carbonic acid for the radiation from a carbonic oxide flame, and of water vapour for that from a hydrogen flame, will probably lead all to admit that these gases when heated will emit some radiation of the same type. The only question is, How much?

R. von Helmholtz was of opinion that the radiation in a flame comes mainly from molecules which have only just been formed, and which are, therefore, still in a state of vigorous vibration. Pringsheim, Smithells, and others take the same view. This is practically equivalent to saying that this radiation, like the radiation of higher frequency which gives luminosity, is due to chemical action and not to purely thermal causes. On the other hand, Paschen and some others have maintained that the radiation from a flame is purely thermal, or that it arises from gas which has attained the normal or equilibrium state, and is substantially the same as that which would be emitted if the products of combustion were heated.

It will readily be seen that the difference between the two opinions really turns on the question of the time taken by a gas which is not initially in, or has been disturbed from, the equilibrium state to attain that state. All will concede that the carbonic acid or steam molecule will radiate more powerfully just after its formation than at any other time. If, as R. von Helmholtz contended, the greater part of the radiation which it gives out in the course of its life is to be ascribed to this early period of its history, we must suppose that this period is sufficiently extended to give time for the emission of a considerable amount of energy, with a rate of radiation which, though greater than that of the gas in its ultimate equilibrium state, is at least of the same order of magnitude. In other words, we must suppose that the process which may indifferently be called attainment of equilibrium, or continued chemical action, must go on in the gases as they pass through the flame for a time of the order perhaps of 1-10th of a second. For if it be supposed that equilibrium is reached in an excessively short time (say) in 1-1000th of a second or less, then the radiation, if ascribed to this short period, must be supposed to be of corresponding intensity—there must be a sudden and violent flow of energy by radiation just while combustion is going on, and very little radiation after it is complete. This is, however, negated by the bolometer measurements made during an explosion, which show that radiation goes on for something like half a second after maximum pressure [see Appendix B]. Those who hold that the radiation emitted by carbonic acid and steam is mainly due to continued combustion, must be prepared to admit that such combustion goes on for a long period after the attainment of maximum pressure in an explosion. The issue involved here is, in fact, the same as that in the controversy about "after-burning."

The principal argument advanced by R. von Helmholtz in support of his view is the experimental fact discovered by him, that the radiation of a flame is diminished by heating the gas and air before they enter the burner, in spite of the fact that the temperature of the flame must be raised. This he explains by the acceleration of the approach to the state of equilibrium which would be brought about by the more frequent collisions between the newly-formed compound molecules and their neighbours.

The question of the velocity with which a gas approaches its normal state after a disturbance, has been much discussed in connection with the kinetic theory. Immediately after an explosion, we have an extreme case of such a disturbance; the atomic energy being, at any point which the flame has just reached, in considerable excess. The transformation of this energy into the pressure form will proceed at a rate diminishing with the amount remaining to be transformed, and, in the final stages of the process at all events, proportional thereto. The slowness of approach to the state of equilibrium may be measured by the time required for the reduction of the untransformed energy in any specified ratio. It is usual to take  $\frac{1}{e}$  as this ratio; and, following Maxwell,

the corresponding time may be called the "time of relaxation." Estimates of this time, based on the kinetic theory of gases, may be made in various ways; but they all involve hypotheses as to the nature of the action between the molecules, and must be regarded as little more than speculation. It will be well, however, to indicate the general character of the arguments on which they are based. By methods which need not be considered in detail here, it is possible to calculate the number of collisions with its neighbours which the average molecule undergoes per second. This calculation can be approached in various ways, based on different kinds of data. But they all lead to the same result, at any rate as regards order of magnitude—namely, that a molecule of air at normal temperature and pressure collides on the



average  $3 \times 10$  times per second with other molecules. At every collision, the energy that is distribution in the colliding molecules is modified, both as regards the manner in which it is shared between the two and the relative proportions due to vibration and translation in either. It is argued that, after every molecule has suffered a few thousand collisions, which will happen in a millionth of a second, the gas must have reached a steady average state. This argument would, however, be upset if the interchange of energy as between vibration and translation at each collision were sufficiently small. It is only necessary to suppose that a vibrating molecule loses less than one thousand millionth part of its vibrating energy at each collision, to raise the time of relaxation to something of the order of a second. Any objection to this supposition must be founded on some hypothesis, which cannot be other than entirely speculative, as to the mechanism of a collision. The kinetic theory, therefore, can give no information about the absolute value of the time of relaxation, though it provides valuable suggestions as to the way in which that time is affected by the temperature and the density of the gas.

There is plenty of physical evidence, however, that under ordinary circumstances the time of relaxation is excessively short. The phenomena of the propagation of sound show that compressions and rarefactions of atmospheric air may take place many thousands of times in a second without the gas departing appreciably at any instant from the state of equilibrium. The experiments of Tyndall, in which an intermittent beam of radiant energy directed through the gas caused variations of pressure sufficiently rapid to give sounds, show that the transformation of vibrational into pressure energy under the conditions of his experiments is a process far more rapid than any with which we are accustomed to deal in the gas-engine or in the study of gaseous explosions. The departure from equilibrium which follows combustion is, however, of a special kind; and it may be that the gas is slower in recovering from it than when the disturbance is that produced by propagation of sound at ordinary temperatures.

#### TRANSPARENCY.

The radiation from hot gas is complicated by the fact that the gas is to a considerable extent transparent to its own radiation. The radiation emitted, therefore, depends upon the thickness of the layer of gas, instead of being purely a surface phenomenon, as in the case of a solid body. This property, besides being of great physical interest, is important from the point of view of the Committee, because upon it depends, or may depend, the relative magnitude of radiation losses in engines or explosion-vessels of different sizes.

The transparency of flames is well illustrated by some experiments which Professor Callendar has been making, and which he showed to the Committee. The radiation from a Meker burner (which gives a "solid" flame without inner cone) was measured by means of a Féry pyrometer, the reading of which gives a measure of the radiation transmitted through a small cone intersecting the flame and having its vertex at this point of observation (see fig. 1). Callendar proposes to give the name "intrinsic

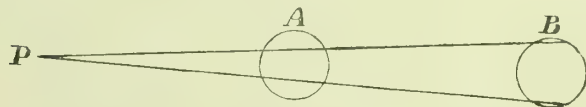


Fig. 1.

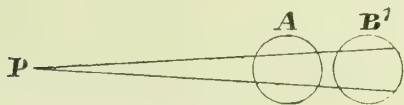


Fig. 2.

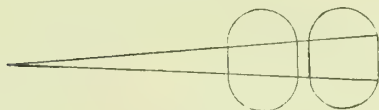


Fig. 3.

radiance" to the radiation of a flame measured in this way, divided by the solid angle of the cone. When a second similar flame was placed behind the first in the line of sight, it was found that the reading recorded by the pyrometer was considerably increased, but not doubled. The first flame appeared to be partly, but not completely, transparent to the radiation emitted by the second. A third flame placed behind the first two contributed a further but smaller addition to the radiation; and as the number of flames in the row was increased, the radiation received from each fell off according to an exponential law. The total radiation from the whole row (which is that recorded on the pyrometer) tends to a finite limit as the number of the flames is increased. The radiation from a depth of 12 cms. is about half, and that from a depth of 100 cms. is within half per cent. of that emitted by an infinitely great depth.

The general result of Callendar's experiments is to show that flames of a diameter of 3 cm. or less burning at atmospheric pres-

sure emit radiation approximately in proportion to the volume. If the diameter be increased beyond that figure, the radiation will also increase, but not in proportion to the volume of the flame. Radiation from very large flames would tend to become proportional to the surface; but no certain inference as to the diameter of flame for which this would be substantially true can be drawn from Callendar's experiments, because he was looking along a thin row of flames with but little lateral extension.

The flames met with in a gas-engine cylinder or in explosion vessels differ from open flames such as can readily be produced in the laboratory, both in respect of the lateral extension which has just been mentioned, and also in respect of density. In both these particulars, the difference is rather great; the least dimension of the mass of flame in a gas-engine cylinder being only in the smallest sizes comparable with the diameter of the Meker burner flame, while the density of the gas just after firing in the gas-engine is from twenty to thirty times that of the burner flame gases. It does not seem possible from theoretical considerations to determine the effect of these two factors with sufficient accuracy to enable any quantitative inference as to radiation in the gas-engine to be drawn from laboratory experiments on flames; but it is useful to discuss their probable qualitative effects.

In fig. 1, P is the point of observation at which the pyrometer is placed, as in Callendar's experiments; and the portion of the flame from which the radiation is measured is that intercepted by the small cone. If a second similar flame B is placed behind A at a considerable distance, but so that it is intersected by the cone, then the radiation recorded by the pyrometer will be increased (say) by 50 per cent., showing that of the radiation emitted by B and falling on A 50 per cent. is absorbed, and the remainder is transmitted to the pyrometer. The absorbed energy is, of course, not lost, but must result in slightly increased radiation from A in all directions. The flame A appears to be a little hotter because of the proximity of B. Thus the increase of radiation absorbed at the pyrometer is due, not only to the radiation transmitted from B, but also to an increase in the intrinsic radiance of A. If the two flames are a considerable distance apart, the latter part is negligibly small, since the flame A does not then receive much radiation from B, and what it does receive is dissipated in every direction. But when flame B is pushed close up to A into the position of B' (fig. 2), this effect may be considerable; and it is obvious that it will be greatly enhanced if the two flames are extended laterally, as in fig. 3. For in such case, flame A must get rid of the energy which it is receiving by radiation from B' mainly by an enhanced radiation in the direction of P. It may, therefore, be expected that the effect of lateral extension will be to make the flame apparently more transparent.

To a first approximation it may be expected that the radiating and absorptive powers of a gas at a given temperature will be proportional to its density. That is to say, two geometrically similar masses of flame, in which the temperatures at corresponding points are the same, and the densities in inverse proportion to the volumes (so that the total masses are the same), will radiate in the same way, and to the same total amount. It would seem that this must be so, so long as the vibrations of the radiating molecules are the same in character and amplitude in the two cases. For there will then be the same number of molecules vibrating in exactly the same way and arranged in the same way, in the two cases. The only difference is in the scale of the arrangement; and this can only affect the matter if the distance between the molecules is comparable with the wave-lengths of the radiation emitted, which is not the case. It is only, however, within moderate limits that the molecular vibrations are independent of density. Angström found that the absorption of the radiation from a given source in a tube of carbonic acid at ordinary temperature and at atmospheric pressure was reduced by increasing the length and diminishing the pressure in the same proportion so as to keep the mass of gas constant. Schäfer found that, on increasing the pressure, the absorption bands of this gas were widened, so that the curve connecting intensity of radiation and wave-length did not remain of the same shape. These experiments were made at low temperatures; and at the higher temperatures in which the Committee are more particularly interested there has been but little work. There is no reason to doubt, however, that the character and amount of the radiation from carbonic acid and steam at high temperatures will change with the density.

From the point of view of the molecular theory, such a change might be anticipated from either of two causes. An increase of density implies a proportionate increase in the frequency of molecular collisions; and this would result in greater facility of interchange between the translational and atomic types of energy. It is possible that the equilibrium proportion of the two types might be different in consequence. The denser gas may conceivably possess, with a given amount of translational energy, more atomic energy, and therefore radiate more strongly at a given temperature. It is certain that there would be a more rapid attainment of equilibrium in the gas after an explosion or a rapid expansion. Another possible cause is a direct interaction between the molecules apart from collisions. Two molecules at a sufficient distance apart will vibrate practically independently—each behaving as though the other was not there—except that there will be a tendency for them to vibrate in the same phase. But if the two are close together, they react on one another, so that the natural period or periods of the two together will not be the same as those which each would have if it were isolated.



Such direct measurements as have been made of the radiation after a closed vessel explosion suggest that the flame is more transparent than might be inferred from the experiments on open flames. According to information given to the Committee by Professor Hopkinson, W. T. David has found that the radiation received by a bolometer outside a fluorite window in the cover of a cylindrical explosion vessel 30 cm. by 30 cm. is greatly increased by highly polishing the portion of the opposite cover which can be "seen" by the bolometer. This implies that a thickness of 30 cm. of flame, under these circumstances, can transmit much of the radiation which it emits. The density of the gas in this case was atmospheric; and the 30 cm. thickness in the explosion vessel would be equivalent to perhaps 150 cm. of open flame, if absorption were simply proportional to density. According to Callendar's experiment, such a thickness would be almost completely opaque. It is possible that the lateral extension is sufficient to account for this result. The open flame should be a cylindrical mass of dimensions 150 cm. by 150 cm., instead of a long strip with a cross section of 3 cm., in order to make the two cases strictly comparable. It will be remembered that, in the discussion above, it appeared that the laterally extended flame would seem to be more transparent.

#### APPENDIX A.

##### Radiation from Flames.

By H. L. CALLENDAR.

In the course of my experiments in 1903-4 with a small petrol motor of 2·36-inch bore, on the variation of efficiency with speed, I became convinced that the greater part of the loss of efficiency with a small high-speed motor was practically independent of the speed. Loss by radiation from the flame appeared to be one among the many possible causes contributing to this result; and I accordingly made some experiments on radiation from flames, with a view to estimate the probable order of magnitude and the possible limits of the loss incurred. The experiments were necessarily of a qualitative character, and could not be directly applied to the calculation of the actual loss occurring in an internal combustion engine; but they appeared to indicate that the effect was much larger than had generally been supposed, and could not be neglected in a discussion of the heat loss occurring in a gaseous explosion. Some of the results of these experiments were mentioned in the discussion on a paper by Professor B. Hopkinson, "Explosions of Coal Gas and Air," and a general summary was given in the discussion on my paper, "On the Effect of Size on the Thermal Efficiency of Motors," from which the following is a quotation:

A large part of the energy of the flame during ignition exists in the form of energy of vibration of the dissociated and recombining ions, which is proved by the fact that a flame radiates energy more intensely than a mass of inert gas at the same temperature. The energy of vibration is realized as pressure, or energy of translation, only in proportion as the ions combine and equilibrium is established. The loss of thermal efficiency from this cause is merely another aspect of dissociation or increase of apparent specific heat, and is not a loss of heat at all, though it gives rise, as already explained, to a considerable diminution of the thermal efficiency. But while the condition of flame persists, there is necessarily some loss of heat by radiation to the walls. In order to estimate this loss, I made a series of direct measurements of the actual proportion of the heat or combustion radiated from various flames—luminous and non-luminous—some of which were quoted by Hopkinson in his paper. I found that the heat radiated from an ordinary non-luminous bunsen flame might amount to 15 or 20 per cent., but that it depended on the duration of the incandescence and was much smaller (corresponding with a reduction in the size of the flame) in explosive mixtures. It is not possible to estimate separately the exact amount of this loss in the cylinder of a gas-engine; but I think it belongs chiefly to losses of the type A being proportional to the wall-surface exposed, and practically independent of the time, since the duration of the flame is short in the most efficient mixtures. It is probable, however, that part of the radiation loss taking place during the propagation of the flame and throughout its mass is proportional to the volume and not to the surface, in which case it would be represented by a constant term in the expression for the loss of thermal efficiency.

The only account which I have been able to find of previous systematic experiments on the proportion of the heat of combustion radiated from a flame, is in a thesis for doctorate by Robert (the son of Hermann) von Helmholtz. For a majority of non-luminous hydrocarbon flames mixed with air, R. Helmholtz finds approximately the same result—namely 5 per cent. of the heat of combustion radiated. According to my experiments this low value is to be explained by the fact that he employed in these measurements small flames (6 mm. diameter by 60 mm. high), which were probably burning at a comparatively low temperature, and which do, as a matter of fact, give a percentage of this order. In one case, he finds 8·7 per cent. of the heat of combustion radiated by a flame 11·8 mm. diameter.

In my own experiments the heat radiated from flames of various sizes and burning under different conditions, was measured (in calories per square cm. per minute) at a measured distance, by means of an Angström pyrheliometer in a special mounting. The constant of the pyrheliometer, which had shown signs of change, was checked by means of a radio-calorimeter and also by an absolute measuring bolometer. An ordinary wet-meter was employed for measuring the gas supply to the flame; and the same meter was employed in the measurement

of the calorific value of the gas with a Boys calorimeter. In some experiments the air supplied to the flame before ignition was measured with the apparatus subsequently employed by Swann in his experiments on the specific heat of air and carbonic acid. This was useful for estimating the strength of the mixture in relation to the appearance of the flame, and for varying the temperature, but could not give quite exact results, because the flames were necessarily burning in free air. With the air and gas adjusted as nearly as could be estimated in the proportions required for complete combustion, the proportion of heat radiated varied from 10 to 15 per cent. for burners from 1 inch to 4 inches in diameter. As the air supply was reduced for the same rate of gas consumption, the size of the flame increased and also the heat radiated. A maximum of 15 to 20 per cent. was reached for these burners when a brilliant and well-defined inner cone was formed. If the amount of air supplied was in excess of that required for complete combustion, the radiation fell off considerably, in consequence of the reduction in size and fall in temperature of the flame. When the air supply was reduced until the inner cone disappeared, with burners of this type, the flame became unsteady and was reduced in temperature; the radiation falling to about 12 to 16 per cent. With steady luminous flames, of the argand or batwing type, there was a considerable increase of radiation on excluding air from the flame. With small flames of low temperature, the proportion of heat radiated might be as low as 2 or 3 per cent.

These results appeared to indicate that the radiation depended largely on the size of the flame as well as on the temperature, and on the presence of carbonic oxide or solid carbon when the air was insufficient for complete combustion. The mixtures employed corresponded fairly with the range available in a petrol motor; but the temperature of the flame in a motor, with ignition at constant volume, would certainly be much higher. A considerable percentage of the loss of thermal efficiency in such cases might evidently be ascribed to radiation. The exact proportion could not be directly estimated; but it occurred to me, in preparing this note, that the probable effect of radiation on the variation of efficiency with size could be deduced by a more complete study of one particular type of flame, and by measuring the radiation and the absorption for different thicknesses. With the assistance of Mr. G. Nelson, I accordingly repeated and extended some of these observations.

#### EXPERIMENTS WITH A MÉKER BURNER.

The type of burner selected for these experiments was the Méker burner, with a nickel grid of 3 cms. diameter, consuming gas at the rate of 0·185 cubic foot per minute. The heat radiated was measured, in calories per square cm. per minute, by an Angström pyrheliometer at a distance of 52 cms.; and the result was multiplied by 4522 to deduce the total radiation in calories per minute, assuming the flame to radiate equally in all directions. The lower calorific value of the gas was measured wet under the temperature and pressure of the experiment, and was found to vary from 470 to 500 B.Th.U. per cubic foot. With full air supply (the gas and air being nearly in the proportions required for complete combustion), the burner gives a solid homogeneous conical pointed flame, with no indications of an inner cone. As the air supply is reduced, minute cones make their appearance over the grid, and finally coalesce into a single steady brilliant inner cone, which increases in size. The percentage of heat radiated rises steadily with the increase of size of the flame—from 10·5 with a full air supply to 16 per cent. as a maximum with a large and bright inner cone. Beyond this point the inner cone becomes ill-defined; the flame flickers; and the radiation falls off to 14 per cent.—rising again to over 16 per cent. as the flame becomes luminous. These variations are compared in the accompanying table with the approximate composition in volumes of air to one of gas before ignition. The form of the curve depends to some extent on the shape, size, and nature of the flame. It would not be the same for a batwing or argand flame. The rate of gas consumption was maintained approximately constant, and the size of the flame varied with the strength of mixture.

The total radiation of Méker burner per cent. of heat of combustion was:—

|                           |      |      |      |      |      |      |    |
|---------------------------|------|------|------|------|------|------|----|
| Total radiation per cent. | 10·5 | 12·3 | 14·0 | 15·9 | 14·1 | 14·6 | 17 |
| Ratio air gas by volume   | 5    | 4    | 3    | 2·5  | 1·5  | 1    | 0  |

The gas was in all cases completely burnt. The ratio of air to gas before ignition merely describes the nature of the flame. Mixtures in these proportions, if burnt without any further addition of air, would not, of course, radiate the same percentage of heat. With the ratio air to gas = 5, the duration of the luminous flame was estimated at about 1·50th of a second.

#### INTRINSIC RADIANCE OF FLAME.

The intrinsic radiance of a flame has the same meaning in respect of total energy of radiation that intrinsic brilliance or brightness has in respect of luminosity. It may be measured by the radiation emitted per unit area of surface; but in the case of a flame which is more or less transparent, the radiation comes from a finite thickness, and must be measured per unit of solid angle subtended. This measurement may conveniently be effected by means of a total radiation pyrometer of any kind, in which an image of the flame is formed on a radiometer or bolometer. A Féry mirror pyrometer was used for this purpose; the instrument being focussed on the flame at a height of 4 to 5 cms. above the grid, where the flame was steady and sensibly homogeneous.



With this restriction, it was found that the intrinsic radiance of the Méker burner did not vary materially as the air supply was reduced from that necessary for complete combustion, until the inner cone became so large that the flame could no longer be regarded as sensibly homogeneous. This showed that the increase of total radiation simultaneously observed was due chiefly to the increase in the size of the flame, and that the increase of thickness of the flame was compensated either by a fall in temperature or by an increase in absorptive power. The thickness of the flame at the height focussed in the pyrometer varied from 2·8 cms. with a full air supply to 3·6 cms. when the inner cone was 3 cms. high and just cleared the area focussed.

In order to determine the manner in which the intrinsic radiance  $R$  varied with the thickness  $x$  of the flame in the line of sight, and to measure the co-efficient of absorption, six precisely similar burners were mounted in a row along the axis of the radiation pyrometer, which was focussed in such a way that the reading was the same for any one of the burners singly or for any combination of the same number of burners at different distances. The pressure of the gas supply was regulated to a constant value, and care was taken to prevent the air in the laboratory becoming contaminated, which produced a notable effect on the radiation. Several series of measurements were taken with one to six burners lighted in different orders, for two distinct states of the flame which were easily reproducible—(1) with full air supply, (2) with the inner cones 2·5 cms. high. In the latter case the flames all touched each other, and the layer of flame was 21·6 cms. thick and was sensibly homogeneous.

#### Summary of Observations.

|                                                                                |    |     |     |     |     |     |
|--------------------------------------------------------------------------------|----|-----|-----|-----|-----|-----|
| 1. Full air supply, mean thickness per flame, 2·8 cms.                         |    |     |     |     |     |     |
| Number of flames . . . . .                                                     | 1  | 2   | 3   | 4   | 5   | 6   |
| Radiation observed . . . . .                                                   | 68 | 124 | 171 | 214 | 250 | 282 |
| Radiation calculated . . . . .                                                 | 66 | 124 | 173 | 216 | 250 | 282 |
| Formula $R = 473 (1 - e^{-0.537x})$ .                                          |    |     |     |     |     |     |
| Limit $R/x$ when $x = 0$ , $= 473 \times 0.537 = 25.4$ per cm. thickness $x$ . |    |     |     |     |     |     |
| Limit of $R$ when $x = \text{infinity}$ , $R = 473$ .                          |    |     |     |     |     |     |
| 2. Cones 2·5 cms. high. Mean thickness per flame, 3·6 cms.                     |    |     |     |     |     |     |
| Number of flames . . . . .                                                     | 1  | 2   | 3   | 4   | 5   | 6   |
| Radiation observed . . . . .                                                   | 72 | 122 | 165 | 197 | 232 | 261 |
| Radiation calculated . . . . .                                                 | 66 | 120 | 166 | 201 | 232 | 257 |
| Formula $R = 373 (1 - e^{-0.641x})$ .                                          |    |     |     |     |     |     |
| Limit $R/x$ when $x = 0$ , $= 373 \times 0.641 = 20.2$ per cm. thickness.      |    |     |     |     |     |     |
| Limit of $R$ when $x = \text{infinity}$ , $R = 373$ .                          |    |     |     |     |     |     |

The observed and calculated values agree as closely as could be expected with the exponential law of absorption, which is fairly appropriate in this case, since the radiation emitted is necessarily of the same quality as that absorbed, and the flame is nearly homogeneous. An apparent confirmation of the formula is that the coefficient of absorption is practically the same—namely 0.054 for the two flames. The limit of  $R/x$ , when  $x = 0$ , which gives the intrinsic radiance per cm. of flame corrected for absorption, is higher for the case of complete combustion because the temperature of the flame is higher. The limit of radiance for an infinite thickness of flame is higher in the same proportion. The radiation observed for a single flame in case (2) is rather larger than that calculated, because the thickness of a single flame was slightly greater than the mean of several flames in contact. It will be observed that the flame is surprisingly transparent to its own radiation.

It is very commonly assumed that, because a flame absorbs precisely those radiations which it emits, and absorbs them in the same proportion as it emits them, the flame would, therefore, be practically opaque to its own radiation; so that the radiation proceeding from the interior of a mass of homogeneous flame might be neglected, and the total radiation assumed proportional to the surface. The above observations show that this is very far from being the case, owing to the relatively wide separation of the radiating and absorbing molecules.

#### EFFECT OF TEMPERATURE AND PRESSURE.

The effect of temperature and pressure on the intrinsic radiance of a flame of this kind can be theoretically predicted with a reasonable degree of probability; but it would be difficult to determine either experimentally. Within quite moderate limits of pressure, the radiating and absorbing powers of a flame per unit thickness at a given temperature and composition should both vary directly as the pressure or density. The value of the radiation from a layer of thickness 1 cm. at a pressure of 10 atmospheres would be the same as that from a layer of 10 cms. at 1 atmosphere, assuming that the quality of the radiation or the nature of the combustion were not altered by the pressure. This effect is represented by increasing the absorption coefficient in proportion to the pressure, leaving the limit for infinite thickness unaltered.

The effect of temperature is more difficult to estimate because the radiation from a flame is very complicated, and there are no means of accurately measuring the temperature. Nernst, from observations by others on the cooling of an explosive gas mixture, maximum pressure about 6 atmospheres, allowing for convection and conduction, finds the radiation to vary as the fourth power of the temperature. The method is very uncertain; and his conclusion was most severely criticized by Lummer, Bringsheim, and Schaefer, who explained that the radiation was quite different from that of a black body, and that the quality of the radiation was little, if at all, affected by pressure up to 4 atmospheres.

The principal maxima of emission and absorption in the bunsen-flame spectrum are at 2·8  $\mu$  and 4·4  $\mu$ . Taking a mean

wave-length of 3·5  $\mu$ , it is easy to estimate how the intensity should vary with temperature by assuming Planck's equation. The following table gives approximate relative values for comparison with the fourth-power law of Stefan for the radiation of a black body:

|                                |       |       |       |       |       |
|--------------------------------|-------|-------|-------|-------|-------|
| Absolute temperature . . . . . | 1000° | 1500° | 2000° | 2500° | 3000° |
| Radiation—                     |       |       |       |       |       |
| Planck . . . . .               | 0.016 | 0.059 | 0.142 | 0.233 | 0.331 |
| Stefan . . . . .               | 0.009 | 0.045 | 0.142 | 0.347 | 0.721 |

The rate of variation, according to Planck's formula for a single wave-length, is much slower than the fourth-power law, and tends in the limit to be directly proportional to the absolute temperature at high temperatures. The actual rate of variation should lie between these limits, but nearer to Planck, unless carbon begins to separate in rich mixtures at high temperatures.

#### EFFECT OF RADIATION LOSS ON THERMAL EFFICIENCY.

Although it is not possible to calculate the absolute magnitude of the radiation-loss in a motor, or to deduce from it the relative loss of thermal efficiency, it is not difficult to see in what manner this loss should vary with flame temperature and with linear dimensions of the cylinder. We may assume for this purpose that the cylinder at the moment of maximum pressure is filled with practically homogeneous flame and that the walls are practically non-reflecting. For similar motors under similar conditions the heat-loss per explosion will vary as the product  $RS$  of the intrinsic radiance  $R$  and the surface  $S$ . The percentage heat-loss should vary as  $RS/V$ , where  $V$  is the volume of the cylinder. This will vary as  $R/D$ , where  $D$  is the diameter, for similar motors. Assuming a pressure of 20 atmospheres in a cylinder of 2 inches (5 cms.) diameter, the equivalent thickness of flame at 1 atmosphere is 100 cms., and the intrinsic radiance for a flame of this thickness has already reached within less than  $\frac{1}{2}$  per cent. of its limit for an infinite thickness. The percentage loss due to radiation per stroke will, therefore, vary inversely as the diameter in similar motors; since  $R$  will be practically independent of the dimensions in all cases which occur in practice. Since the rate of loss due to radiation diminishes very rapidly with the time, the effect of variation in speed on the radiation loss may be appropriately represented by a factor of the type  $(A + Bn)$ , where  $n$  is the speed in revolutions per minute, as suggested in my paper already quoted at the beginning of this note. From the rapidity of the radiation-loss during ignition, it is clear that the  $A$  term will be of considerable importance and will affect the comparison of similar motors of different sizes when running at the same piston-speed ( $n$  inversely as  $D$ ) in the manner explained in my paper. I was convinced on general principles that this would turn out to be the case; but without actually measuring the absorption coefficient it was not possible to assert definitely that  $R$  would be practically independent of the dimensions.

The variation of the coefficients  $A$  and  $B$  with flame temperature will be proportional to  $R$ , and will be of the nature already indicated. This is corroborated by my analysis of Dr. Watson's observations in a contribution to the discussion on his paper.

#### ABSOLUTE VALUE OF INTRINSIC RADIANCE.

The absolute value of the intrinsic radiance of these flames was determined by comparison with the radiation of a black body with the same pyrometer. The black body temperature for six flames with full air supply, giving a deflection of 282 scale divisions with the galvanometer, was 679° C. or 952° absolute, for a thickness of 16·8 cms. This means that the intrinsic radiance of such a layer of flame is the same as that of a black body at 679° C.

Assuming the radiation from a black body at a temperature  $\theta$  abs. to vary as  $E \theta^4$  where  $E$  is the radiation constant, and has the value  $5.32 \times 10^{-5}$  ergs per sq. cm. per second, or  $1.273 \times 10^{-12}$  gm. cal. per sq. cm. per second, the radiation from a black body at 952° abs. or 679° C. would be 63 cal. per sq. cm. per minute.

The limiting value of the intrinsic radiance for infinite thickness would be 105 cal. per sq. cm. per min. in case No. (1) with full air supply, and 83 cal. per sq. cm. in case No. (2) with cones 2·5 cms. high. These values would correspond approximately with the initial rates of loss of heat by radiation per sq. cm. of surface in a gas-engine cylinder filled with similar flames at corresponding temperatures. The higher value gives a loss of 175 cal. per sq. cm. in the first tenth of a second. Professor Hopkinson's experiments with a bolometer placed outside an explosion vessel, in which the flame temperature was certainly a good deal higher, give 315 cal. per sq. cm. lost in the first tenth of a second after ignition commences, or 35 cal. in the first tenth after maximum pressure. These are quantities of the same order of magnitude, and differ in the right direction from the value that was deduced above. They may be regarded as confirming the validity of both methods of estimating the absolute value of the radiation loss.

In applying these results to an internal combustion engine, it must be remembered that the radiation is not, in fact, strictly homogeneous. There are considerable variations of temperature, which affect the quality of the radiation. It appears probable that luminous carbon, giving a continuous spectrum, may separate in rich mixtures, more especially if not perfectly uniform. These variations would tend to increase the effective transparency of the flame, and the increase of radiation-loss with dimensions. Some further investigation will, doubtless, elucidate



these points. But, in so far as the flame tends to absorb its own radiation selectively, the theory above sketched may serve a useful purpose as a first approximation.

APPENDIX B.

On Radiation in a Gaseous Explosion.

By B. HOPKINSON.

In the first report of the "British Association Committee on Gaseous Explosions," attention was drawn to the probable importance of radiation in determining the rate of cooling of the mass of hot gas produced by igniting an inflammable mixture in a closed vessel. In the second report reference was made to some experiments which I had made on the effect of coating the walls of the explosion vessel with bright tin-foil. It was found that if a mixture of coal-gas and air of given composition were exploded in a vessel thus lined, the maximum pressure reached was the same (within 1 per cent.) as that given by an identical mixture when the tin-foil lining was blackened; but the rate of cooling was decidedly less. An experiment was also described, in which an attempt was made to measure the actual heat absorption of the walls and the radiation, by means of a bolometer of copper strip, whose temperature was recorded photographically during the progress of the explosion and of cooling—the strip being in different experiments blackened, polished, and placed behind a gas-tight screen of rock salt. A considerable difference was found between the blackened and polished surfaces in respect of heat absorption, and this difference was of the same order as the heat absorbed by the bolometer behind the rock-salt screen. The results were strong evidence that the effect of the tin-foil lining on the rate of cooling was due to radiation, and gave an indication of its order of magnitude. But, as tin-foil is not a very good reflector, and as the rock-salt plate was destroyed by the explosion so that only a single experiment with it was possible, I have thought it desirable to do some further work in the same direction.

I have accordingly had prepared a cylindrical cast-iron explosion vessel, 30 cms. long by 30 cms. diameter, the whole of the interior surface of which is plated with silver; and I have compared the results of exploding a mixture containing 15 per cent. of Cambridge coal-gas—first with the vessel polished as highly as possible, and second with the surface blackened over. All precautions were taken to ensure that the mixture in the comparison experiments should be of identical composition. The pressures were recorded in the usual way—sometimes with a pencil indicator, and sometimes with an optical indicator—the same instrument being used, however, in each set of comparison experiments.

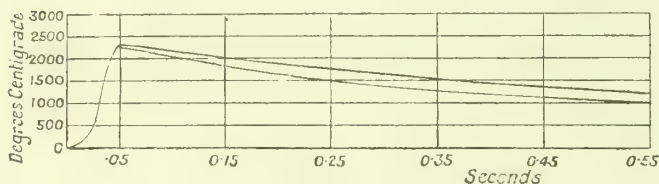


Fig. 4.

Fig. 4 shows superposed the pressure records obtained by the optical indicator in one such comparison. As in the case of the tin-foil lining, there is a difference in the rate of cooling; but the difference is here very much greater—more than twice as great. Further, there is undoubtedly a difference in maximum pressure amounting to between 2 lbs. and 3 lbs. per square inch, which is equivalent to about 60° C. in temperature; or, having regard to the higher volumetric heat in the neighbourhood of 2000° C., to perhaps 5 per cent. in thermal energy.

Comparing the two records it will be seen that when the walls are reflecting, the gas takes about one-and-a-half times as long to reach a temperature of 1500° C. as it does when the walls are blackened. The actual heat given to the walls in the two cases must be the same; so that the mean rate of cooling during this period in the one case is about one-and-a-half times as great as in the other. This proportion remains fairly constant until the temperature has fallen to about 1000° C., when it shows some tendency to diminish. It was found that the precise state of polish of the silver had a great effect on this result—differences in polish hardly appreciable to the eye causing a substantial change in the rate of cooling. In the diagram shown the surface was polished by means of a motor-driven buffing-wheel with rouge, and washed with methylated spirit, and then again polished with a leather.

A number of experiments have also been made with a recording bolometer of silver strip, which was sometimes polished and sometimes blackened. Simultaneous records were taken of the gas-pressure and of the temperature of the bolometer. Two such records, in which the pressure curves are identical, are shown superposed in fig. 5. The bolometer was mounted on a linoleum backing, and there is considerable loss of heat to this backing, which makes the estimate of the absolute amount of heat absorbed rather uncertain. Since, however, the curves of temperature-rise in the two cases (the blackened and the polished) are very

nearly similar, differing only as regards temperature scale, the proportion of heat lost will be the same in the two cases, and the ratio of heat absorption by the blackened and polished surfaces will be nearly equal to the ratio of the temperatures. The ratio of the temperatures shown in fig. 5 is 0.75 at the end of 0.25 second from ignition, which agrees as well as might be expected with the ratio of the rates of cooling deduced from the pressure records with blackened and reflected walls—having regard to the great effect of small differences in polish upon the rate of cooling. The ratio of the bolometer temperature increases a little as the gas temperature falls, which again agrees with the gradual approximation as regards rate of cooling disclosed by the pressure records.

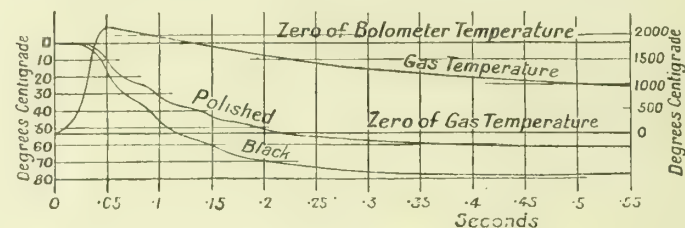


Fig. 5.

Some estimate of the heat lost to the backing can be made as follows: If the temperature of the surface of a solid be caused to vary in a given manner, then the quantity of heat which has passed into it at any time can be calculated by means of the Fourier analysis, provided that the product of the thermal conductivity  $k$  and the thermal capacity  $c$  of the solid is known—being, for a given temperature variation, proportional to the square root of this product. In the present case the solid is the linoleum backing, and the surface temperature is that of the silver in contact with it, and is given by the bolometer record. The total heat absorbed by the bolometer per square centimetre at any instant can, therefore, be estimated from the bolometer record, subject only to a knowledge of  $\sqrt{k c}$  which occurs as a multiplier. Thence, assuming that the average heat loss over the whole surface is the same as that absorbed by the bolometer, the whole heat given by the gas can be calculated. This heat loss can be obtained also from the pressure record by deducting from the whole heat of combustion the quantity of heat remaining in the gas, whose energy at a temperature of (say) 1000° C. may be considered as known sufficiently nearly for this purpose. The value of the factor  $\sqrt{k c}$  is then so chosen as to make the heat obtained from the bolometer equal to that deduced from the pressure record. The following table showing the absolute heat losses has been obtained in this way:

TABLE I.

| Time | Temperatures °C. |         | Heat in Silver Cals. per sq. cm. |      | Proportion Lost to Backing. |      | Total Absorption. |      | Difference b'tween Blackened and Polished. |     |
|------|------------------|---------|----------------------------------|------|-----------------------------|------|-------------------|------|--------------------------------------------|-----|
|      | Gas.             | Silver. |                                  |      |                             |      |                   |      |                                            |     |
|      |                  |         | B.                               | P.   | B.                          | P.   | B.                | P.   |                                            | B. | P. |
| .05  | 2150             | 15.9    | 12.0                             | .188 | .142                        | .30  | .30               | .245 | .185                                       | .06 |
| .10  | 1940             | 45.8    | 31.9                             | .530 | .376                        | .50  | .50               | .705 | .505                                       | .23 |
| .15  | 1750             | 61.0    | 44.1                             | .720 | .520                        | .70  | .69               | 1.22 | .88                                        | .34 |
| .20  | 1590             | 70.0    | 51.7                             | .826 | .610                        | .90  | .88               | 1.57 | 1.15                                       | .42 |
| .30  | 1350             | 76.8    | 59.0                             | .906 | .696                        | 1.22 | 1.18              | 2.01 | 1.52                                       | .49 |
| .50  | 1030             | 78.7    | 62.5                             | .929 | .737                        | 1.70 | 1.63              | 2.51 | 1.94                                       | .57 |

The difference between the loss to the polished and blackened surfaces represents the greater part of the radiation from the gas. There is reason to suppose, however, that it does not represent the whole, because it is probable that at an early stage in the cooling with the polished walls the bright surface of the silver is dimmed by a deposit of moisture.\*

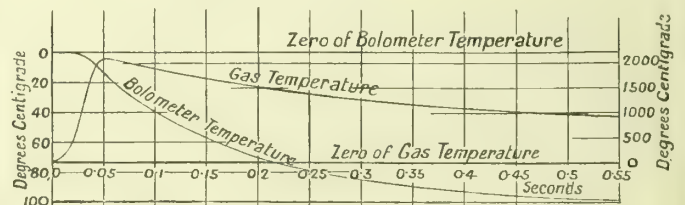


Fig. 6.

Finally, a series of records have been taken with a bolometer placed outside the explosion vessel altogether, but exposed to the radiation of the flame through a window of fluorite (fig. 7). This bolometer was of platinum, blackened with lamp-black; and the records were taken in exactly the same way as in the other cases. A facsimile of one such record is given in fig. 6, and Table II. shows the amounts of heat absorbed by this bolometer at different times. There cannot be any question that the whole of the heat recorded by the bolometer is radiated heat; and I do not think

\* The possible importance of such a deposit was suggested to me by Mr. W. T. David, who carried out all the experiments described in this note.



TABLE II.

| Time from Ignition. | Temperature °C. |           | Heat in Platinum Cals. per sq. cm. | Loss by Radiation, &c. | Total Absorbed. Cals. sq. cm. | Heat Absorbed as Percentage of Heat of Combustion. |
|---------------------|-----------------|-----------|------------------------------------|------------------------|-------------------------------|----------------------------------------------------|
|                     | Gas.            | Platinum. |                                    |                        |                               |                                                    |
| ·05                 | 2090            | 13·6      | ·11                                |                        | ·11                           | 3                                                  |
| ·1                  | 1870            | 39·6      | ·315                               |                        | ·315                          | 8·5                                                |
| ·15                 | 1690            | 57·4      | ·46                                |                        | ·46                           | 12·5                                               |
| ·20                 | 1510            | 70·3      | ·57                                |                        | ·57                           | 15·5                                               |
| ·3                  | 1290            | 84·2      | ·675                               | ·025                   | ·70                           | 19                                                 |
| ·4                  | 1110            | 91·7      | ·735                               | ·035                   | ·77                           | 21                                                 |
| ·5                  | 980             | 96·4      | ·770                               | ·05                    | ·82                           | 22                                                 |

that there is much doubt that, subject to any reflection from the surface of the platinum (which has not been allowed for), the above figures represent the amount of radiation coming through the fluorite window. Fluorite is said to absorb about 5 per cent. of the radiation falling upon it; but no allowance has been made

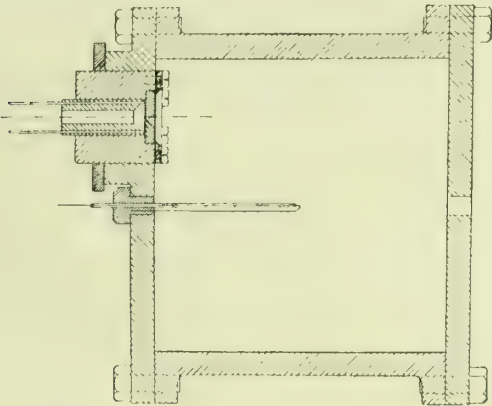


Fig. 7.

for this. It will be seen that the radiation here recorded exceeds by about 50 per cent. the difference between the heat absorption with the blackened and polished surfaces. When a plate of glass is substituted for the fluorite plate, the heat absorbed by the bolometer is reduced to about one-third of the above amounts; and if the platinum surface is polished, instead of blackened, the heat recorded is only 20 per cent. The latter figure agrees fairly well with the result given by Hagen and Rubens for the reflecting power of polished platinum.

APPENDIX C.

Abstracts from Various Papers relating to the Application of Heat Radiation from Luminous Flames to Siemens's Regenerating Furnaces.

In September, 1884, Mr. Frederick Siemens read a paper before the Iron and Steel Institute in which he described the application of radiant heat derived from luminous flames to such purposes as glass ovens and steel furnaces. The greater part of the paper was devoted to practical considerations; but in the discussion which followed, he expressed his views as to the theory of the action, and stated that, in order to obtain the best results, from the heat efficiency point of view, the operation should be divided into two parts. In the first part chemical combination took place; the flame was luminous; and the heat should be abstracted by radiation only. In order that the radiant heat might be a maximum, there should be a larger space, so that perfect combustion could take place without the gases coming into contact with any solid substance. This space was the furnace proper. In the second part, there was no combustion; the flame was non-luminous; and the heat should be abstracted from it by contact, as was done in the regenerative part of the furnace.

Siemens ascribed the radiant heat of the luminous flame to the incandescent particles of carbon, and said that, since flame is transparent to its own radiation, not only does the surface of the flame radiate, but also its interior. Hence a flame radiates far better than a solid substance. "A solid surface radiates only from its outer surface, and from that surface only towards one\* direction, while a flame radiated from every point within it, and on its surface in every direction, or from every point of its entire volume towards every direction." If the area of a solid substance were doubled, it would only radiate twice as much; but if the surface of a (geometrically smaller) flame be doubled, the radiation would be four times as much.

He specially called attention to the advantage of this method of heating by referring to the experience obtained with glass pot furnaces in Dresden and in Bohemia, to which the new method of heating had been applied. There were great gains in every direction—50 per cent. more glass for the same expenditure of heat; less breakage of pots; the furnace lasted about six times longer; and higher temperatures were obtained, so that open pots could be used instead of closed ones. The glass was produced from cheaper materials, and was of superior quality.

\* This is not true unless possibly when the surface is perfectly polished.

The statements made in the above paper were severely criticized by German engineers, and therefore on Oct. 26, 1884, Mr. Frederick Siemens read a paper at a meeting of the "Sachsischen Ingenieur und Architekten Verein" which was practically a repetition of his previous paper. In October, 1886, he read another paper before the Iron and Steel Institute, entitled "Combustion with Special Reference to Practical Requirements." In it, he confirmed what he previously stated, and added some remarks on dissociation—pointing out that if flame came into contact with heated surfaces there was a tendency to condense "one or other of the constituents," and that, therefore, dissociation could take place at comparatively low temperatures. Hence dissociation experiments should be carried out in large open spaces. He also remarked that the bunsen flame, being non-luminous, had but little radiating power. In 1886, he read another paper, in which he confirmed his previous statements. In this communication he stated that the radiating effect of luminous flames had been originally put into operation at his Dresden glass-works in 1877, and in his Bohemian glass-works in 1878; but the results were not published, for commercial reasons.

Mr. Jeremiah Head read a paper on the Siemens glass ovens before the British Association (Section G) at the Birmingham meeting in 1886. He pointed out that, with direct-heating, the furnace must be small; whereas with radiant heating the furnace can be, and must be, large. He stated that in these large spaces dissociation did not take place, although the temperatures were very high.

Mr. Frederick Siemens published another paper, in which he stated that the highest temperatures were observed where the flame did not come into contact with the furnace walls. Hence the highest temperature must be due to radiant heat. He again remarked that surfaces in contact with flame not only hindered combustion, but promoted dissociation.

Gustav Westmann published a scientific inquiry into the Siemens method of glass heating in a paper read before the "Verhandlungen des Vereins zur Beforderung des Gewerbflusses," in 1886. An experiment on a large scale, lasting 24 hours, was made with a glass furnace, in which 25 tons of glass were melted by the gasification of 5 tons of coal and 5 tons of lignite. Full particulars of all measurements are given; and it is shown that the thermal efficiency was 41·9 per cent., the temperature 1200° C.

THE PRICE OF ELECTRICITY.

The numerous systems of charging for electricity in different parts of the country, and the conflict of opinion on the matter among electrical engineers, was the subject of a lengthy paper by Mr. E. W. Cowan read before the Economic Science and Statistics Section of the British Association at Sheffield last Thursday. A fundamental principle which the electrical industry has established as the ideal to be aimed at is that of charging upon the basis of equal rate of profit for every class of consumer. But the author argued that the "equal profit" system fails in the attainment of the best economic results, because the factor of demand is ignored in such a system. Of course, the intensity of the different classes of demand for electricity differs; and the author contended that the greatest economic advantage is realized when there is the closest and widest possible correspondence between the incidence of supply and the incidence of demand. Therefore the adjustment of price of supply according to the intensity of demand in the case of each class would secure a more efficient correspondence, and consequently greater aggregate economic advantage. The difficulties in giving effect to a practical system of classified tariffs were discussed; and it was shown, by reference to the successful operation of the system in railway working and in other industries, that these difficulties are not insurmountable. The adherence of electrical engineers to "equal profit" systems was discussed; they believing that such a system is ethically right, and that the classification of prices according to the nature of the demand would involve the introduction of an unfair element into the business. Mr. Cowan contended that, when the conditions are analyzed, it is found that there are no grounds for such a view; but that, from an ethical standpoint, classification can be resorted to without injury or loss to any class. The gain due to such a method was shown not to be a differential but a specific one which may be shared by all classes of consumer. The paper concluded with the expression of opinion that there is an immense potential demand for electricity for power and domestic heating and refrigeration, which could be rendered active by the sufficient lowering of price. The discussion on the paper rather showed that the general principles put forward might be accepted, but that the difficulties of translating them into a scientific tariff were too great.

The Livesey Requests to Public Charities.—A few months after the death of Sir George Livesey, it was mentioned in the "JOURNAL" that, according to the terms of his will, a number of bequests had been made to public institutions, subject to the life interest of Lady Livesey. On her decease early the following year, the various sums specified became available for distribution among the charities selected; and we learn from Messrs. Hicklin, Washington, and Pasmore, the Solicitors under the wills, that the moneys were all paid over on the 24th ult.



## GASEOUS COMBUSTION.

By WILLIAM A. BONE, D.Sc., Ph.D., F.R.S.

[Report presented to the British Association, Friday, Sept. 2.]

We have received from Professor Bone a revised print of this report, which was presented last Friday in Section B (Chemistry) of the British Association, at the meeting in Sheffield. It aims at summarizing the results of the principal researches upon the chemical aspects of gaseous combustion during the past thirty years, and is preceded by a synopsis.

## INTRODUCTION.

The era in the scientific investigation of gaseous combustion with which this report is specially concerned was inaugurated some thirty years ago by the pioneering researches of the French savants, Mallard and Le Chatelier, and M. Berthelot, on the initial stages of "inflammation" and the setting-up of "detonation" in explosive mixtures, and by the equally fruitful discoveries by Harold B. Dixon and H. B. Baker concerning the part played by steam in combustion. Previous knowledge of the chemistry of fire had been mainly derived from the researches of Davy and his contemporaries (1815 to 1825), and those carried out or inspired by Bunsen some fifty years later. Davy's work, primarily undertaken in order to elucidate the causes of explosions in coal-mines, had disclosed, and brought within range of experimental inquiry, the broad facts connected with the ignition of explosive mixtures; the influence of narrow passages and of cold surfaces in extinguishing flames; the relative "combustibilities" and "explosion limits" of inflammable gases; and the effects of rarefaction and dilution on gaseous combustion. Finally, his notable discovery regarding the flameless combustion of hydrogen and of coal gas in contact with a glowing spiral of platinum, followed by the more systematic investigations of Dulong and Thénard, had drawn attention to the "intensifying" influence of hot surfaces on combustion, the importance of which has perhaps never been fully appreciated.

But the work of Davy—standing as it does between the ages of Lavoisier and Clausius, and singularly fruitful as it was in its immediate practical results—gave rise to no great theoretical developments. Soon after his death, the path of progress became choked with error. There arose the dogma of the selective combustion of hydrogen in hydrocarbon flames, which, although inconsistent with Dalton's experiments on the partial combustion of ethylene and methane, continued to dominate chemical science for more than half-a-century. There is no evidence that Davy himself ever countenanced this doctrine; but it possibly may have been suggested to his immediate successors by his mistaken views concerning the much higher combustibility of hydrogen as compared with hydrocarbons—a notion still widely prevalent.

Bunsen's researches upon gaseous combustion, while they did incalculable service to chemistry and metallurgy in introducing exact methods of gas analysis, and in elucidating the reducing action of carbon monoxide in the blast-furnace, unfortunately gave rise to certain misconceptions, due to unsuspected errors in the experimental methods employed. His experiments on the division of oxygen between carbon monoxide and hydrogen, which were originally undertaken to test the law of mass-action, are now recognized to have been vitiated by the fact that he worked with undried gases in a "wet" eudiometer. From his results, however, he concluded that the condition of equilibrium in such a case is determined by an assumed tendency to form certain "hydrates of carbon dioxide," and undergoes discontinuous alteration on gradual change in the relative proportions of the combustible gases originally present. But while this conclusion was afterwards disproved by the independent researches of H. B. Dixon and Horstmann, the underlying notion of "discontinuity" or variation *per saltum* in regard to gaseous combustion is still occasionally met with in technical literature.

A similar error crept into Bunsen's interpretation of the results of his measurements of the pressures produced when either hydrogen or carbon monoxide is exploded with half its own volume of oxygen at atmospheric pressure in a closed vessel. He contended that, in either case, one-third only of the gases combine in the first instance, whereby the temperature of the system is raised to some point between 2844° and 3033°; that it then falls by radiation to 2558°, between which point and 1146° a further one-sixth of the mixture combines, leaving the remaining half to burn as the system cools down to the ordinary temperature. This idea of combustion *per saltum* was revived again by Von Oettingen and Von Gernet in 1888, in connection with their photographic researches on the explosion of electrolytic gas. But it has been clearly proved by H. B. Dixon that their observations can be explained on other grounds.

Bunsen's first measurements of the rates at which flames are propagated in gaseous mixtures (namely, 34 metres per second for a mixture  $2\text{H}_2 + \text{O}_2$ , and 1 metre per second for a mixture  $2\text{CO} + \text{O}_2$ ) have since been shown to apply only to the initial stages of an explosion, where the gases combine with relatively very slow velocities compared with those characteristic of "detonation." It was in the year 1881 that Berthelot, and independently Mallard and Le Chatelier, announced the discovery of the rapid acceleration of the initial velocity of inflammation and the final attainment of the enormously higher constant velocity of the "explosion wave."

## SECTION I.—IGNITION TEMPERATURES AND THE INITIAL PHASES OF GASEOUS EXPLOSIONS.

Chemical change may be determined in a gaseous explosive mixture at a much lower temperature than its ignition point. Thus, if electrolytic gas be heated in a sealed bulb to a temperature somewhat higher than 400°, the formation of steam can usually be detected after a lapse of a few days. Between 450° and 500° the rate of combination, although considerably greater, would still be insufficient to cause any self-heating of the mixture. If, however, the temperature of the enclosure be further slowly raised, a point (probably about 550°) would soon be reached at which self-heating of the mixture would begin. Its temperature would thus be raised above that of the enclosure, and the rate of combination rapidly accelerated until explosive combustion would be set up. The precise temperature at which this would occur would obviously depend upon the amount of slow combustion which had taken place during the preliminary heating-up of the mixture. Thus it follows that the only way of determining the true ignition temperature of such a mixture, undiluted by the products of its own slow combustion, would be either to make the preliminary heating-up period negligibly short, or, better still, to heat separately the combustible gas and the air or oxygen to the ignition temperature before allowing them to mix.

The work of Victor Meyer and his pupils, as also that of Hélier and Emich, which yielded very discordant results for the ignition temperatures of mixtures of the commoner inflammable gases with oxygen, doubtless suffered from the large amount of flameless combustion which occurred before the temperature of the mixture as a whole had been raised to the true ignition-point.

Quite recently, however, H. B. Dixon and H. F. Coward, using an apparatus in which the combustible gas and air or oxygen were separately heated to the temperature of the enclosure before being allowed to mix, succeeded in fixing, within narrow limits, the ignition temperatures at atmospheric pressure of a number of gases. In the cases of hydrogen, carbon monoxide, and acetylene, the ignition temperatures were practically the same in air as in oxygen, thus:

|                                   | In Air.   | In Oxygen. |
|-----------------------------------|-----------|------------|
| Hydrogen . . . . .                | 580°—590° | 580°—590°  |
| Carbon monoxide (moist) . . . . . | 644°—658° | 637°—658°  |
| Acetylene . . . . .               | 406°—440° | 416°—440°  |

In most other cases, however, the limiting temperatures observed in air were higher than in oxygen, thus:

|                    | In Air.   | In Oxygen. |
|--------------------|-----------|------------|
| Methane . . . . .  | 650°—750° | 556°—700°  |
| Ethylene . . . . . | 542°—547° | 500°—519°  |
| Cyanogen . . . . . | 850°—862° | 803°—818°  |

Another notable fact is that, in an homologous series of hydrocarbons, the limiting ignition temperatures appear to fall as the series is ascended. Thus we have (in oxygen):

Methane, 556°—700°. Ethane, 520°—630°. Propane, 490°—570°.

During 1906-7 K. G. Falk, acting on a suggestion made by Nernst, endeavoured to determine the ignition points of various mixtures of hydrogen and oxygen by compressing them in a steel cylinder by means of a weight falling on a piston. Assuming that (1) the mixture was heated adiabatically and uniformly throughout its whole mass until it reached the ignition point, (2) that the whole then detonated instantaneously, and (3) that the downward movement of the piston was arrested at the moment of ignition, he calculated the ignition temperatures under adiabatic compression shown in the table given below.

H. B. Dixon, in a recent criticism of Falk's assumptions, contends that while (1) may be in certain cases practically true, (2) and (3) cannot be allowed, and also that Falk's results are unreliable on account of his having neglected to stop the descent of the piston the moment the gases were brought to the true ignition point. Adopting this necessary precaution, Dixon has repeated Falk's experiments, with results which compare as follows, when  $\delta$  is assumed to be 1.40 in all cases:

| Mixture.                             | Ignition Temperature under Adiabatic Compression. |        |
|--------------------------------------|---------------------------------------------------|--------|
|                                      | Falk.                                             | Dixon. |
| $4\text{H}_2 + \text{O}_2$ . . . . . | 605°                                              | —      |
| $2\text{H}_2 + \text{O}_2$ . . . . . | 540°                                              | 536°   |
| $\text{H}_2 + \text{O}_2$ . . . . .  | 514°                                              | 530°   |
| $\text{H}_2 + 2\text{O}_2$ . . . . . | 530°                                              | 520°   |
| $\text{H}_2 + 4\text{O}_2$ . . . . . | 571°                                              | 507°   |

Using the specific heats of hydrogen and air found by Joly under high pressures, Dixon calculates the ignition point of electrolytic gas to be 557°, from his experiments on adiabatic compression. From Dixon's results, it would also appear that successive additions of oxygen to electrolytic gas regularly lower the ignition-point.

We are principally indebted to the photographic researches of H. B. Dixon and his pupils for the most notable recent additions to our knowledge concerning the initial phases of explosion and the phenomena associated with the setting-up of detonation in gaseous mixtures. The first investigators to use a photographic method were Mallard and Le Chatelier in their researches on the initial phases of gaseous explosions. They recorded the movement of the flame along a horizontal glass tube on a sensitized plate moving vertically, thus obtaining a graph compounded of the two velocities. Failing to obtain any satisfactory records with such feebly luminous flames as those yielded by mixtures either of carbon monoxide or of hydrogen with oxygen, they



employed mixtures of carbon disulphide with oxygen or nitric oxide, which they regarded as typical of all oxygen or air mixture respectively.

The behaviour of these mixtures was found to differ according as they were ignited near (a) the open or (b) the closed end of a tube. In the case of (a) the flame proceeded for some distance down the tube at a practically uniform velocity, which is the true rate of propagation "by conduction." With the mixture  $\text{CS}_2 + 6\text{NO}$ , this state was succeeded by an oscillatory period; the flame swinging backwards and forwards with increasing amplitudes, and then either dying out altogether or giving rise to "detonation." With the oxygen mixtures, the initial period of uniform slow velocity was shorter, and appeared to be abruptly succeeded by detonation without the intervention of any oscillatory period. When the nitric oxide mixtures were ignited near the closed end of the tube, the forward movement of the flame was uniformly accelerated until detonation was set up.

According to Le Chatelier the following numbers represent in metres per second the true initial rates of inflammation (i.e., of propagation of flames "by conduction") for various mixtures:

Hydrogen and Air.

|                     |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|
| Hydrogen, per cent. | 10   | 20   | 30   | 40   | 50   | 60   | 70   |
| Metres, per second  | 0.60 | 1.95 | 3.30 | 4.37 | 3.45 | 2.30 | 1.10 |

Methane and Air.

|                    |      |      |      |      |      |      |
|--------------------|------|------|------|------|------|------|
| Methane, per cent. | 6    | 8    | 10   | 12   | 14   | 16   |
| Metres, per second | 0.03 | 0.23 | 0.42 | 0.61 | 0.36 | 0.10 |

Acetylene and Air.

|                      |     |   |   |   |    |     |      |      |      |
|----------------------|-----|---|---|---|----|-----|------|------|------|
| Acetylene, per cent. | 2.9 | 5 | 7 | 9 | 15 | 22  | 40   | 60   | 64   |
| Metres, per second   | 0.1 | 2 | 4 | 6 | 3  | 0.4 | 0.22 | 0.07 | 0.05 |

Coal Gas and Air.

|                    |      |      |      |      |      |      |      |      |
|--------------------|------|------|------|------|------|------|------|------|
| Gas, per cent.     | 8    | 10   | 12   | 14   | 15   | 17   | 20   | 24   |
| Metres, per second | 0.30 | 0.50 | 0.72 | 0.93 | 1.05 | 1.27 | 0.80 | 0.40 |

Oxygen Mixtures.

|                                                 |                      |
|-------------------------------------------------|----------------------|
| $2\text{CO} + \text{O}_2$                       | 2 metres per second. |
| $2\text{H}_2 + \text{O}_2$                      | 20 "                 |
| $\text{CS}_2 + 3\text{O}_2$                     | 22 "                 |
| $\text{C}_2\text{H}_2 + 2\frac{1}{2}\text{O}_2$ | 200 "                |

It should be noted that for mixtures of the same gas with various proportions of air, the initial rate of inflammation attains a maximum when the combustible gas is present in considerable excess of that required for perfect combustion.

H. B. Dixon's experimental method consisted in photographing the explosion flame travelling along a horizontal tube on a highly sensitive film rotated vertically with a constant high velocity (varying, however, between 25 and 50 metres per second in different experiments); the explosion tube being placed at such a distance from the camera that the size of the image was about one-thirtieth that of the flame. In this way it was found possible to analyze the progress of an explosion from its point of origin up to the final attainment of its maximum force and velocity in "detonation." The investigation also included the discovery of the wave of "retonation," which is thrown back through the still burning gases from the point where detonation starts (a phenomenon also independently discovered by Le Chatelier in 1900), of the effects of collision between two explosion waves, and of the passage of reflected waves through the hot products of explosion.

The phenomena associated with the development of an explosion in a gaseous mixture, fired in a closed tube by a spark passed between wires a few inches from the closed end, are clearly shown in the photograph reproduced in fig. 1, which is analyzed in the diagram fig. 2. This photograph was taken during an experiment in which carbon disulphide was exploded with a quantity of oxygen represented by the expression  $\text{CS}_2 + 5\text{O}_2$ . The flame, in starting at the point O, sends out invisible compression waves in both directions along the tube, which travel in advance of the flame with the velocity of sound through the unburnt gases, as represented by the dotted lines OM, ON in the diagram. The flame itself, travelling at first more slowly than the compression waves, traces the curves OA and OB. The compression wave ON, on reaching the closed end of the tube, is reflected back again as NC, and, on meeting the flame (which is still travelling in the direction OA), retards it, and passes thence through the hot and probably still burning gases as the visible wave CD. An instant later it overtakes at D the front of the flame, travelling in the direction OB, thereby accelerating it and increasing its luminosity in consequence of the quickened combustion. The flame then continues to move forward with rapidly accelerated velocity until "detonation" is set up at the point E. At this point a strongly luminous wave of compression EG (the "retonation wave") is sent backwards through the still burning gases, which, on reaching the near end of the tube, is reflected back again as GH. The "detonation wave" EF passes onwards through the mixture with its characteristic uniform high velocity and intense luminosity. Fig. 3 is a similar photograph which shows the development of

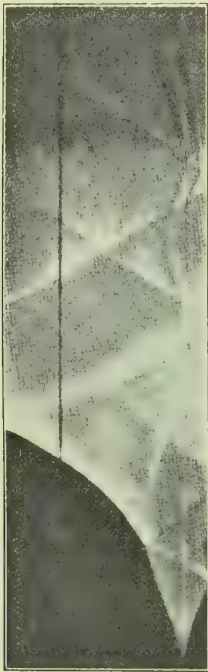


Fig. 1.

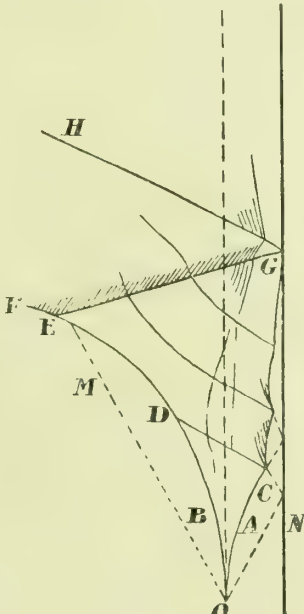


Fig. 2.

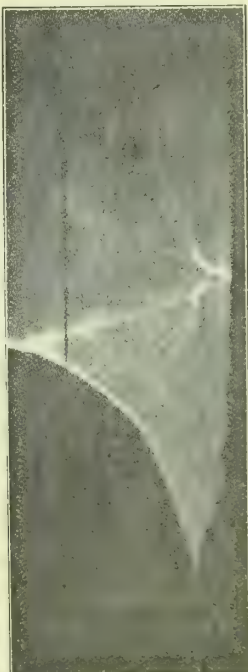


Fig. 3.

"detonation" and the phenomenon of "retonation" in the case of a mixture of cyanogen and oxygen ( $\text{C}_2\text{N}_2 + \text{O}_2$ ) fired near the closed end of a tube.

Except in special circumstances (e.g., when it is reinforced by another reflected wave) the velocity of the retonation wave is always inferior to that of detonation. Thus Le Chatelier gives 2990 metres per second for the "detonation wave" and 2330 metres per second for the "retonation wave" in an equimolecular mixture of acetylene and oxygen. When, however, the "retonation wave" is developed just at the closed end of a tube (e.g., when the explosive mixture is fired at such a distance from the closed end that "detonation" is set up just as the flame arrives at the end) it may be reinforced by a reflected wave, in which case its velocity cannot be distinguished from that of a true "detonation."

The explanation of the intense luminosity of the retonation wave, and its higher velocity than sound through the exploded

gases, is to be found in the fact that the combustion during the initial stages of an explosion is very much slower than when detonation is set up. Under the extreme conditions of "detonation" the temperature of each successive layer of the explosive mixture is suddenly raised to the ignition point by adiabatic compression; and it is probable that a large proportion of collisions between chemically opposite molecules are fruitful of change. The whole combustion is probably completed in an immeasurably short interval of time, as the result of a comparatively limited number of successive molecular collisions. But during the initial period of the explosion ("inflammation") not only is the flame propagated with a much slower velocity, but also the actual process of combustion is much more prolonged than in detonation; and at the moment when detonation is set up combustion is still proceeding in the layers of gas for some distance behind the flame-front. The "retonation" wave, in passing backwards through these layers, quickens this residual combustion, and is



itself thereby rendered highly luminous. This interpretation is supported by repeated observations of Dixon, that the collision of two flames in neither of which "detonation" has been determined, will frequently give rise to reflected waves more rapid and more luminous than the incident waves. There can be little doubt as to the important part played by reflected waves in determining the violent shattering effects associated with gaseous explosions on a large scale.

#### SECTION II.—THE EXPLOSION WAVE.

Berthelot and Vieille, in announcing their discovery of the development of detonation ("l'onde explosive") in gaseous explosions, described it as "*une certaine surface régulière, où se développe la transformation, et qui réalise un même état de combinaison, de température, de pression, etc. Cette surface, une fois produite, se propage ensuite, de couche en couche, dans la masse tout entière, par suite de la transmission des chocs successifs des molécules gazeuses amenées à un état vibratoire plus intense en raison de la chaleur dégagée dans leur combinaison, et transformées sur place, ou, plus exactement, avec un faible déplacement relatif . . .*" Such conditions are comparable with those of a sound wave passing through the gaseous mixture, with, however, the important difference that, whereas a sound wave is propagated from layer to layer with a small compression and a velocity determined solely by the physical condition of the vibrating medium, it is an abrupt change in chemical condition which is propagated in the explosion wave, and which generates an enormous force as it passes through each successive layer of the medium. Berthelot considered that the mean velocity of the translation of the molecules of the products of combustion, retaining the total kinetic energy corresponding to the heat developed in the reaction, may be regarded as the limiting maximum rate of propagation of the explosion wave ( $\theta$ ), which would be given, in metres per second, by the equation

$$\theta = 29'354 \sqrt{T}$$

where  $T$  is the absolute temperature and  $\rho$  the density of the products referred to air. In calculating  $T$ , Berthelot made two erroneous assumptions—namely, (1) that the specific heats of the products are independent of temperature and equal to the sum of the specific heats of the reacting gases, and (2) that the gases burn under conditions of constant pressure. He was also of opinion that, owing to the high pressures generated, dissociation plays no appreciable part in the phenomena of the wave.

In their experimental work, Berthelot and Vieille proved that the velocity of the explosion wave is independent of the length of the column of gas traversed, and of the material or diameter of the tube employed (at least above a certain small limiting diameter). It was also immaterial whether the tube was laid out straight, coiled round a drum, or even zigzagged. They also concluded that the velocity is independent of initial pressure. But this is not strictly correct, as H. B. Dixon has since shown. The rate increases slightly with the initial pressure, attaining a nearly constant value at a pressure of about two atmospheres.

H. B. Dixon (the bearing of whose researches upon the question of the mechanism of combustion will be discussed later) modified Berthelot's theory in the following particulars: namely, by assuming (1) that the explosion wave is carried forward by movements of molecules of density intermediate between that of the products of combustion and that of the unburnt gas; (2) that the gases are heated at constant volume; (3) that the temperature of the gas propagating the wave is double that due to chemical reaction alone; (4) that the temperature is increased when the chemical volume of the products is larger, and diminished when it is smaller, than that of the unburnt gases; (5) that the velocity of a sound wave is only 0.7 of the mean velocity of the molecules in the gas.\* Dixon's formula for the rate of explosion of a given mixture is, therefore, as follows:—

$$v = 0.7 \times 29'354 \sqrt{\left(2 \frac{Q}{Cv} + T\right) \left(\frac{v_2}{v_1}\right)^{\gamma-1}}$$

where  $Q$  = the heat developed by the reaction,  $v_2$  and  $v_1$  = the chemical volumes of the products and unburnt gases respectively,  $\rho$  = the mean density of the products and the unburnt gases, and  $Cv$  = the specific heat of the products at constant volume, which Dixon wrongly assumed to be independent of the temperature,  $T$  = the temperature in  $^{\circ}\text{C}$ , and  $\gamma$  = ratio of specific heats.

But, whereas the values of  $v$ , calculated by this formula, do in many instances correspond with those actually found (e.g., for mixtures of cyanogen and oxygen, and in nearly all cases where the detonating mixture is largely diluted with an inert gas), there are a large number of cases of undiluted detonating mixtures in which the agreement is not good (e.g., for  $2\text{H}_2 + \text{O}_2$  the calculated value is 3416, whereas that actually found is only 2821 metres per second). Dixon ascribed such discrepancies to partial dissociation of the products in the wave; but there is now little doubt that the formula does not hold good, as Dixon himself readily enough admits.† Nevertheless for many years it was a valuable working hypothesis and inspired much fruitful investigation.

In 1899, D. L. Chapman—following up a suggestion made by Schuster at the time when Dixon's memoir was first published—deduced a formula for rates of explosion from Riemann's equation

for the propagation of an abrupt variation in the density and the pressure of a gas, on the assumption that such a variation can be propagated without change of type. According to this view, the explosion wave is to be regarded as a wave of compression not in a homogeneous medium, but in a medium which is discontinuous in the vicinity of the wave-front. It is assumed (1) that the "front" of the wave (i.e., from the unexploded gas to the point of maximum pressure) does not alter in character, or, in other words, that every portion of the wave travels with the same velocity; (2) that the velocity is the minimum velocity consistent with (1); and (3) that at the point of maximum pressure the chemical change concerned in the propagation of the wave is complete. The unburnt gases immediately in front of the waves are, of course, fired by compression; and the abrupt variation in the density and pressure of the medium is due to the chemical change. Chapman's formula for the velocity of the explosion wave in centimetres per second is:

$$V = \sqrt{\frac{2RJ}{\mu C_v}} \left[ \{(m-n)C_p + mC_v\} C_p t_0 + (C_p + C_v)h \right],$$

where  $R$  = the gas constant (1.985),  $J$  = the dynamical equivalent of heat ( $42 \times 10^6$  ergs),  $\mu$  = the gram equivalents of the mixture exploded (e.g., 58 in the case of  $\text{C}_2\text{H}_2 + \text{O}_2$ ),  $n$  and  $m$  = the number of gaseous molecules before and after the chemical change in the wave,  $C_p$  and  $C_v$  = the mean specific heats of the products at constant pressure and volume respectively,  $h$  = the total heat generated in the wave, and  $t_0$  = the initial temperature (abs.) of the mixture exploded. From the fact that the dilution of electrolytic gas ( $2\text{H}_2 + \text{O}_2$ ) with oxygen lowers its rate of explosion a little more than a corresponding dilution with nitrogen, Chapman considers it improbable that there is any appreciable dissociation of steam in the wave. He assumes that the molecular heat of steam rises more rapidly with temperature than that of a diatomic gas; and that the molecular heats of oxygen, hydrogen, nitrogen, and carbon monoxide may for practical purposes be considered as equal at any given temperature. Selecting some seventeen of Dixon's found rates of explosion, he has calculated by means of his formula the corresponding molecular heats and temperatures; arriving at the following results for  $C_v$  at intermediate temperatures by interpolation;—

| Temperature            | 4300°  | 4000°  | 3700°  | 3400°  | 3100°  | 2800°  | 2500° |
|------------------------|--------|--------|--------|--------|--------|--------|-------|
| Steam                  | 14'750 | 14'297 | 13'750 | 13'102 | 12'250 | 11'040 | 9'797 |
| $C_v$ { Diatomic gases | 7'707  | 7'674  | 7'641  | 7'608  | 7'575  | 7'542  | 7'509 |

With the aid of this series of numbers he proceeded to apply his formula to the calculation of the rates of explosion of some forty other mixtures investigated by Dixon; finding in all cases close agreement between the found and calculated values, of which the following may suffice as examples:—

| Mixture Exploded.                                 | Products in the Wave.                             | Temperature. | Rate of Explosion, Metres per Second. |        |
|---------------------------------------------------|---------------------------------------------------|--------------|---------------------------------------|--------|
|                                                   |                                                   |              | Calculated.                           | Found. |
| $2\text{H}_2 + 2\text{N}_2\text{O}$               | $2\text{H}_2\text{O} + 2\text{N}_2$               | 3813         | 2408                                  | 2305   |
| $4\text{H}_2 + 2\text{N}_2\text{O}$               | $2\text{H}_2\text{O} + 2\text{N}_2 + 2\text{H}_2$ | 3077°        | 2604                                  | 2545   |
| $6\text{H}_2 + 2\text{N}_2\text{O}$               | $2\text{H}_2\text{O} + 2\text{N}_2 + 4\text{H}_2$ | 2612°        | 2720                                  | 2705   |
| $2\text{H}_2 + 2\text{N}_2\text{O} + 2\text{N}_2$ | $2\text{H}_2\text{O} + 4\text{N}_2$               | 3077°        | 2097                                  | 1991   |
| $\text{C}_2\text{H}_4 + 2\text{O}_2$              | $2\text{CO} + 2\text{H}_2\text{O}$                | 4305°        | 2619                                  | 2581   |
| $\text{C}_2\text{H}_4 + 3\text{O}_2$              | $2\text{CO} + 2\text{H}_2\text{O} + \text{O}_2$   | 3882°        | 2348                                  | 2368   |
| $\text{C}_2\text{H}_2 + \text{O}_2$               | $2\text{CO} + \text{H}_2$                         | 5029°        | 3101                                  | 2961   |
| $\text{CH}_4 + \text{O}_2$                        | $\text{CO} + \text{H}_2\text{O} + \text{H}_2$     | 2772°        | 2502                                  | 2528   |
| $2\text{CH}_4 + 3\text{O}_2$                      | $2\text{CO} + 4\text{H}_2\text{O}$                | 3764°        | 2485                                  | 2470   |
| $2\text{CH}_4 + 3\text{O}_2 + \text{N}_2$         | $2\text{CO} + 4\text{H}_2\text{O} + \text{N}_2$   | 3513°        | 2353                                  | 2349   |

A characteristic feature of detonation is the extremely short duration of chemical action and subsequent rapid cooling of the products, as compared with ordinary combustion. Some years ago the writer, working in conjunction with Bevan Lean, under Professor H. B. Dixon's direction, found by a photographic method that the duration of luminosity in each successive layer of gas in the detonation of electrolytic gas is certainly less than  $\frac{1}{10000}$  second—a much shorter interval of time than was required to shatter a tube of thin glass attached to the end of the explosion coil used. This tube, though it was invariably smashed by the force of the explosion, always appeared perfectly intact in the photograph. Dixon's subsequent photographic researches have demonstrated the abrupt suddenness with which the gases attain the maximum temperature in detonation, the intensity and short duration of luminosity, and the subsequent rapid cooling, as compared with ordinary combustion. Moreover, high as is the temperature attained, there is no evidence of any considerable dissociation of steam in the wave; for, despite the instantaneous cooling of the products, there is less than 1 per cent. of the gases left uncombined after the wave has passed through electrolytic gas ( $2\text{H}_2 + \text{O}_2$ ).

*Influence of an Excess of an Inert Gas upon the Rate of Explosion.*  
—Writing Chapman's formula as follows:—

$$V = \sqrt{\frac{2RJ}{\mu C_v}} \left[ \{(m-n)C_p + mC_v\} C_p t_0 + (C_p + C_v)h \right]$$

and putting  $\frac{2RJ}{\mu C_v} = A$ , and the terms between the square

brackets =  $B$ , it will be immediately perceived that the addition of an inert diatomic gas (e.g.,  $\text{H}_2$ ,  $\text{N}_2$ , or  $\text{O}_2$ ) to a given explosive

\* The reader is referred to the original memoir in the "Philosophical Transactions" for 1893, for details of the argument.

† See his recent Presidential Address to the Chemical Society.



mixture will affect the values of both A and B, but not necessarily in the same direction. It will increase the value of  $\mu$  and diminish the values of  $C_v$  and  $C_p$ , partly by lowering the temperature in the wave and partly also (if steam or carbon dioxide be formed in the wave) by reason of its own specific heat being lower than that of the undiluted products. It will also increase the value of  $m$  without altering  $(m - n)$ . If it be assumed that the molecular heats of the three diatomic gases under consideration are, for all practical purposes, equal at any given temperature, it will be at once seen that an equal dilution of a given explosive mixture with any one of the three gases, while it will have an equal effect on all terms included under B, may either increase or diminish the value of A, according as to whether or not the *plus* effect of the lower value of  $C_v$  is counterbalanced by the *minus* effect of the increase in  $\mu$ . If the latter effect be small, as would be the case with hydrogen as the diluent, the value of A would on the whole be increased; whereas if the increase in  $\mu$  were large, as would be the case with nitrogen or oxygen as the diluent, the value of A would on the whole be diminished.

As an example of the probable effects of the equal dilution of a given explosive mixture with each of the three gases in question, the case of an equimolecular mixture of hydrogen and nitrous oxide, fired at 10° and 760 mm., may be cited as follows:—

| Mixture.                                               | h       | m | m-n. | $\mu$ | C <sub>v</sub> | Temp.  | A         | B         | V. in Metres per second. |        |
|--------------------------------------------------------|---------|---|------|-------|----------------|--------|-----------|-----------|--------------------------|--------|
|                                                        |         |   |      |       |                |        |           |           | Calculated.              | Found. |
| H <sub>2</sub> +N <sub>2</sub> O . . .                 | 152.500 | 4 | 0    | 92    | 10.81          | 3813°  | 15,640    | 3,758,750 | 2425                     | 2305   |
| H <sub>2</sub> +N <sub>2</sub> O+2H <sub>2</sub> . . . | 6       | 0 | 96   | 9.10  | 3077°          | 20,980 | 3,251,500 | 2612      | 2545                     |        |
| H <sub>2</sub> +N <sub>2</sub> O+2N <sub>2</sub> . . . | 6       | 0 | 148  | 9.10  | 3077°          | 13,610 | 3,251,500 | 2104      | 1991                     |        |
| H <sub>2</sub> +N <sub>2</sub> O+2O <sub>2</sub> . . . | 6       | 0 | 156  | 9.10  | 3077°          | 12,830 | 3,251,500 | 2042      | —                        |        |

An inspection of the figures under columns A and B will at once make it clear why, whereas dilution with hydrogen is invariably found to increase the rate of explosion of a given mixture, an equal dilution with nitrogen or oxygen invariably diminishes it, and also why the retarding influence of oxygen must always be greater than that of an equal proportion of nitrogen. The following examples, taken from Dixon's memoir, may be cited in support of the above argument:

Effects of Dilution upon the Rate of Explosion of Electrolytic Gas.

| Mixture Exploded.                                          | Rate.<br>Metres per Second. |
|------------------------------------------------------------|-----------------------------|
| 2H <sub>2</sub> +O <sub>2</sub> . . . . .                  | 2817                        |
| 2H <sub>2</sub> +O <sub>2</sub> +2H <sub>2</sub> . . . . . | 3268                        |
| 2H <sub>2</sub> +O <sub>2</sub> +4H <sub>2</sub> . . . . . | 3527                        |
| 2H <sub>2</sub> +O <sub>2</sub> +6H <sub>2</sub> . . . . . | 3532                        |
| 2H <sub>2</sub> +O <sub>2</sub> +O <sub>2</sub> . . . . .  | 2328                        |
| 2H <sub>2</sub> +O <sub>2</sub> +3O <sub>2</sub> . . . . . | 1927                        |
| 2H <sub>2</sub> +O <sub>2</sub> +N <sub>2</sub> . . . . .  | 2426                        |
| 2H <sub>2</sub> +O <sub>2</sub> +3N <sub>2</sub> . . . . . | 2055                        |

Effects of Dilution with Hydrogen upon the Rate of Explosion of Hydrogen and Chlorine.

| Mixture . . . . .                | H <sub>2</sub> +Cl <sub>2</sub> . . . . . | 2H <sub>2</sub> +Cl <sub>2</sub> . . . . . | 3H <sub>2</sub> +Cl <sub>2</sub> . . . . . |
|----------------------------------|-------------------------------------------|--------------------------------------------|--------------------------------------------|
| Rate—metres per second . . . . . | 1729                                      | 1849                                       | 1855                                       |

**The Burning of Gaseous Carbon.**—Of the many important facts brought to light during the course of Dixon's investigation, none are of greater interest than those relating to the burning of gaseous carbon in the explosion wave, as illustrated by the case of cyanogen. In view of the fact that the molecular heat of combustion of cyanogen, when burnt completely to carbon dioxide, is 259.6 kilogram C. units, whereas, if burnt to carbon monoxide, it would only be 123 units, it might be expected that the rate of explosion for a mixture C<sub>2</sub>N<sub>2</sub> + 2O<sub>2</sub> would be much higher than for C<sub>2</sub>N<sub>2</sub> + O<sub>2</sub>, if gaseous carbon is primarily burnt to carbon dioxide in the wave. The exact opposite is the case, however, as the following results show:

| Mixture.                                                  | Products.                                   | Rate.                     |
|-----------------------------------------------------------|---------------------------------------------|---------------------------|
| C <sub>2</sub> N <sub>2</sub> + O <sub>2</sub> . . . . .  | 2CO + N <sub>2</sub> . . . . .              | 2728 } metres per second. |
| C <sub>2</sub> N <sub>2</sub> + 2O <sub>2</sub> . . . . . | 2CO <sub>2</sub> + N <sub>2</sub> . . . . . | 2321 }                    |

Still more cogent is the evidence in favour of the initial formation of carbon monoxide in the wave, when the following figures are considered:

| Rate—metres per second | C <sub>2</sub> N <sub>2</sub> + O <sub>2</sub> . . . . . | C <sub>2</sub> N <sub>2</sub> + O <sub>2</sub> + N <sub>2</sub> . . . . . | C <sub>2</sub> N <sub>2</sub> + O <sub>2</sub> + O <sub>2</sub> . . . . . |
|------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
|                        | 2728                                                     | 2398                                                                      | 2321                                                                      |

The conclusion to be drawn from the preceding figures is that cyanogen is initially burnt to carbon monoxide and nitrogen in the wave itself, any excess of oxygen afterwards burning up the carbon monoxide as the gases cool down in rear of the wave.

This conclusion was driven home by Dixon, in conjunction with Strange and Graham, by photographing on a sensitive film, rotated at a speed of about 1500 metres per minute, the explosion flame in the case of the three mixtures (a) C<sub>2</sub>N<sub>2</sub>+O<sub>2</sub>, (b) C<sub>2</sub>N<sub>2</sub>+O<sub>2</sub>+N<sub>2</sub>, (c) C<sub>2</sub>N<sub>2</sub>+2O<sub>2</sub>. In each case the flame was photographed, after detonation had been set up, as it dashed past a glass window inserted into the lead explosion coil. The image obtained in the case of (a) showed an intensely brilliant flame (the explosion wave), slightly drawn out in tapering form; in the case of (b), with nitrogen as diluent, the flame was less brilliant and somewhat more drawn out than in (a); but with (c) the flame while no more luminous than in (b), was drawn out to

great length, owing to the continued combustion of carbon monoxide in the rear of the wave. The diagram fig. 4 (approximately to scale), will convey an idea of the relative durations of the flames in the three cases:—

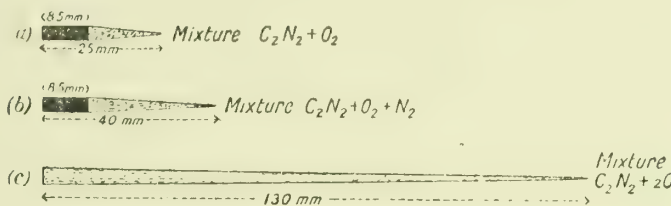


Fig. 4.

**The Burning of Hydrocarbons in the Wave.**—It was during the course of measurements of the rates of explosion of hydrocarbons with varying proportions of oxygen in 1891-92 that Dixon and his collaborators rediscovered facts (originally set forth by Dalton in his "New System of Chemical Philosophy") which finally disposed of the dogma that in a deficient supply of oxygen a "selective" burning of hydrogen occurs. It was found that when either ethylene or acetylene is detonated with its own volume of oxygen the ultimate products consist almost entirely of carbon monoxide and hydrogen. The rates of explosion, while they do not reveal the real mechanism of the combustion, show very clearly that, as in the case of cyanogen, the carbon of a hydrocarbon is burnt initially to the monoxide in the wave itself, the formation of the dioxide being an after-effect and taking place in the rear of the wave. In the cases of methane and acetylene, the fastest rates are observed with equimolecular mixtures, whereas with ethylene the rate increases with the proportion of oxygen up to the limit C<sub>2</sub>H<sub>4</sub> + 2O<sub>2</sub>. As the question of the mechanism of hydrocarbon combustion will be fully discussed later, the following rates of explosion, as determined by Dixon, may now be given without further comment:

(A) Methane and Oxygen in Varying Proportions, Fired at 10° and 760 mm.

| Mixture . . . . .                | CH <sub>4</sub> +O <sub>2</sub> | CH <sub>4</sub> +1½O <sub>2</sub> | CH <sub>4</sub> +2O <sub>2</sub> | CH <sub>4</sub> +3O <sub>2</sub> * | CH <sub>4</sub> +4O <sub>2</sub> |
|----------------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------|----------------------------------|
| Rate—metres per second . . . . . | 2528                            | 2470                              | 2322                             | 2146                               | 1963                             |

\* Compare this with the 2154 metres per second observed for CH<sub>4</sub>+1½O<sub>2</sub>+1½N<sub>2</sub> as showing the inertness of at least the moiety of the oxygen in the wave.

(B) Ethylene and Oxygen in Varying Proportions, Fired at 10° and 760 mm.

| Mixture . . . . .                | C <sub>2</sub> H <sub>4</sub> +O <sub>2</sub> | C <sub>2</sub> H <sub>4</sub> +2O <sub>2</sub> | C <sub>2</sub> H <sub>4</sub> +3O <sub>2</sub> * | C <sub>2</sub> H <sub>4</sub> +4O <sub>2</sub> | C <sub>2</sub> H <sub>4</sub> +6O <sub>2</sub> |
|----------------------------------|-----------------------------------------------|------------------------------------------------|--------------------------------------------------|------------------------------------------------|------------------------------------------------|
| Rate—metres per second . . . . . | 2507                                          | 2581                                           | 2368                                             | 2247                                           | 2118                                           |

\* Compare this with the 2413 metres per second observed for C<sub>2</sub>H<sub>4</sub>+2O<sub>2</sub>+N<sub>2</sub>.

(C) Acetylene and Oxygen in Varying Proportions, Fired at 10° and 760 mm.

| Mixture . . . . .                | C <sub>2</sub> H <sub>2</sub> +O <sub>2</sub> | C <sub>2</sub> H <sub>2</sub> +1½O <sub>2</sub> | C <sub>2</sub> H <sub>2</sub> +2½O <sub>2</sub> * |
|----------------------------------|-----------------------------------------------|-------------------------------------------------|---------------------------------------------------|
| Rate—metres per second . . . . . | 2916                                          | 2716                                            | 2391                                              |

\* Compare this with the 21.4 metres per second observed for C<sub>2</sub>H<sub>2</sub>+1½O<sub>2</sub>+N<sub>2</sub>.

SECTION III.—PRESSURES PRODUCED BY GASEOUS EXPLOSIONS.

Many investigators, from the time of Bunsen's well-known experiments in 1867 onwards, have measured the pressures produced in gaseous explosions, with doubtless considerable success so far as what may be termed the mean effective pressures are concerned. As the subject is at present engaging the attention of a Committee appointed by the Association in 1907, any lengthy reference to it in this report may seem superfluous. Nevertheless, if only for the sake of completeness, a brief *résumé* of our present knowledge may not here be out of place. The explosion vessel employed by Bunsen was a stout glass tube, 8.15 cm. long, 1.7 cm. internal diameter, and of 18 c.c. capacity. It was closed by a suitable valve, the load on which could be adjusted till it was just lifted when the explosive mixture was fired by means of a powerful spark passed along the axis of the tube. Bunsen considered that the combustion would occur under adiabatic and "constant volume" conditions; and he identified the rate of ignition of a particular mixture with that of the completion of chemical change. In calculating from his results the corresponding flame temperatures, he assumed the constancy of the specific heats of steam and carbon dioxide. Finding that the pressures recorded in the cases of electrolytic gas and of a mixture of carbon monoxide and oxygen in their combining proportions (namely 9.5 and 10.1 atmospheres respectively) were somewhat less than one-half of those theoretically required on the above assumptions, he concluded that in each case combustion had proceeded *per saltum*, owing to the supposed theoretical flame temperatures exceeding the limits at which steam and carbon dioxide respectively are completely dissociated. The problem was again attacked independently by Mallard and Le Chatelier in 1883, and by Berthelot and Vieille in 1885. The last-named fired various gaseous mixtures at atmospheric pressure in a spherical iron bomb, measuring the effective pressures by the movement of a light piston working against a spring in a tube attached to the bomb. In order to gain some information as to the possible cooling influence of the walls upon the effective pressures recorded, three bombs of different capacities—namely, A, of 300 c.c., B, of 1500 c.c., and C, of 4000 c.c.—were employed. The



results, expressed in each case as atmospheres in excess of the atmospheric pressure, were as follows :

| Bomb.                                                                       | A.      | B.    | C.      |
|-----------------------------------------------------------------------------|---------|-------|---------|
| Capacity in cm. . . . .                                                     | 300     | 1500  | 4000    |
| Surface in cm. . . . .                                                      | 216     | 648   | 1220    |
| Surface per unit volume. . . . .                                            | 0.72    | 0.43  | 0.33    |
| Diameter in cm. . . . .                                                     | 6.0     | 14.2  | 21.7    |
| Length of firing piece in cm. . . . .                                       | 6.3     | 5.3   | 6.3     |
| Travel of flame before reaching the piston in cm. . . . .                   | 9.1     | 16.3  | 24.8    |
| Mixture exploded.                                                           | Atms.   | Atms. | Atms.   |
| 2H <sub>2</sub> + O <sub>2</sub> . . . . .                                  | 7.41    | 9.69  | 9.80    |
| 2CO + O <sub>2</sub> . . . . .                                              | 9.29    | 9.93  | 10.21   |
| CH <sub>4</sub> + 2O <sub>2</sub> . . . . .                                 | 13.94   | 14.81 | 16.31   |
| C <sub>2</sub> N <sub>2</sub> + O <sub>2</sub> . . . . .                    | —       | —     | 25.11   |
| C <sub>2</sub> N <sub>2</sub> + 2O <sub>2</sub> . . . . .                   | —       | —     | 20.96   |
| Time required for flame to travel from firing piece to piston of indicator. | Second. | —     | Second. |
| Mixture (2H <sub>2</sub> + O <sub>2</sub> ) . . . . .                       | 0.00104 | —     | 0.00214 |
| (2CO + O <sub>2</sub> ) . . . . .                                           | 0.01286 | —     | 0.01551 |

Perhaps the most notable feature about these results is the smallness of the difference between the pressures observed with bombs A and C in any particular case. These differences might at first sight be attributed to the (supposed) much smaller cooling influence of the walls of bomb C as compared with bomb A. But if this were the true explanation, the difference should be greater with the slow-burning 2CO+O<sub>2</sub> mixture than with the fast-burning 2H<sub>2</sub>+O<sub>2</sub>, whereas the opposite was the case. Moreover, the fact that dilution of the mixture 2H<sub>2</sub>+O<sub>2</sub> with twice its own volume of nitrogen almost obliterated the difference between the pressures observed in the cases of bombs A and C (the ratio  $\frac{P_C}{P_A}$  for the diluted being 0.95, as against 0.76 for the undiluted mixture) is all against the cooling theory. The more probable explanation is to be found in the fact that, owing to the much longer travel of the flame before it reached the piston of the indicator in bomb C as compared with A, the explosion would be in a more advanced phase of its development, and this would be most marked in the case of the fastest burning mixtures. Berthelot and Vieille assumed that in the above experiments completion of the combustion synchronized with the attainment of maximum pressure, and attributed the marked disparity between the observed pressures (bomb C) and those calculated from the heats of combustion (on the assumption of adiabatic conditions) to a rapid increase in the specific heats of steam and carbon dioxide at high temperatures. They considered it improbable that dissociation phenomena play any conspicuous part in limiting the pressures attained.

Mallard and Le Chatelier, who used a Bourdon gauge for measuring pressures, and applied a "cooling correction" to their results, arrived at practically the same conclusions as Berthelot and Vieille respecting both the increase of the specific heats of steam and carbon dioxide with temperature and the small if not negligible influence of dissociation. They calculated that the temperature of the flame when moist electrolytic gas is exploded in a closed vessel at atmospheric pressure is about 3350°, and that the mean molecular heat of steam at constant volume between 0° and 3350° is 16.6. In the case of the mixture 2CO+O<sub>2</sub> they concluded that the molecular heat (C<sub>v</sub>) of carbon dioxide rises to 13.6 at 2000°, above which temperature dissociation at once comes into play.

The experience of all subsequent investigators has confirmed that of Bunsen and the French savants, in so far as the facts of the case are concerned. It may be taken as commonly agreed that the maximum effective pressures recorded when gaseous mixtures are fired in closed vessels are always considerably less than those calculated on the assumption that the whole heat of combustion is communicated without loss to the products, and that the specific heats of the products do not vary with temperature. Thus in the case of Mr. Dugald Clerk's experiments, where hydrogen and air mixtures were exploded at atmospheric pressure in a closed cylindrical vessel, 21 cm. in length, 17.75 cm. diameter, and 5.2 litres capacity, the maximum pressures, recorded by a Richards's indicator making a graph on a revolving drum, varied between about 50 and 60 per cent. of those calculated on the above assumptions, as follows :

| Mr. Dugald Clerk's Experiments (1884-5).                       |                                  |      |      |
|----------------------------------------------------------------|----------------------------------|------|------|
|                                                                | Volumes Air to 1 Volume Hydrogen |      |      |
|                                                                | 2½                               | 4    | 6    |
| Maximum pressure found . . . . .                               | 6.44                             | 5.63 | 3.80 |
| Maximum pressure calculated on the above assumptions . . . . . | 13.0                             | 9.45 | 7.0  |

Another feature (since confirmed by many subsequent observers) brought out by Mr. Clerk's experiments was the very short time required for the attainment of maximum pressure relative to the subsequent cooling period. Thus in the case of the mixture of 1 volume hydrogen with 4 volumes air, the maximum pressure of 68 lbs. per square inch above the atmospheric

was attained in 0.026 second, whereas the subsequent cooling period occupied 1.05 seconds, or forty times as long.

The great disparity between the found and "calculated" maximum pressures has been attributed by the various investigators concerned to one or other of the following causes :

1. To the marked increase in the specific heats of steam and carbon dioxide with temperature. That this is a true cause is now generally admitted. As, however, the subject was fully dealt with in the first report of the Committee appointed by the Association in 1907 for the investigation of gaseous explosions, it need not be considered in any detail here.

2. To the fact that in ordinary gaseous explosions, where detonation has not been determined, combustion is by no means instantaneous, and may not be completed within the period required for the attainment of maximum pressure. Mr. Dugald Clerk put forward this suggestion as long ago as 1886 in criticizing the conclusions of Mallard and Le Chatelier respecting the great increase in the specific heats of steam and of carbon dioxide with temperature. He considered it highly probable that combustion extends far into the actual "cooling period" in gaseous explosions (and hence the long drawn out "cooling curve"); so that the system loses a certain part of the heat of combustion before the chemical action is completed. This idea of a continued combustion finds support in H. B. Dixon's photographic researches; and chemists generally will concede its reality in any gaseous combination in which detonation is not determined. But to what extent it may be held to affect the pressures actually recorded by explosions is still a matter of conjecture.

3. To loss of energy by direct radiation. Thus in the explosion of a mixture of hydrogen and oxygen it is conceivable that the initial action results in the formation of an intensely vibrating molecular complex from which steam issues as the first recognizable product. Some experiments made in 1890 by Robert von Helmholtz showed that non-luminous hydrocarbon flames radiate about 5 per cent. of the heat of combustion of the gas, and more recent experiments by Professor Callendar and Mr. Nelson show that the heat radiated from an ordinary non-luminous bunsen flame may amount to between 15 and 20 per cent. of the total heat of combustion, a figure which is in close agreement with the results of experiments carried out by Mr. E. W. Smith under the auspices of the Gas-Heating Research Committee appointed by the Institution of Gas Engineers in conjunction with the University of Leeds. There is, therefore, little doubt but that this cause is truly operative in gaseous explosions.

4. To dissociation of products (steam and carbon dioxide). In the case of two combining gases producing a dissociable product, it is clear that if the average temperature in the system reaches that at which dissociation begins, the combustion must be delayed while heat escapes from the system by radiation and conduction. Qualitatively, the partial dissociation of steam and carbon dioxide has been proved at temperatures which are certainly exceeded by those of explosion flames; but it may be urged that, inasmuch as all experiments upon dissociation have up to the present involved contact with hot solid surfaces, there is no positive evidence that the phenomenon would play any conspicuous part in an unconfined gaseous system. On the other hand, there is direct experimental evidence of the attainment of enormously high temperatures in the explosion wave—temperatures which would generally be considered as far beyond that of the initial, or perhaps even of the complete, dissociation of steam or of carbon dioxide. Moreover, the fact that the rate of explosion of electrolytic gas is retarded rather more by an excess of oxygen than by a corresponding excess of nitrogen, is inconsistent with the supposition of any appreciable dissociation of steam in the explosion wave; and photographic records give no evidence of continued combination in the rear of the wave except where two or more chemical stages are in the combustion.

SECTION IV.—INFLUENCE OF MOISTURE UPON COMBUSTION.

Thirty years ago H. B. Dixon, in repeating Bunsen's experiments on the division of oxygen between carbon monoxide and hydrogen, both present in excess, discovered that a mixture of carbon monoxide and oxygen, dried by long contact with phosphoric anhydride, will not explode when sparked in the usual way in a eudiometer, whereas the presence of a trace of moisture or of any gas containing hydrogen (e.g., methane, ammonia, or hydrogen chloride) at once renders the mixture explosive. These experiments, proving as they did the complexity of what at first sight would appear to be one of the simplest cases of combustion, opened up a new field of scientific investigation.

In 1883, H. B. Baker (working in Dixon's laboratory at Balliol College, Oxford) found that purified charcoal, when heated to redness in carefully dried oxygen, burns with extreme slowness and without flame—yielding principally the monoxide; the proportion of the dioxide formed varying inversely with the degree of dryness of the oxygen. In a further series of experiments he proved that highly purified sulphur or phosphorus may be repeatedly distilled in an apparatus filled with carefully dried oxygen, without any combustion whatever occurring, though the admission of even a trace of moisture at once causes a vivid burning. In subsequent investigations extending over a number of years, Baker has shown that a large number of gaseous interactions are either conditioned or greatly accelerated by the presence of moisture. Thus a dried mixture of hydrogen and chlorine does not explode on exposure to sunlight; dried ammonia and hydrogen chloride are mutually inert; and dried



electrolytic gas, free from hydrocarbon impurity, can be heated to redness without exploding.

The amount of moisture required to bring about such chemical changes as the above, is surprisingly small. E. W. Morley has estimated that the mere passing of a gas through a long column of phosphoric anhydride leaves only 3 milligrams of water vapour in a million litres (or rather less than 4 molecules of steam per 1000 million molecules of gas); and yet a much more prolonged drying is usually required to inhibit chemical action. Such facts as these, even if they do not raise doubts as to the adequacy of the usually accepted kinetic views of chemical processes, at least suggest the necessity of less stringent application of them.

The dependence of the combustion of carbon monoxide upon the presence of water vapour is well illustrated by H. B. Dixon's determination of the rates of explosion for mixtures of carbon monoxide and oxygen in combining proportions containing varying amounts of water vapour. Starting with a "well-dried" mixture, the rate of explosion increases with successive additions of moisture, from 1264 metres to a maximum of 1738 metres per second for mixtures saturated at 35°, any further addition of steam having a decidedly retarding influence, as follows:

Rates of Explosion, at 10° and 760 mm. for a Mixture 2CO + O<sub>2</sub> containing Varying Proportions of Steam.

| Hygroscopic Condition.     | Per Cent. Moisture. | Rate. Metres per Second. |
|----------------------------|---------------------|--------------------------|
| Well dried . . . . .       | —                   | 1264                     |
| Saturated at 10° . . . . . | 1.2                 | 1670                     |
| " 20° . . . . .            | 2.3                 | 1703                     |
| " 28° . . . . .            | 3.7                 | 1713                     |
| " 35° . . . . .            | 5.6                 | 1738                     |
| " 45° . . . . .            | 9.5                 | 1693                     |
| " 55° . . . . .            | 15.5                | 1666                     |
| " 65° . . . . .            | 24.6                | 1526                     |
| " 75° . . . . .            | 38.0                | 1266                     |

Before entering upon a discussion of the theoretical aspects of the matter, certain other facts must be considered, namely:

1. In the detonation of a dried mixture of cyanogen with twice its own volume of oxygen the formation of carbon dioxide is complete. Moreover, under such conditions, it has been proved that carbon monoxide is primarily formed in the wave itself; the second stage of the combustion (namely, 2CO + O<sub>2</sub> = 2CO<sub>2</sub>) taking place in the rear of the wave.

2. A well-dried mixture of carbon monoxide (36 per cent.), ozone (8 per cent.), and oxygen cannot be fired with a powerful electric spark; also, on sparking a well-dried mixture of carbon monoxide (60 per cent.), chlorine peroxide (29 per cent.), and oxygen (11 per cent.), although a flame is propagated through the gases, as much as 76 per cent. of the original carbon monoxide may remain unburnt.

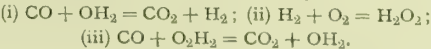
3. Dried carbon monoxide and oxygen completely combine without flame in contact with a heated platinum wire. Moreover, the writer recently proved that the most careful drying possible greatly accelerates the rate at which the gases combine in contact with a hot fire-clay surface at 500°.

4. There are certain well-established instances in which combustion is not determined by the presence of moisture—namely, the combustion of cyanogen, of carbon disulphide, and of hydrocarbons (ethane, ethylene, and acetylene).

Theories respecting the Function of Moisture.

1. H. B. Dixon has consistently maintained that, in the combustion of carbon monoxide, steam merely acts as the carrier of oxygen. He contends that in explosions the formation of carbon dioxide is always limited by its dissociation, and that at the highest temperature (e.g., in the wave-front when the mixture C<sub>2</sub>N<sub>2</sub>+2O<sub>2</sub> is detonated) it is not formed at all by direct interaction of the monoxide and oxygen, because the internal energy which would thereby be imparted momentarily to the newly-born dioxide molecule, would bring about its dissolution. For the same reason flame is not propagated through a dried mixture of carbon monoxide and oxygen. But, if steam be present, the interaction of CO + OH<sub>2</sub> = CO<sub>2</sub> + H<sub>2</sub> would bring molecules of the dioxide into existence with a much less degree of internal agitation, and therefore capable of continued existence, while the hydrogen liberated would immediately combine with oxygen, forming steam, which is less easily dissociated than carbon dioxide. This explanation, while consistent with many of the facts connected with the combustion of carbon monoxide, cannot be extended to other well-known instances, and is particularly inapplicable to the case of hydrogen.

2. Mendelejeff, in his "Principles of Chemistry," ascribed the mutual inertness of carbon monoxide and oxygen to the circumstance that gases combine according to a supposed "law of equal volumes," or, in other words, that from the kinetic standpoint the primary changes in all cases must be considered as involving the collision of two molecules only. In the case of carbon monoxide he postulated the following cycle of changes:



But, according to this supposed "law of equal volumes," a well-dried mixture of carbon monoxide and nitrous oxide, or of carbon monoxide and ozone, should be active, whereas Dixon has proved them to be as non-explosive as a dried mixture of the monoxide and oxygen.

3. H. E. Armstrong has always contended that chemical actions cannot occur between two perfectly pure substances, but require the conjunction of an electrolyte in order to form a closed conducting system. The presence of steam, which he supposes may always be regarded as rendered "conducting" by association with some traces of an electrolyte impurity, provides the necessary conditions for the passage of the current, the oxygen playing the part of depolarizer, thus:



On the other hand, H. B. Dixon has urged that a rate of explosion of nearly 1700 metres per second for a moist mixture of carbon monoxide and oxygen is incompatible with any interaction of the complexity thus postulated. There is doubtless *prima facie* much force in this objection; but it is by no means fatal, seeing that the dimensions of the explosion wave are incomparably greater than molecular units, and the duration of chemical action, though extremely short when measured in terms of ordinary gross units of time, is at least many thousands of times greater than the intervals between successive molecular collisions.\* A more serious objection to Armstrong's theory is the fact that there are well-established cases in which combustion apparently does not depend upon the presence of moisture.

4. In 1893 Sir J. J. Thomson pointed out that if the forces holding the atoms together in a molecule are electrical in character, the presence of drops of any liquid (such as water) of high specific inductive capacity would probably cause a sufficient loosening of the bands between the atoms to render the molecule much more reactive. He showed that the complete drying of a gas renders it non-conductive. H. B. Baker, in his "Wilde Lecture" before the Manchester Literary and Philosophical Society, described a number of new experiments which led him to tentatively put forward the theory that chemical interchanges in gaseous systems depend upon the presence of both "ions" and water vapour. The "ions" act as nuclei for the condensation of steam; and the liquid drops of water so formed, by virtue of their high specific inductive capacity, facilitate chemical change in the layer of gas immediately in contact with them. Chemists will await with the greatest interest the further development of this hypothesis. But the idea that such rapid changes as are met with in gaseous explosions are dependent upon the formation of aggregates of steam molecules in an atmosphere containing less than four of them per 1000 millions, and that such aggregates approximate to liquid drops at the high temperatures of flames, makes large demands upon the imagination; and it will require to be supported by the strongest experimental evidence.

SECTION V.—COMBUSTION OF HYDROCARBONS.

The question of how a hydrocarbon is attacked by oxygen in combustion has been the subject of much controversy during the past twenty years; but it is only quite recently that experimental inquiry has been pushed far enough to justify the advancement of any complete theory of the process.

Throughout the greater part of last century it was accepted as an article of faith among chemists that hydrogen is the more combustible element of a hydrocarbon. Thus, as lately as 1884 H. B. Dixon, in his "Cantor Lectures" on "The Use of Coal Gas," speaking of the combustion of ethylene in its bearing on the luminosity of hydrocarbon flames, said: "This ethylene, when it is raised to a high temperature in contact with air, is decomposed; the hydrogen burning first and the carbon afterwards. There is a race for the oxygen of the air between the two constituents of the ethylene; and the hydrogen, being the fleetest of the two, gets to the oxygen first, and is burnt to water." Eight years later, when it was discovered in Dixon's laboratory that an equimolecular mixture of ethylene and oxygen yields on detonation almost exactly twice its own volume of carbon monoxide and hydrogen, in accordance with the empirical equation:



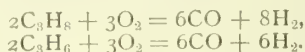
and when also, about the same time, Smithells and Ingle, in their work on the "Structure and Chemistry of Flames," proved the presence of hydrogen in the interconal gases of aerated hydrocarbon flames, the dogma of the preferential combustion of hydrogen became untenable. Attempts were then made to revive an idea originally put forward by Kersten in 1861—namely, that "before any part of the hydrogen is burnt all the carbon is burnt to carbonic oxide, and that the excess of oxygen (if any) divides itself between the carbonic oxide and hydrogen." H. B. Dixon was himself inclined to this view; and Smithells spoke of the "preferential" burning of carbon both in his 1892 paper and in his lecture on "Flame" at the Nottingham meeting of the Association in 1893, although he has since disclaimed any intention of exalting it into a general doctrine.

The idea of a "selective" combustion, whether of carbon or of hydrogen, is, however, so repugnant to well-established principles that it could hardly be expected to meet with general acceptance in any final or complete sense, and there were many

\* As the writer understands Dixon's objection to Armstrong's view, it is that while chemical action in the explosion wave may last a comparatively long time (i.e., during many molecular collisions), and that therefore a quintuple molecular collision might happen in that period, it is impossible for the wave to be propagated as a sound-wave through quintuple collisions. Ordinary sound-waves may be many molecules thick, but they are propagated through bi-molecular collisions.



sceptics as to its validity. Moreover, while in the cases of acetylene and ethylene the assumption of a direct transition from the system  $C_nH_m + \frac{n}{2}O_2 \rightarrow nCO + \frac{m}{2}H_2$  implies a simple transaction from the kinetic standpoint, an extension of the idea to the cases of such hydrocarbons as propane or propylene would obviously raise serious difficulties,



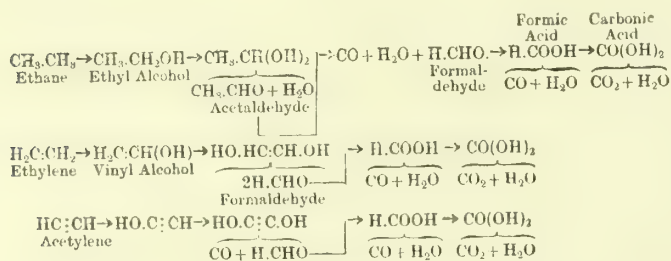
It therefore seemed necessary to consider whether the solution of the problem might not lie in the assumption of an initial association of the hydrocarbon and oxygen forming an unstable "oxygenated" or "hydroxylated" molecule, as suggested by H. E. Armstrong many years ago; and it was with some such possibility in view that the writer undertook the re-investigation of the subject about ten years ago.

Previous workers had confined their attention to combustion at such high temperatures as prevail in hydrocarbon flames and the explosion wave—conditions highly unfavourable to the detection or isolation of unstable intermediate "oxygenated" products, if such are really formed. It was therefore decided first of all to make a systematic study of hydrocarbon combustion at temperatures below the ignition points of the mixtures used, where the rate of oxidation would be much slower and more controllable, and the intermediate products more stable. The hydrocarbons selected for investigation were methane, ethane, ethylene, and acetylene; and at the outset of the work it was fortunately discovered that all four gases combine with oxygen at temperatures much below those at which either hydrogen or carbon monoxide begin to be oxidized with any appreciable velocity, or at which either carbon reduces steam or the reversible reaction  $CO + OH_2 = CO_2 + H_2$  could have any influence whatever upon the result. Conditions were thus established which precluded the interference of secondary processes with the main line of change.

The first experimental method consisted in maintaining mixtures of each hydrocarbon with varying proportions of oxygen, sealed up in borosilicate glass bulbs of about 60 c.c. capacity, at known constant temperatures between 250° and 350°, for definite periods of time. Subsequently an apparatus was devised in which large volumes of the reacting mixtures could be circulated at a uniform speed in a closed system comprising (1) a surface of porous porcelain maintained at a constant temperature in a combustion furnace, (2) suitable cooling and washing arrangements for the removal of condensable or soluble intermediate products, (3) a mercurial manometer for recording pressures.

By means of these two experimental methods it was proved, as regards slow combustion—(1) that a hydrocarbon is ultimately burnt to a mixture of steam and oxides of carbon without any separation of carbon or liberation of hydrogen at any stage of the process; (2) that the oxidation is marked by a very large intermediate formation of aldehydic products; (3) that the fastest rates of oxidation are (in the cases of the four hydrocarbons examined) always obtained with a ratio of hydrocarbon to oxygen between 2 : 1 and 1 : 1 (an excess of oxygen above the equimolecular ratio always having a marked retarding influence); (4) that a large proportion of carbon dioxide is often found in the products under conditions which preclude all possibility of its formation either by the direct oxidation of the monoxide or by the interaction of the monoxide with steam.

Finally, the balance of evidence was so overwhelmingly in favour of the supposition that combustion had proceeded by successive stages of "hydroxylation" that the following schemes were put forward for the typical hydrocarbons ethane, ethylene, and acetylene:



In other words, the attack of the oxygen upon the hydrocarbon may be supposed to involve a series of successive "hydroxylations"—the hydroxylated molecules either breaking down or else undergoing further oxidation, according to their relative stabilities and affinities for oxygen at the particular temperature, substantially as represented by the above schemes.

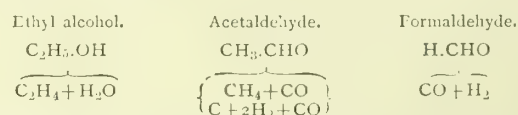
It should be mentioned, however, that while in many of the "circulation" experiments a very large proportion of the intermediate aldehydic products were successfully removed from the sphere of action before undergoing further oxidation—e.g., as much as 92 per cent. of the formaldehyde indicated at the third stage of the ethane scheme, and 45 per cent. of that required at the second stage of the ethylene scheme—in none of the experiments was it found possible to detect or isolate any of the monohydroxy derivatives which are, *ex hypothesi*, initially formed. This was perhaps hardly to be expected in the cases of ethylene or acetylene, where the monohydroxy derivative would be extremely

unstable. In the case of ethylene, however, acetaldehyde (which is known to be readily formed by molecular rearrangement from vinyl alcohol) was isolated in certain experiments. But failure to detect the formation of ethyl alcohol during the slow oxidation of ethane did at first sight seem a serious obstacle to the acceptance of the "hydroxylation" theory. This difficulty was, however, largely removed when it was subsequently found that ethyl alcohol is oxidized at a much faster rate than is ethane under like conditions—a circumstance which seems to warrant the view that the effect of the initial "hydroxylation" of the hydrocarbon is to render the molecule much more susceptible to further attack. Finally, when Drugman, working in the writer's laboratory, obtained direct proof of the large formation of ethyl alcohol as the result of the interaction of ethane and ozone at 100°, the difficulty referred to entirely disappeared. Moreover there is strong indirect proof of the initial formation of monohydroxy derivatives during slow combustion in the fact that whereas the rates of oxidation observed with mixtures containing two molecules of hydrocarbon to one molecule of oxygen were hardly, if at all, inferior to those observed with equimolecular mixtures, the process was always much retarded by any further addition of oxygen beyond the equimolecular ratio. It may also be urged that the hydroxylation theory readily explains the large formation of carbon dioxide in the bulb experiments under conditions which would entirely preclude the idea of its formation by the direct oxidation of the monoxide or as the result of interaction of the monoxide with steam.

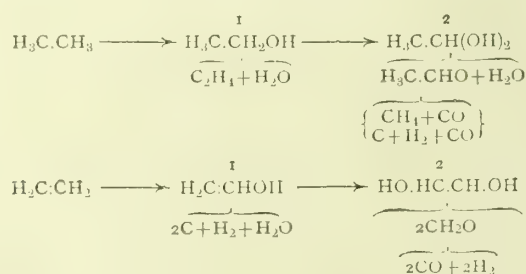
The next step in the inquiry was to ascertain whether the presence of moisture is essential to hydrocarbon combustion. A series of careful experiments on mixtures of the three typical hydrocarbons respectively with oxygen in equimolecular proportions thoroughly dried by long contact with redistilled phosphoric anhydride, under conditions which (as was proved) inhibited the formation of steam from electrolytic gas, gave wholly negative results. If anything, combustion occurred rather more readily with the dried gases than in the case of the corresponding experiments with undried mixtures. Therefore, while the conclusion finally advanced concerning the mechanism of hydrocarbon combustion agrees with the view originally put forward by H. E. Armstrong, in so far as the nature of the intermediate products is concerned, it differs from his in supposing that the oxygen is directly active.

With the extension of the investigation to hydrocarbon flames and explosions, including "detonation" and explosions under high initial pressures, it became increasingly evident that the mechanism of combustion is essentially the same above as below the ignition point, in so far as the result of the initial molecular encounters between hydrocarbon and oxygen is concerned. At the higher temperatures of flames, secondary thermal decompositions undoubtedly come into operation at an earlier stage than in slow combustion; but they do not precede the onslaught of the oxygen on the hydrocarbon, as was formerly supposed, but arise in consequence of it.

In considering explosive combustion, therefore, it is necessary to take into account the possible modes of decomposition of the hydroxy derivatives formed in the first two stages of slow combustion, because these derivatives are so manifestly unstable at the high temperatures of flames that they would at once break down into simpler products. Ethyl alcohol, it is known, decomposes into ethylene and steam; acetaldehyde, into methane and carbon monoxide, or into carbon, hydrogen, methane, and carbon monoxide, according to the temperature; formaldehyde is resolved into carbon monoxide and hydrogen without the slightest separation of carbon. Thus:



Therefore taking as examples the typical cases of ethane and ethylene, the scheme for explosive combustion becomes



with the proviso that, in a sufficient supply of oxygen, the transition from the hydrocarbon to the dihydroxy stage is so rapid that no breaking-down of the molecular structure occurs in passing through the monohydroxy stage. When, however, the supply of oxygen is reduced below the equimolecular proportion, it is evident that the initial monohydroxy product cannot all be further oxidized to the dihydroxy stage. Some of it must, therefore, decompose—yielding, usually, steam as one product. It will be immediately perceived that the above theory affords a complete explanation of the well-known fact that either ethylene or acetylene on explosion with its own volume of oxygen yields carbon monoxide



and hydrogen, without any separation of carbon or steam formation, because in each case the principal intermediate product is formaldehyde, a substance which decomposes straight into carbon monoxide and hydrogen at high temperatures.

There are, moreover, two groups of facts relating to explosive combustion which, while they completely subvert the notion of a preferential combustion of carbon, harmonize very well with the new view of "hydroxylation." They are, briefly, as follows: (1) That whereas mixtures of olefines and oxygen corresponding

to  $C_n H_{2n} + \frac{n}{2} O_2$  behave on explosion like ethylene, inasmuch as they yield mainly carbon monoxide and hydrogen without any separation of carbon, similar mixtures of paraffins and oxygen—namely,  $C_n H_{2n+2} + \frac{n}{2} O_2$ —yield carbon, oxides of carbon, methane, hydrogen, and steam all in considerable quantities. (2) That, even in the case of an olefine, if the proportion of oxygen be reduced below that indicated by the expression  $C_n H_{2n} + \frac{n}{2} O_2$ , both carbon and steam are prominently formed.

In his presidential address to this section at the Leicester meeting in 1907, Smithells criticized the writer's interpretation of explosive combustion on the ground that "the isolation of an intermediate product under one set of circumstances is in itself no proof that this product is transitorily formed when the reaction is proceeding under another set of circumstances." To this criticism it may be replied: (1) That there is direct experimental proof of the formation of intermediate aldehydic products in hydrocarbon flames and explosions; (2) that notwithstanding the fact that the combustion of hydrocarbons has now been investigated over a range of temperature extending from that of incipient oxidation right up to the extreme conditions prevailing in detonation, no evidence has yet come to hand which warrants the assumption of any discontinuity in the immediate result of the initial encounter between hydrocarbon and oxygen molecules; and (3) that the theory of the intermediate formation of "hydroxylated" or "oxygenated" products furnishes a complete and sufficient explanation of the facts of hydrocarbon combustion as at present known—a requirement which no other alternative theory yet put forward is capable of satisfying. In this connection, the writer is glad to find some support in the recent Presidential Address of H. B. Dixon to the Chemical Society, where, speaking of the detonation of a mixture of equal volume of ethane and oxygen, he says: "The ethane is not burnt wholly to carbon monoxide and hydrogen, but appears to form (as Professor Bone has shown at lower temperatures) acetaldehyde and steam; the acetaldehyde yielding methane and carbon monoxide."

But to return to the consideration of facts: One of the most significant features of the writer's experiments has been the proof afforded of the relatively much greater affinity of hydrocarbons, as compared with that of either hydrogen or carbon monoxide, for oxygen at the high temperatures of flames. Thus when a mixture of acetylene and electrolytic gas corresponding to  $C_2 H_2 + 2 H_2 + O_2$  is exploded, there is absolutely no separation of carbon or formation of steam, and practically the same thing holds good in the case of a mixture of ethylene, hydrogen, and oxygen corresponding to  $C_2 H_4 + H_2 + O_2$ . In each case the hydrocarbon is burnt to (ultimately) carbon monoxide and hydrogen, just as would be the case were no hydrogen originally present in the mixture. Recently the writer in an unpublished research on the division of oxygen between methane and hydrogen, in which mixtures corresponding to  $CH_4 + O_2 + x H_2$  ( $x = 2, 4, 6$ , or 8) have been exploded at high initial pressures, has proved that with  $x = 2$  upwards of 95 per cent. of the oxygen initially reacts with the hydrocarbon, and less than 5 per cent. of it goes to the hydrogen. Moreover, the proportion of the oxygen which goes to the hydrogen has been found to increase according to the second power of  $x$ , a circumstance which suggests that the combustion of hydrogen involves the trimolecular reaction  $2 H_2 + O_2 = 2 H_2 O$ , and not the initial formation of hydrogen peroxide, as some have supposed. A similar series of experiments with mixtures  $CH_4 + O_2 + x CO$  have proved that the affinity of carbon monoxide for oxygen is even less than that of hydrogen, and that the proportion of oxygen going to it increases as approximately the first power of  $x$ .

These observations have an important bearing on the chemistry of flames. Hitherto hydrogen has been considered as one of the most combustible of gases; but in reality it is very much less so than hydrocarbons. Indeed, so overwhelmingly great is the affinity of a hydrocarbon for oxygen, as compared with the affinities of either hydrogen or carbon monoxide or with its own tendency to decompose, that the initial stage of its combustion probably takes precedence of all other chemical phenomena in flames. This is certainly true of the propagation of flame through a homogeneous explosive mixture of hydrocarbon and oxygen. In the special case of a stream of hydrocarbon burning in air, partial decomposition may possibly occur in the innermost regions of the flame, where the supply of oxygen is very limited, before actual combustion begins. But in general, whenever the hydrocarbon and oxygen meet at high temperatures, their mutual affinities will prove superior to any disruptive force which might otherwise break-down the hydrocarbon. It is probably not so much the original hydrocarbon as its hydroxylated molecule that decomposes in ordinary flames. Be this, however, as it may, the experimental evidence does not warrant the view, so often

encountered in scientific literature, that hydrocarbons are resolved into their elements prior to being burnt.

#### SECTION VI.—INFLUENCE OF HOT SURFACES ON COMBUSTION.

It is to the genius of Sir Humphry Davy that we owe the discovery of surface combustion. In his experiments on the ignition points of various gases, he had found (what is now a matter of common knowledge) that the constituents of a combustible mixture will combine with fair velocity at temperatures below the ignition point. This led him to ask the question whether, seeing that the temperatures of flames far exceed those at which solids become incandescent, a metallic wire can be maintained at incandescence by the slow combination of two gases without actual flame. He therefore tried the effect of introducing a warm platinum wire into a jar containing a mixture of coal gas and air rendered non-explosive by an excess of the combustible constituents. The wire immediately became red hot, and remained so until nearly the whole of the oxygen had disappeared. In subsequent experiments, Davy proved that hydrogen is far more susceptible to surface combustion than either ethylene or carbon monoxide; also, that the power of inducing surface combustion is by no means confined to the metals of the platinum group, which, however, exhibit it in an eminent degree.

In 1823 the subject was systematically investigated by Dulong and Thénard, and independently also by Döbereiner, who showed that all solids possess the power of accelerating combustion in varying degrees, according to their specific characters and fineness of division. Two years later William Henry observed that, when a platinum ball is immersed in a mixture of equal volumes of ethylene and electrolytic gas, the hydrogen and oxygen alone combine; no combustion of the hydrocarbon occurring unless the original mixture contains a much larger proportion of oxygen. This important result was confirmed by Graham in 1829.

Several explanations of surface combustion were put forward by these early investigators. Davy himself suggested an electrochemical one. "Supposing," he wrote, "oxygen and hydrogen to be in the relation of negative and positive, it is necessary to effect their combination that their electricities should be brought into equilibrium or discharged. This is done by the electrical spark or flame, which offers a conducting medium for this purpose, or by raising them to a temperature in which they become themselves conductors. Now platinum, palladium, and iridium are bodies very slightly positive with respect to oxygen. . . . They offer to the gases the conducting medium necessary for carrying off and bringing into equilibrium their electricities without any intervening energy, and accumulate the heat produced by this equilibrium." Döbereiner, who discovered that freshly prepared platinum black absorbs oxygen from the air, and that in this "oxygenated" condition it will cause steam to be formed on being plunged into a jar of hydrogen, contended that the metal merely acts as a carrier of oxygen. On the other hand, Fusinieri (1825) maintained that it is the combustible gas (hydrogen) only which is affected by the surface, being condensed and rendered extraordinarily active by association with the surface.

The matter formed the subject of a celebrated controversy between Faraday and De la Rive in 1834-35. De la Rive strongly upheld the view that surface combustion essentially consists of a series of rapidly alternating oxidations and reductions of the catalyzing material. Faraday, whilst not denying that finely divided platinum absorbs oxygen, argued with great force that true surface combustion involves an action quite distinct from that of an oxidized wire or foil upon a combustible gas. The function of the solid is, he contended, to condense both the oxygen and the combustible gas at the surface—thus producing a condition in the surface layer comparable to that of high pressure. After the year 1836, however, interest in the subject waned, and was not revived until quite recently.

It may here be remarked that heated surfaces have undoubtedly a marked influence in accelerating not only combustion but all chemical interchanges in gaseous systems. It is usually considered that the action of the surfaces is merely an accelerating and not a directive one at any particular temperature; and, although this may be generally true, it is not necessarily or universally so. But in regard to combustion, it may be assumed that, in general, the introduction of a hot surface will merely accelerate the process.

In the generation and applications of gaseous fuels, the technologist has to deal not only with combustion, and the interaction of the products of incomplete combustion, but also with decomposition and dissociation phenomena, and contact with hot surfaces accelerates all alike. Thus the influence of hot solids (in the shape of furnace walls and the like) assumes an importance which can hardly be over-estimated.

It will be generally agreed that the best means of elucidating the factors operative in surface combustion lies in determining the rates of combination of different gases with oxygen when the reacting mixtures are brought into contact with various solid surfaces at selected constant temperatures. This has been the line of attack usually adopted in recent investigations. But the method is only capable of yielding results of any value when the temperature selected is low enough to prevent the masking of the effects of surface combustion proper by changes in the main body of the gas which is not in contact with the surface at any given instant.

\* No attempt has been made to discuss in any detail the experimental evidence on which the new theory of hydrocarbon combustion is based.



In interpreting the results of such velocity measurements the following possible factors must be considered—namely (1) the actual rate of combination at the surface, (2) the rates at which the reacting gases respectively diffuse inwards from the outside mixture on to the surface, (3) the rate at which the reaction product is removed from the surface, (4) the rates at which the reacting gases (or either of them) are rendered "active" by the surface, supposing the surface may act in some such manner, (5) changes (if any) in the physical texture of the surface itself.

It is obvious that, since any system in which a gaseous mixture is combining exclusively at the surface of a heated solid must be regarded as heterogeneous, the velocity of reaction will not be governed by its "order," as would probably be the case with a homogeneous system. Nevertheless several recent investigators—notably Bodenstein in his earlier experiments upon the non-explosive combination of electrolytic gas in contact with the walls of a glazed porcelain vessel—by overlooking this obvious consideration, have largely invalidated their conclusions.

Of the factors above enumerated, it is now generally agreed among competent observers that the actual rate of combination at the surface far exceeds either the rates of diffusion of the reacting gases on to the surface or the rates at which they are rendered "active" by the surface. This being so, it follows that the amount of change observed in the system in unit time will not be governed by the actual rate of combination at the surface, but by one or other of the remaining factors, whichever happens to be the slowest in its operation.

Nernst, who has recently advanced a general theory of reactions in heterogeneous systems, based on measurements of the rates of solution of salts in water, or of such substances as magnesia in acids, ignores (in the case of surface combustion) the possible "activation" of the gases by the surface, and contends that the velocity of surface combustion is governed by diffusion factors only. Bodenstein, in an entirely inconclusive series of experiments on the combination of hydrogen and oxygen in contact with platinum at the ordinary temperature, attempted to provide an experimental basis for the above theory; but it has been recently completely disproved by the researches of the writer and his pupils [R. V. Wheeler, G. W. Andrew, A. Forshaw, and H. Hartley], a first instalment only of which has so far been published. The following is a brief *résumé* of the principal results of these researches.

At an early stage of the research it became manifest that, in order to avoid errors inherent in a too restricted view of the phenomena, the action of a considerable variety of surfaces must be studied, including (1) such ordinary non-oxidizable metals as gold, silver, and platinum, (2) oxidizable metal, such as copper and nickel, (3) easily reducible oxides, as well as (4) non-reducible oxides of both basic and acidic character. Although the investigation has revealed certain minor differences between the action of the various surfaces, the results as a whole leave no room for doubt that the catalytic combustion depends primarily upon the condensation or absorption of one or other (and possibly both) of the reacting gases by the surface, whereby they are rendered "active." Any chemical explanation—such, for instance, as the supposition of a rapidly alternating series of oxidations and reductions of the catalyzing surface—is inconsistent with the numerous velocity measurements made during the research. Equally certain is it that the rate of combustion is governed, not by diffusion factors, as Nernst has supposed, but by the rate of "activation" of one of the reacting gases (usually the combustible gas) by the surface.

The catalyzing power of a new surface at a given temperature usually increases up to a steady maximum when successive charges of the reacting gases, mixed in their combining ratios, are circulated over it. After the attainment of this steady condition, the rate of combination is always directly proportional to the pressure, provided that the gases are present in their combining ratios and the product of combustion is rapidly removed from the sphere of action. Where, however, one or other of the reacting gases is present in excess, the rate of combustion is in nearly all cases proportional to the partial presence of the combustible gas (*e.g.*, hydrogen or carbonic oxide), which thus becomes the ruling factor. The behaviour of copper oxide towards mixtures of hydrogen with excess of oxygen, and of nickel oxide towards mixtures of carbon monoxide with excess of oxygen, have so far proved exceptional in this respect; the observed rates in both cases being more nearly proportional to the partial pressure of the oxygen than to that of the combustible gas. In the case of copper oxide there is definite proof of the formation of a condensed film of "active" oxygen at the surface, which actually burns up the hydrogen before it can reach the still more active oxygen chemically combined with the copper.

The catalyzing powers of all the metallic and non-reducible oxide surfaces examined are highly stimulated by previous exposure to the combustible gas, which is undoubtedly rendered "active" by association with the surface. This stimulus is usually very durable; but in most cases it is at once destroyed by a short exposure to oxygen. Although as a general rule oxygen has *per se* no stimulating effect on a catalyzing surface, cases to the contrary have been encountered. But even in these exceptional instances the effect is neither so marked nor so durable as the corresponding effects always observed in respect of the combustible gas.

One notable feature with regard to the catalytic combustion of carbon monoxide over a fireclay surface is the fact that the rate of combustion of a mixture of  $2\text{CO} + \text{O}_2$  at  $500^\circ$  is about doubled

by a thorough drying of the gases; the "reaction constant" increasing from about 0.09 to about 0.20. This remarkable result can hardly be explained on the supposition that, in the case of the undried mixture (saturated at  $18^\circ$ ), steam acts merely as a diluent. It apparently exercises a specific retarding influence out of all proportion to its relative mass.

Of scarcely less interest are some recent results bearing upon the effects of a hot fireclay surface (at  $500^\circ$ ) upon the relative rates of combustion of methane, hydrogen, and carbon monoxide. In the previous section attention was directed to the fact that in ordinary explosive combustion the affinities of methane and other hydrocarbons far exceed those either of hydrogen or of carbon monoxide for oxygen. In contact with a hot surface, however, the order is completely reversed, owing to an apparently selective action of the surface in rendering the combustible gases active. This circumstance is sufficient to invalidate the conclusions of certain earlier investigators, notably those of Landolt, concerning the relative combustibilities of various gases, owing to their having sucked off the products of partial combustion from the inner regions of coal-gas flames through platinum tubes and the like. It may be taken for granted that the introduction of a hot solid into a mixture of burning gases is in itself sufficient to upset the regular conditions of explosive combustion.

The conclusions drawn by Bone and Wheeler as to the catalytic combustion of hydrogen derive collateral support from the recent researches of Sabatier and Senderens on the remarkable powers of many metallic surfaces (and especially nickel) of rendering this gas "active" at comparatively low temperatures. In illustration of their results may be quoted the following remarkable instances of direct "hydrogenations" effected by merely passing a mixture of the substance in question with hydrogen over finely divided and freshly reduced nickel. In this way olefinic hydrocarbons are convertible into the corresponding paraffins at  $160^\circ$ ; benzene yields cyclo-hexane; nitro-benzene may be reduced to aniline; while nitro-methane is convertible into methylamine at  $150^\circ$  to  $180^\circ$ , and into methane and ammonia at  $350^\circ$ . Finally, a mixture of carbon monoxide (1 volume) and hydrogen (3 volumes) may be completely transformed into methane and steam at  $250^\circ$ .

In the present imperfect state of our knowledge, any suggestion which may be put forward as to the action of hot surfaces in rendering such gases as hydrogen or carbon monoxide "active" must be considered as quite tentative. Several facts, however, point to a possible connection between surface combustion and the emission of charged particles by hot solids. In 1903, H. A. Wilson discovered that hydrogen has an enormous influence upon the negative leakage from a clean platinum wire at high temperatures. Thus at  $135^\circ$  for a given potential difference, the leakage in hydrogen at 0.014 mm. pressure was found to be no less than 25,000 times greater than in air. It was also proportional to the pressure and depended upon the hydrogen actually occluded by the metal. These observations have since been confirmed by O. W. Richardson, who, however, finds that the leakage consists of two parts, one proportional to the pressure (due to ionization by collisions), the other quite independent of it. He takes the view that hydrogen does not act *per se*, but only indirectly by producing some change in the surface of the metal. Sir J. J. Thomson has found that the rate of emission of negative corpuscles by alkali metals at ordinary temperatures is greatly increased while they are absorbing hydrogen. F. Horton has proved that the negative leakage from hot lime is much greater in hydrogen than in air. With regard to the catalytic combustion of hydrogen in contact with metallic surfaces P. J. Kirkby, when experimenting upon the effects of electrically heating a platinum wire to *circa*  $275^\circ$  in electrolytic gas at pressures under 40 mm., concluded that it is "probably connected with the corpuscular discharge which is known to be emitted by platinum." Finally, it has recently been proved in the writer's laboratory that gold gauze immediately acquires a negative charge on its inducing the surface combustion of either hydrogen or carbon monoxide.

All these facts point to the necessity of a systematic investigation of the electrical condition of heated surfaces during catalytic combustions as a preliminary to a better understanding of the phenomenon.

### Reinforced Concrete for Engineering Structures.

We have received from the Council of the Institution of Civil Engineers a copy of the preliminary report upon the inquiry undertaken by the Institution into the conditions of the employment of reinforced concrete in engineering structures. It deals entirely with facts and information relating to experience with this material up to the present time; the Committee charged with the inquiry being now engaged upon tests and investigations with a view to enlarge the knowledge which has been already gained, and to formulate views by engineers bearing upon the employment of reinforced concrete. The contents include a "Summary of Various Systems of Reinforced Concrete," "Experimental Data in regard to Beams and Columns," and "Experimental Data bearing upon the Properties of Materials Employed in Reinforced Concrete," by Mr. E. W. Hollingworth; a "Summary of Rules for the Use of Reinforced Concrete in Various Countries," by Mr. C. F. Marsh; a full report of the evidence and information given on special points of the Committee's inquiry; and reports on works executed. Following these matters are a useful bibliography and an index.



# THE DOHERTY PROCESS FOR TREATING COMBUSTIBLE GASES.

Rather more than twelve months ago, letters patent for the United States were granted to Mr. H. L. Doherty, of New York, for a process for treating combustible gases. The invention, as set forth in the opening words of the specification, "consists of a method of treating combustible gases (such as blast-furnace gases and what is known as Mond gas), containing an appreciable amount of carbon dioxide, by preheating the gas to a temperature sufficient to supply the heat required for the dissociation of the carbon dioxide, or to a temperature as near to such temperature as is practicable, and then passing the preheated gas through the fuel bed of a down-draught producer, whereby the contained carbon dioxide is reduced to carbon monoxide, with the production of a gas nearly free from carbon dioxide, and which is particularly suitable for use in gas-engine and high-temperature work." Mr. Doherty has applied for an English patent (No. 7786 of the present year); but the specification has not yet been issued. The following particulars of the invention are therefore taken from the American publication.

As is well known, the presence of any large amount of carbon dioxide in a combustible gas reduces, to a very appreciable extent, the flame temperature obtainable in the combustion of that gas. This is due to the fact that part of the heat developed must go to raising the temperature of the inert and useless carbon dioxide. As the specific heat of carbon dioxide per unit volume is high, this means that the heat available for raising the temperature of the necessary elements of the combustion is materially reduced. Besides, carbon dioxide has a specific retarding action on the combustion itself; rendering it slow, and producing a slow-burning diffused flame of large volume, instead of the concentrated intense flame produced by a rich gas free from carbon dioxide when burnt by an adequate supply of air.

When a furnace gas is burnt to generate steam, in the manner in which it is generally utilized, the carbon dioxide, which is always present, has the effect of decidedly reducing the efficiency of the combustion. As explained above, it acts to render the combustion sluggish and diffused. The result is that the gases come into contact with the comparatively cool tubes of the boiler before the gas has been thoroughly burnt; and their temperature is in this way quickly reduced below that necessary to maintain combustion. The result is that the flue gases generally show a considerable amount of unburnt carbon monoxide. In the case of so-called Mond gas, which is a gas made by the use of a large amount of water in the producer, the effects of its carbon dioxide are similar, though the high content of hydrogen renders them less noticeable.

The average composition of an iron blast-furnace gas is about as follows: Carbon monoxide, 23 per cent.; carbon dioxide, 12 per cent.; methane, 2 per cent.; hydrogen, 2 per cent.; water vapour, 3 per cent.; nitrogen, 58 per cent. Mond gas has an average composition as follows: Carbon monoxide, 16 per cent.; carbon dioxide, 12.4 per cent.; methane, 2.2 per cent.; hydrogen, 24 per cent.; nitrogen, 45.4 per cent. The analysis given of the Mond gas is for the cooled gas, which is therefore comparatively free from water vapour. Since this gas is invariably cooled before leaving the producer apparatus for the purpose of recovering the ammonia which it carries, while the blast-furnace gas, when used to fire boilers, is always used hot, the comparison of cold Mond gas with hot blast-furnace gas is a perfectly fair one.

From the facts mentioned above, we can see that the efficiency of the utilization of these gases could be greatly improved by even the simple removal of the high proportion of carbon dioxide. By this invention, however, instead of removing the carbon dioxide, it is decomposed in contact with carbon at a high temperature, forming two molecules of carbon monoxide for every molecule of carbon dioxide; thus actually enriching the gas, and at the same time appreciably increasing its volume, as well as eliminating the carbon dioxide to a large extent.

In the accompanying illustrations, fig. 1 is a section of an apparatus suitable for applying the invention, taken on a plane through the lines A B of fig. 5, A<sup>1</sup> B<sup>1</sup> of fig. 3, and A<sup>11</sup> B<sup>11</sup> of fig. 4. Fig. 2 is a section through a recuperator, which is functionally connected with the gas-producer proper, taken on a plane through the line C D of fig. 5. Fig. 3 is a cross-section through the superheater on the line E F of fig. 5 and E<sup>1</sup> F<sup>1</sup> of fig. 1. Fig. 4 is a cross-section through the recuperator, which is functionally connected with the enriching producer, on a plane through the line G H of fig. 5 and G<sup>1</sup> H<sup>1</sup> of fig. 1. Fig. 5 is a diagrammatic plan of the entire apparatus.

The method of operation is as follows: Air enters the bottom flues of the recuperator A (fig. 5) through the dampers B, which regulate the volume and distribution of the air. Passing through the air-flues of the recuperator, the air comes into contact with a layer of water, which is maintained in the necessary number of flues to ensure proper saturation of the current. The hot gas from the producer passes through the gas-flues, enveloping the air-flues; its direction of flow being parallel, but opposite in direction, to the current of air. The greater part of the sensible heat which the gas carries out of the producer is thus returned to the latter in the heated air and water vapour. The hot air water vapour current, after leaving the recuperator, is introduced, in the usual type, into the lower part of the gas producer C,

through the pipe D. Passing upwards through the fuel bed in the producer, the oxygen and part of the water of the air current react with the fuel therein and form Mond gas in the ordinary way. This gas passes off from the producer through the pipe E, and thence through the gas-flues of the recuperator.

The air-flues F in the recuperator consist of a number of horizontal sections joined alternately front and back with the adjacent flues above and below, so as to form a continuous return-bend flue. As shown in fig. 2, the recuperator has three such flues; but it is obvious that the number may be either increased or diminished without departing from the principle involved. The air-flues are located in, and enveloped by, three larger parallel flues G. These flues consist of horizontal sections joined alternately front and back, so as to form continuous return-bend

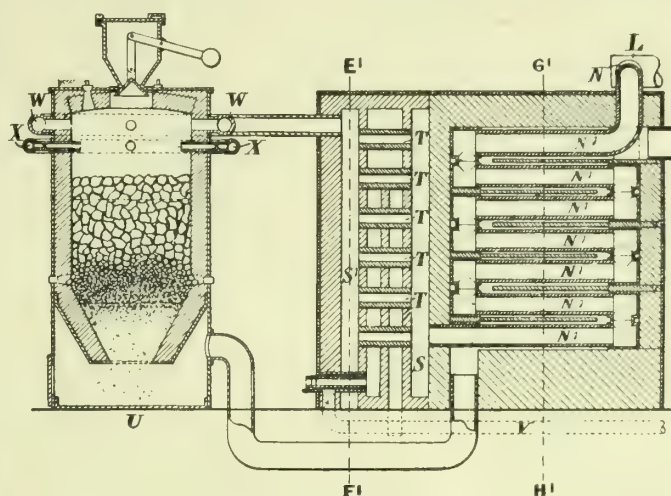


Fig. 1.

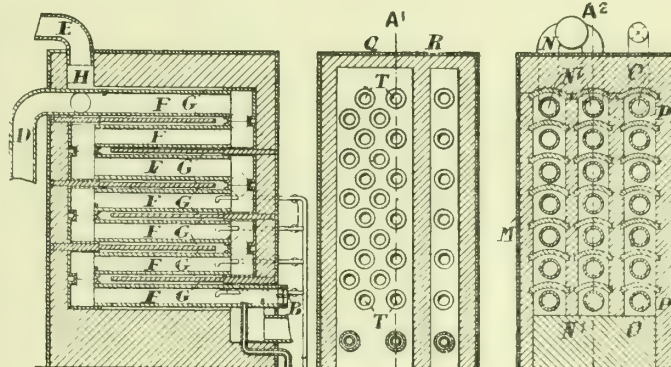


Fig. 2.



Fig. 3.

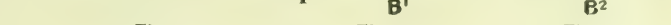


Fig. 4.

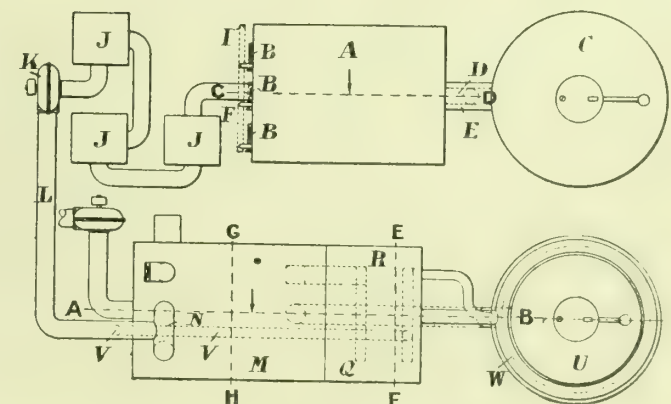


Fig. 5.

flues. The hot gas from the producer enters the recuperator through the pipe E, and is distributed to the flues G by the cross flue H. The hot gas passes through the flues G, and gives up most of its sensible heat to the air passing through the flues F. The air enters the recuperator through dampers shown, passes through the flues F of the recuperator, and thence to the producer. The recuperator has a water-supply pipe I, with connections, into the lower sections of the flues F. Valves control the flow of water to the air-flues.

In order to maintain as high a temperature differential as possible between the air and gas currents, it is desirable to secure the evaporation of the water as low down in the recuperator as



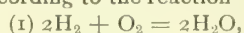
possible. For this reason the patentee introduces the water to the air-flues at such a point that the air passing through the flues is loaded with the proper quantity of water. All the water evaporated in each flue is preferably run into the uppermost water-pan in use, and the pans below are supplied by the overflow from this. Dams in the flues, having water connections, ensure the maintenance of a shallow layer of water in the flues, and thus form water-pans of the bottom of the sections. If the amount of evaporation is lower than is required, water is admitted to a section higher up in the recuperator. Drain pipes are provided to carry away any excess of water from the lower flues.

The cooled Mond gas leaving the recuperator passes to the ordinary scrubbing towers J, where the ammonia is removed from the gas. These towers do not necessarily differ from those at present in use. From the last tower the gas is withdrawn by the exhauster K, and forced through the pipe L to the recuperator M. This is in reality two separate recuperators, one for air and the other for gas, built side by side, within the same shell. The section shown in fig. 1 is through one of the gas-flues; but the construction is identical on the air side. N (fig. 4) is a cross connection between the two gas-flues N<sup>1</sup>, so that the gas flowing through N is divided between the flues M, which are made up of horizontal sections, each connected alternately, front and back, with the vertically adjacent flues, in order to form continuous return-bend flues. Enveloping these flues are return bend flues for the enriched gas. The latter flues are formed by introducing staggered, horizontal baffle walls in the recuperator, so as to make the gaseous current passing through the return bend flues take a path parallel, but in the opposite direction, to the current passing through N<sup>1</sup>. O is the air-flue, while P is the enveloping gas-flue.

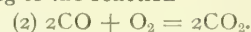
When the gas to be treated contains only such a proportion of carbon dioxide that the preliminary superheating of the gas is sufficient to furnish the heat requisite for the dissociation of the carbon dioxide, the addition of air to the gas is omitted. In this case the secondary air recuperator as well as the superheater are omitted.

The cold Mond gas and air passing through the recuperator go next to their respective superheaters Q R (fig. 5). These are built within the same shell, but are so arranged that there is no communication between the gas and air sides. On passing from the recuperator, the gas enters a flue extending across the full interior width of the superheater, establishing communication with the small flues shown. They are simply fire-clay flues, of small interior diameter, piercing the walls of the superheater, and also the baffle wall, and establishing communication between S and the similar flue S<sup>1</sup>. The gas entering S passes through the flues T into the flue S<sup>1</sup>, thence out through the pipe shown to the gas-pipe of the enriching producer. The air passes in similar manner through the flues of the air superheater to the air-pipe of the producer U (fig. 5). V is a pipe tapped into the pipe L, and diverting a portion of the Mond gas to the burners of the superheaters, which have an air passage with a damper regulating the admission of air. Surrounding the air passage is an annular one for the gas. The air and gas mix and burn on their entrance to the combustion flue; the hot products of combustion passing upward around the flues T, over the baffle wall down through the flues to the hot gas flue of the air recuperator, and thence to the stack. The burners are connected by a cross flue, so that they are all supplied with gas by the pipe V. Gates or dampers control the supply of gas to the burners.

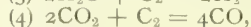
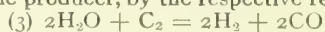
The enriching producer may be of any type suitable for operation with downdraught in the manner hereafter explained. In the apparatus shown, the producer has a metal shell, suitably lined with refractory material, and having a refractory roof or arch to the fuel chamber. Suitable pokeholes are arranged for giving access to the interior of the producer; and a charging device is provided for putting in the fuel. The highly heated Mond gas to be treated (enriched) is introduced into the upper part of the fuel chamber through the pipe W and connections; and the heated air usually necessary to maintain the reaction in the producer is admitted through the pipe X and connections—the inner portions of the latter being of refractory material. The temperature in the fuel chamber being maintained at a high point, a portion of the Mond gas is burnt by the oxygen of the air, with the probable formation of water vapour and carbon monoxide. Owing to the high proportion of hydrogen in the Mond gas, and the high velocity of the reaction between this element and oxygen, it is probable that the oxygen of the air introduced burns principally according to the reaction—



rather than according to the reaction—



Since the products of these combustions are dissociated again in the fuel bed of the producer, by the respective reactions—



the net heat developed is the same in each case, since it is that due to the burning of equal weights of carbon to carbon monoxide. It is therefore a matter of indifference which reaction predominates.

The gases from the upper combustion chamber of the producer, carrying the carbon dioxide introduced with the Mond or blast-furnace gas and the water vapour and carbon dioxide produced

by the combustion in the upper part pass downwards and into the fuel bed, where the highly incandescent carbon reacts with the water vapour and carbon dioxide, according to reactions (3) and (4). In the case of the water vapour and carbon monoxide formed from the partial combustion of the gas; they have, in the combustion itself, furnished enough heat for their subsequent dissociation. Moreover, owing to the fact that the oxygen of the water and half of that of the carbon dioxide burns a portion of the fuel to carbon monoxide, the net result of the combustion of the hydrogen and carbon monoxide and their subsequent dissociation is to liberate an amount of heat equal to that formed by the burning of the weight of carbon with which they react to carbon monoxide. This is the heat which serves to dissociate the carbon dioxide originally present in the untreated gas. Since the carbon dioxide requires theoretically about 1600 B.Th.U. per pound of carbon dioxide so dissociated, and the net amount of heat theoretically liberated in the combustion of the portion of the gas burnt in the upper part of the producer is about 3280 B.Th.U. per pound of oxygen reacting, there is required theoretically to maintain the fuel bed of the enriching producer  $1600 \div 3280 = 0.488$ , or (say)  $\frac{1}{2}$  lb. of oxygen for every pound of carbon dioxide introduced with the gas. This is on the assumption that the air and gas enter the producer at the temperature of the fuel bed therein—say at 1700° to 1800° Fahr. By the preferred method of treatment which the patentee has revealed in his specification, he introduces the gas and air at the highest practicable temperature—say about 2500° Fahr. By this device, at the expense of burning a small quantity of the untreated Mond gas, he supplies to the gaseous currents, previous to their introduction into the producer, about 65 per cent. of the heat necessary for the dissociation of the carbon dioxide of the gas. As a result, he has reduced the theoretical amount of air necessary to maintain the temperature in the producer to that corresponding to  $\frac{1}{2}$  lb. of oxygen per pound of carbon dioxide, or (say) 1 lb. of air per pound of carbon dioxide originally present in the gas. This would correspond to about 0.20 cubic foot of air per cubic foot of Mond gas. In order to meet the various radiation and conduction losses, however, it is necessary in practice to use at least 0.25 cubic foot of air per cubic foot of Mond gas when they are introduced into the producer at the given temperature—i.e., 2500° Fahr. With gases which contain less carbon dioxide than Mond gas of normal composition, the quantity of air used in the enriching producer may be correspondingly lessened. When the carbon dioxide of the gas is comparatively low, it becomes possible to cut out the auxiliary air entirely, and maintain the reactions in the enriching producer entirely by the self-contained heat of the highly superheated gas.

The cooling of the crude gas, after it leaves the producer in which it was made, should, where practicable, be carried on below 212° Fahr., so as to condense and remove from the gas all the steam or water possible. The presence of steam in the gaseous current introduced into the enriching producer is in the highest degree objectionable, and the patentee says it is to be avoided to the greatest possible extent. Using the proportions of air and gas given, the finished gas would have about the following composition: Carbon dioxide, 2.05 per cent.; carbon monoxide, 27.2 per cent.; hydrogen, 19.65 per cent.; methane, 1.8 per cent.; nitrogen, 49.3 per cent. The gas would at the same time be increased in volume by about 20 per cent., and the calorific power per cubic foot by about 10 to 12 per cent.

One of the difficulties heretofore encountered in the enrichment of gases containing carbon dioxide has been that, owing to the necessity of introducing air into or with the gas to maintain the temperature in the fuel bed of the secondary or enriching producer at a reacting temperature, part of the gas was, of necessity, burnt in the lower part of the fuel bed, with the production of a high temperature at the zone where the ratio of ash to fuel is high, and the consequent fusion of the ash formed. In addition, where the heat developed by the combustion of the oxygen of the air admitted to the producer has alone been relied upon to maintain the temperature of the fuel bed, the large amount of nitrogen that must of necessity be introduced with the air results in a treated gas having a calorific value no higher than, if as high as, the original gas.

#### THE PATENTEE'S EXPLANATION OF HIS INVENTION.

The specification ends with the following remarks by the patentee upon the process described.

In my improved method which I have herein revealed and claimed, I make no attempt to accomplish what is in fact impracticable—i.e., the simultaneous introduction into a bed of ignited fuel of a combustible gas containing an appreciable amount of carbon dioxide and the air necessary for the generation of sufficient heat to balance the endothermic reaction which takes place with the carbon dioxide of the combustible gas, without burning part of the combustible constituents of such gas. In my method, it is a matter of indifference whether the heat for maintaining the dissociating reactions is generated by the combustion of part of the gas itself or the carbon of the fuel bed, since the net thermal result is the same in either case. In my method, it is true, I develop as high, or even higher, temperature in the reductor or secondary producer at the point of introduction of the gas and air; but I do so under conditions which cause the local high temperature to facilitate the operation of the producer rather than retard the same. By introducing the gas and air at the upper surface of the fuel bed, the local high temperature developed



becomes an advantage. By this device, the freshly charged fuel is immediately subjected to a temperature which quickly distills off its volatile constituents, which must of necessity pass through the whole depth of the fuel bed. The result is that the tarry vapours are wholly broken-down into permanent gases, which add greatly to the illuminating and calorific power of the gas when a bituminous coal is used in the reductor. It has heretofore been found very difficult to make use of bituminous coal, owing to the difficulties caused by the tarry substances carried in suspension in the gas.

In the proposed methods of treating blast-furnace gas for the reduction of its carbon dioxide, the difficulties mentioned as following on the local high temperature caused by the combustion between the crude gas and the admixed air are not due to the high temperature of itself, but to the local development of such high temperature in the ash zone of the producer. In the unburnt fuel, the mineral matter which constitutes the ash occurs, for the most part, in very small particles, disseminated throughout the carbonaceous matter of the fuel. These particles are not in contact with each other, but are, so to speak, separated or insulated from each other by the surrounding particles of carbonaceous matter. In such a position, it is immaterial to how high a heat they may be subjected, since they are isolated from one another. They may be more or less completely fused without the least danger of them agglomerating together to form clinker or slag. If, then, we introduce the combustible gas containing carbon dioxide, and the air required to thermally balance its reaction with the carbon of the fuel, in contact with the unburnt fuel, instead of in contact with the ash, it is a matter of indifference how high a temperature is produced. The temperature may be as high as it will, and yet not cause sintering or clinkering of the ash. With a sufficient depth of fuel, there is, practically speaking, no danger of the high temperature of the hottest layers of the fuel bed extending to the ash zone of the reductor; for the water vapour or carbon dioxide formed by the combustion mentioned, in its passage through the fuel bed, is again dissociated with the absorption of heat. There is, therefore, progressive diminution of temperature from top to bottom of the fuel bed. The heat developed, due to the reaction of the gas and air, takes place in immediate contact with the part of the fuel bed the potential re-active energy of which is the greatest. The higher the temperature at which the gases come into contact with the fuel, the greater will be the speed and energy of the endothermic reaction taking place in the upper part of the fuel bed. There is thus secured automatic regulation of the working of the reductor or producer; for, as stated, the development of excessive temperature in any part of the fuel bed is immediately checked by the increased dissociation of the endothermically reacting constituent of the gas. On the other hand, if the temperature at any point tends to fall too low, the diminished dissociation of the carbon dioxide at that point lessens the heat abstracted from the fuel bed at that point, and permits it to recover its normal temperature. This self-balancing action of the exothermic and endothermic reactions has a tendency to keep a much greater depth of the fuel bed at a reactive temperature than is the case in ordinary practice. With any given proportion of air and gas and a given rate at which they are passed through the fuel bed, there is thus a tendency to establish a definite temperature and downward temperature graduation in the mass of fuel. By properly regulating the proportion of air to gas, and the velocity at which the current is forced through the fuel bed, it is possible to maintain the temperature conditions in the producer at any desired point.

The high temperature in the upper part of the fuel bed has an incidental advantage which considerably facilitates the operation of the enriching producer or reductor. The result of the high temperature is that the ash particles are fused within their carbonaceous envelope. As the burning fuel sinks through the shaft of the producer, it is becoming continually cooler and cooler, until, by the time the carbonaceous envelope of the ash particles has been burnt away, it has reached a temperature below the fusing-point of the ash. The result is that the ash, instead of consisting of half-fused masses of clinker, is of a decidedly sandy or granular nature, which greatly facilitates its removal from the producer, as well as keeps the ash bed in an open, porous condition. By introducing an efficient recuperator and evaporator between the Mond producer (where the crude gas is Mond gas instead of blast-furnace gas) and the absorption towers, I am able to restore to the Mond producer a much larger proportion of the heat carried out of it by the gas than can be done in the ordinary method of working. Besides, the additional heat recovered enables me to dissociate more water in the producer, with the result of producing a richer gas.

#### SCOPE OF THE INVENTION.

While in the foregoing description I have selected for the purpose of illustrating my invention its specific application to Mond gas, it is evident that the process may be applied to the treatment of any combustible gas containing reducible quantities of carbon dioxide—that is, quantities sufficiently large to permit a useful amount of reduction by contact with hot carbon. Where, as in the case of the treatment of blast-furnace gas, the volume of gas is very large, it is often advisable to use several reductor producers rather than a single one for treating the gas. When this is done, I may either pass the gas through the producers in parallel (to borrow an electrical term) or in series, as may seem most desirable.

A great advantage of my method is that I am enabled to use in the producer bituminous coals instead of coke or anthracite. The high temperature in the upper part of the fuel bed, and the fact that the products of distillation must, of necessity, pass through the whole mass of incandescent fuel, ensure a perfect breaking-down of the hydrocarbon vapours into permanent gases; thus avoiding any trouble due to the tarry vapours that are ordinarily found in the gas when bituminous coals are used. Owing to the fact that I can make use of bituminous coal, I obtain a gas having a much higher illuminating value than ordinary producer gas. Where the gas is to be used for firing furnaces—such as reheating furnaces, for example—this feature of my invention is of very great importance. The hydrocarbons of the coal have a practical enriching value far in excess of the actual increase which they cause in the calorific value of the gas. This is due to the fact that they cause the gas to burn with a flaming effect, which, by increasing the radiant effect of the combustion, greatly increases the quantity of heat that is transmitted to the charge in the furnace.

#### HORIZONTAL RETORT RESULTS AT STUTTGART.

Most of the carbonizing results from German gas-works to which attention has recently been called relate to vertical retorts or large carbonizing chambers; and it is a welcome change to find that one German gas manager at least—Herr Göhrum, of Stuttgart—still has confidence in the value of horizontal retorts. He has published in the "Journal für Gasbeleuchtung" for the 27th ult. the results obtained at the Stuttgart Gas-Works with a new and up-to-date installation of horizontal retorts; and some particulars are worth quoting from his communication for comparison with the data furnished by other German gas-works for carbonizing plants of other types.

The new retort-house at Stuttgart has been equipped since June, 1909, with 22 settings of nine horizontal retorts, 6 metres (19·7 feet) in length, having the producers on one side. The retorts are charged and discharged by De Brouwer machines, and the coke is handled by Illig's apparatus. They are elliptical in cross section, 400 mm. by 600 mm., or (say) 15·7 in. by 23·6 in. because experience has shown that this shape is well adapted for the use of projecting and expelling stoking machines. There are ascension-pipes on the charging side only of the bench; and the hydraulic main is placed about 6 ft. 6 in. above the crowns of the settings, because previous trials have demonstrated that thick tar does not form in it in these conditions. The tar produced is of a thin and freely fluid character. No sagging of the retorts has taken place. They are charged, at intervals of nine hours, with an average charge of 6½ metric tons (128 cwt.). Six-hour charges have been given up because it was found better in respect of avoidance of the formation of scurf, and economy of labour, to adopt full charges and a longer period for working them off. No stop-plate is used at the discharging end of the retort, but a small portion of the previous block of coke is allowed to remain to serve as a stop. The retorts are charged as full as possible, and the charges are completely worked off in the nine hours. The average make of gas per ton of coal, from Dec. 1 to the present time, has been 11,698 cubic feet.

The whole of the coal supplied to the retort-house passes over an automatic weighing-machine, which is checked once a week. The coal used was taken for the most part from store, and some of it had been standing in the open for a year-and-a-half. It consisted chiefly of English coals. The old settings of horizontal retorts, 9 ft. 9 in. long, had afforded a make of less than 10,765 cubic feet per ton, partly owing to their lower heats. The length of the retort does not affect the make of gas when De Brouwer charging-machines are used, provided the speed of the projecting band is regulated accordingly. The gas had an average net calorific power of about 560 B.Th.U. per cubic foot. The amounts of tar and ammonia produced varied with the kind of coal used. The average make per setting per diem (including time spent in scurving) was 155,390 cubic feet, which corresponds to about 164 cubic feet per diem per square foot of ground area covered by the retort-house. The coke consumed in the producers was 13 to 14 per cent. of the weight of coal carbonized, or 24·3 lbs. to 26·8 lbs. per 1000 cubic feet of gas made.

The coke obtained from all kinds of coal is large and firm; and it may be noted that, by the mode of quenching adopted, it reaches the breaking and screening plant in a dry condition. The stoking machinery is overhauled daily by a man who is in charge also of the other electro-motors on the works; and the costs of repairs are very low. The parts requiring most frequent renewal are the head of the ram of the discharging-machine, which lasts rather more than one year, and the band of the charging-machine, the life of which is about half-a-year. The labour required, including mechanics, clinkering, and looking after the coke-conveyor, is seven men for eight settings with eight-hour shifts. The greater labour required in comparison with vertical retorts and chamber settings is, the author says, balanced financially by the lower charges for depreciation and interest and the smaller fuel consumption. He considers that through horizontal retorts, equipped in the manner described, can compete successfully with all modern systems of carbonization so far tried.



CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

High-Pressure Gas Lighting for Textile Mills.

SIR,—I was very much interested in the extracts from Mr. Walton's valuable paper on "High-Pressure Gas Lighting for Textile Mills" in the last number of the "JOURNAL," and enclose a schedule of actual costs of mill lighting by various systems which may be of interest to your readers. These figures were obtained by me for use in a discussion which took place in February, 1908, between the members of the Manchester and District Junior Gas Association and the Manchester District Students' Section of the Institution of Electrical Engineers. The figures relate to cotton-spinning mills in the Oldham district; and they were in every case supplied by the managers or secretaries of the mills concerned. In the cases of electric lighting, the mill engines were indicated when driving with and without the dynamo running. The lamps used were all carbon filament, as at that time the osram

and tantalum lamps, when tried, proved to be too fragile to stand the vibration of a textile factory. The mantle renewals in mill No. 7 (low pressure) were very excessive, and lead one to think that very inferior mantles must have been used. I would just mention that in the case of gas lighting the costs of installations include services from corporation mains, meters (except No. 6), all piping, burners, cocks, &c., as well as compressing plant for the high-pressure installations. Mr. Walton's figures of 598 to 612 hours' lighting per year are very high compared with those given to me, and which, I was informed, were in all these cases carefully recorded.

I should like to express my appreciation of Mr. Walton's paper, as undoubtedly a good deal of ignorance prevails among mill managers and directors respecting the saving (?) they are effecting by the provision of generating plant, &c., for the purpose of electrically lighting their mills. In many cases of which I have personal knowledge, it only requires a few years' experience to convince such gentlemen that they are most efficiently and economically served by incandescent gas lighting, even when used in low-pressure burners.

JAS. TAYLOR, Engineer and Manager.  
Hollinwood Gas-Works, Oldham,  
Sept. 1, 1910.

Cost of Mill Lighting by Electricity, High-Pressure Gas, and Gas at Ordinary Pressure.

|                                                                                                           | ELECTRICITY. |              |             |              | COMPRESSED GAS. |                                        | TEXTILE<br>H.P.<br>LIGHTING<br>SYSTEM.* | GAS AT ORDINARY<br>PRESSURE. |                        |
|-----------------------------------------------------------------------------------------------------------|--------------|--------------|-------------|--------------|-----------------|----------------------------------------|-----------------------------------------|------------------------------|------------------------|
|                                                                                                           | 1.           | 2.           | 3.          | 4.           | 5.              | 6.                                     | —                                       | 7.                           | 8.                     |
| Total initial cost of installation . . .                                                                  | £1,460       | £1,650(b)    | £1,516      | £2,300       | £800            | £610                                   | £300                                    | £432                         | £450(b)                |
| Number of lights and candle power<br>(nominal)                                                            | 900—16 c.p.  | 1100—16 c.p. | 987—16 c.p. | 2000—16 c.p. | 343—150 c.p.    | 206—150 c.p.                           | 800—80 c.p.                             | 400—60 c.p.<br>Incand.       | 446—60 c.p.<br>Incand. |
|                                                                                                           | 4—200 arcs   | ..           | 17—25 c.p.  | ..           | 40—15 c.p.      | 65—90 c.p.<br>19—60 c.p.<br>26—15 c.p. | ..                                      | 50—15<br>Flat-flame          | 36—15<br>Flat-flame    |
| Total nominal candle power . . . . .                                                                      | 15,200       | 17,600       | 16,217      | 32,000       | 52,050          | 38,280                                 | 64,000                                  | 24,750                       | 27,300                 |
| Horse power required for dynamo or gas<br>compressor . . . . .                                            | 90           | 90           | 100         | 160          | 1               | 1                                      | 0.25                                    | ..                           | ..                     |
| Amount of coal per I.H.P. per hour . . .                                                                  | 2 lbs.       | 6 lbs.       | 2 lbs.      | 2 lbs.       | 3 lbs.          | 3 lbs.                                 | 3 lbs.                                  | ..                           | ..                     |
| Hours lighting per year . . . . .                                                                         | 498          | 420          | 498(b)      | 552          | 440             | 440                                    | 460                                     | ..                           | ..                     |
| Average renewals of lamp or mantles per<br>year . . . . .                                                 | 216          | 200          | 288         | 500          | 360             | 432                                    | 800                                     | 1296                         | 792                    |
| COSTS.                                                                                                    | £ s. d.      | £ s. d.      | £ s. d.     | £ s. d.      | £ s. d.         | £ s. d.                                | £ s. d.                                 | £ s. d.                      | £ s. d.                |
| 4½ per cent. interest on capital . . . .                                                                  | 65 14 0      | 74 5 0       | 68 4 4      | 103 10 0     | 36 0 0          | 29 9 0                                 | 13 10 0                                 | 19 8 10                      | 20 5 0                 |
| Depreciation—7½ per cent. on electric,<br>5 per cent. on gas . . . . .                                    | 109 10 0     | 123 15 0     | 113 14 0    | 172 10 0     | 40 0 0          | 30 10 0                                | 15 0 0                                  | 21 12 0                      | 22 10 0                |
| Coal at 12s. per ton . . . . .                                                                            | 24 0 0       | 60 18 0      | 26 13 6     | 47 6 3       | 0 7 3           | 0 7 3                                  | 0 2 0                                   | ..                           | ..                     |
| Renewal of lamps at 9d., or mantles at<br>4d. . . . .                                                     | 8 2 0        | 7 10 0       | 10 16 0     | 18 15 0      | 6 15 0          | 8 2 0                                  | 15 0 0                                  | 24 6 0                       | 14 17 0                |
| Cost of gas, at 2s. 6d. per 1000 cubic<br>feet (including gas used in electrically<br>lit mills). . . . . | 32 12 6      | 9 11 0       | 51 14 6     | 83 3 6       | 139 4 9         | 77 12 6<br>(c) 2 4 0                   | 103 10 0                                | 156 8 0                      | 197 8 6                |
| Total . . . . .                                                                                           | 240 4 6      | 275 19 0     | 271 2 4     | 425 4 9      | 222 7 0         | 148 4 9                                | 147 2 0                                 | 221 14 10                    | 255 0 6                |
|                                                                                                           | d.           | d.           | d.          | d.           | d.              | d.                                     | d.                                      | d.                           | d.                     |
| Cost per candle power per year . . . .                                                                    | 3.793        | 3.763        | 4.012       | 3.189        | 1.025           | 0.929                                  | 0.6                                     | 2.150                        | 2.242                  |

\* I cannot take any responsibility for these figures, as I did not obtain them myself.—J. T.  
(a) Carbons only for arc lamps. (b) These figures are estimated; actual figures not available. (c) Meter-rent charged in this case.

The following figures were supplied regarding mills Nos. 4 and 6, as representing the full costs to them of their lighting, and which are by them debited to their lighting account:—

Electricity, No. 4.

|                                                           |           |
|-----------------------------------------------------------|-----------|
| Previous total . . . . .                                  | £425 4 9  |
| Proportion of running expenses, engines, boilers, &c. . . | 69 6 8    |
| „ „ engine-room wages . . . . .                           | 18 0 0    |
| Depreciation of buildings, £1000 at 2½ per cent. . . .    | 25 0 0    |
| Upkeep of electric plant . . . . .                        | 50 0 0    |
| Total . . . . .                                           | £587 11 5 |
| Total cost per candle power per year . . . . .            | 4.838d.   |

Compressed Gas, No. 6.

|                                                |           |
|------------------------------------------------|-----------|
| Previous total . . . . .                       | £222 7 0  |
| 22 weeks' wages, at 6s. per week . . . . .     | 6 12 0    |
| Total . . . . .                                | £228 19 0 |
| Total cost per candle power per year . . . . . | 1.055d.   |

Street Lighting.

SIR,—The prominence you have given to the victory of the London Gas Companies, in displacing the electric lighting of the finest thoroughfares in London, must give a great impetus to the use of gas for street lighting throughout the kingdom.

It would be interesting if you could follow the matter up by articles showing what is being done in the big provincial cities.

Is it not time for firms in the street-lamp business to wake up a bit? Being anxious to know what lanterns were being used for ordinary pressure inverted lighting, I looked through last week's "JOURNAL," but could get no satisfaction. I did find an adaptable fitting—a make-shift—and (would you believe it) a half-page illustrated advertisement of a flat-flame governor.

Would that the trade were as enterprising and up-to-date as the "JOURNAL."

Sept. 3, 1910. PROVINCIAL.

Falmouth Gas Company's Prosperous Year.—Presiding at the annual meeting of the Falmouth Gas Company last Thursday, Major J. Mead said that the last year had been the most successful in the Company's history. Though they made a reduction of 4d. per 1000 cubic feet in the price of gas, there was very little difference in their financial position; and in face of the introduction of electric light, they had 90 new consumers and an increase of 4 per cent. in the output of gas. A dividend of 6 per cent. was declared, in addition to the interim dividend of 5 per cent., making 11 per cent. for the year.

APPLICATIONS FOR LETTERS PATENT.

- 19,573.—DEMPSTER, R., AND SONS, LTD., and BROADHEAD, J. W., "Gas-purifiers." Aug. 22.
- 19,578.—HELPS, G., "Main-pipes." Aug. 22.
- 19,588.—NAGEL, H., "Gas-lighting apparatus." Aug. 22.
- 19,605.—VINCENT, W. J., "Universal joints." Aug. 22.
- 19,606.—STORER, J., and DE WITT, G. C., "Obtaining perfect incandescence of mantles with a greatly diminished consumption of gas." Aug. 22.
- 19,608.—SMITH, C. H., "Incandescent gas-lamps." Aug. 22.
- 19,617.—HUMPHREY, H. A., "Raising liquids." Aug. 22.
- 19,653.—HALL-BROWN, E., "Gas-producers." Aug. 23.
- 19,671.—GALVAO, M., "Incandescent lamps." Aug. 23.
- 19,697.—CUTLER, S., "Charging vertical retorts." Aug. 23.
- 19,750.—AKT.-GES. BROWN, BOVERI, ET CIE., "Gas-turbines." Aug. 24.
- 19,761.—GILBERT, H. R., "Solvent for carbon." Aug. 24.
- 19,814.—CHALLIS, J., and STEPHENS, K., "Globe-holders." Aug. 25.
- 19,842.—KEITH, J. & G., "Gas-lamps." Aug. 25.
- 19,843.—BRITISH WELDING COMPANY, LTD., and CONSTANTINE, E. G., "Pipe-joints." Aug. 25.
- 19,902.—HOPKINSON, A., "Facing mouths of retorts." Aug. 26.
- 19,908.—WALLIS, W. H., "Gas-stoves." Aug. 26.
- 19,939.—ELY, B., and ROLLASON, A., "Treatment of coke." Aug. 26.



## MISCELLANEOUS NEWS.

### GAS SUPPLY OF PARIS.

#### Second Report of the Gas Company.

The Directors of the Company formed to carry on the gas supply of Paris in association with the Municipality, presented their second report at a meeting of shareholders recently held. It covered the twelve months ended the 31st of December last; and the following are its principal features.

The quantity of gas consumed in the above-named period was 429,241,411 cubic metres, or about 15,152½ million cubic feet; being an increase of 23,106,073 cubic metres, or rather more than 815½ million cubic feet, compared with the year 1908. This was 5.69 per cent. above the consumption that year, which was 4.23 per cent. higher than that in 1907. Of the gas sent out, 192,646,310 cubic metres, or close upon 6800½ million cubic feet, were used in the daytime; being 7.23 per cent. more than in 1908, which was an advance of 5.38 per cent. upon 1907. The revenue from sale of gas amounted to 79,917,411 frs. (£3,196,696), as compared with 75,660,511 frs. (£3,026,420) for the year 1908; being an increase of 4,256,900 frs. (£170,276), or at the rate of 5.63 per cent., compared with an improvement to the extent of 4.54 per cent. in 1908 over 1907. The number of consumers on the books at the close of 1909 was: Ordinary, 345,176; on the free-fittings system, 285,851—total, 631,027. The figures at the corresponding period of the previous year were: Ordinary, 331,275; on the free-fittings system, 276,874—total, 608,149. There was consequently an increase of 13,901, or 4.20 per cent., in the former class, of 8977, or 3.24 per cent., in the latter class, and of 22,878, or 3.76 per cent., in the total, compared with the year 1908.

For the public lighting of the city there were in use on Dec. 31 53,644 gas-burners, compared with 52,960 at the same period in 1908. They were divided as follows: Ordinary, 1244; incandescent, 52,400—being an increase of 698 of the latter and a decrease of 14 of the former. The number of rising pipes, for the supply of tenements, which at the end of 1908 was 53,355, increased in the course of last year to 54,193; the consumers taking their supply from them being 503,488, or 79.9 per cent. of the entire number, and 20,567 more than on Dec. 31, 1908. From the commencement of the Company's operations to the date just named, the mains were extended by 50,740 yards; bringing up the total length to 1,964,970 yards. In the twelve months just closed, 36,080 yards were added; making the total length at the end of the year 2,001,050 yards, or about 1140 miles.

As already mentioned, the revenue from the sale of gas last year amounted to 79,917,411 frs.; and beyond it residuals, meters, fittings, &c., produced 24,072,273 frs.—making together 103,989,684 frs. (£4,159,587). The expenses amounted to 80,076,538 frs. (£3,203,061); so that a sum of 23,913,146 frs. (£956,526) was available for the Municipality, compared with 22,571,067 frs. (£902,843) for 1908. In addition to the expenditure on the manufacture and distribution of gas, the sum of 80,076,538 frs. mentioned above includes interest and sinking-fund charges, taxes, the cost of new works, pensions and accidents, and the remuneration of the Company, amounting to 1,507,895 frs. This sum was brought up from various sources to 1,667,141 frs. (£66,686). Deducting 5 per cent. for the reserve, there was left a balance of 1,583,784 frs. (£63,352). Adding the sum of 182,894 frs. brought forward, there was produced a total of 1,766,678 frs. (£70,667). The Directors proposed a dividend of 5.25 per cent. for the year, which would absorb 1,575,000 frs. (£63,000), and leave 191,678 frs. (£7667) to be carried forward.

At the meeting of the Company last year, the Directors informed the shareholders that it would be necessary to carry out considerable extensions and improvements at the works, and that a series of proposals on the subject had been submitted to the Prefect of the Seine. [These have already been noticed in the "JOURNAL."] Particulars of the work done last year at the various stations, entailing an expenditure of 19,903,605 frs. (£796,144), are given in the report. The new works proposed will involve an outlay of 205,000,000 frs. (£8,200,000); and the Municipality of Paris have sanctioned the raising of a loan of this amount.

Before closing their report, the Directors bear testimony to the zeal and devotion displayed by the employees in all departments of the Company. After the disastrous floods early in the present year, the Prefect of the Seine conveyed to the Directors the congratulations of the Gas Committee of the Municipality, with which he associated himself, on the admirable way in which the *personnel* had discharged their duties.

### HAMBURG GAS UNDERTAKING.

#### Report for the Year 1909.

The "Journal für Gasbeleuchtung" for Aug. 27 gave a summary of the report of the Lighting Committee of the Hamburg Corporation on the working of the gas and electricity undertakings of the city during the year 1909. We take from it the following particulars.

The total consumption of gas amounted to 97,305,200 cubic metres (about 3,436,392,000 cubic feet), which is an increase of 5.65 per cent. on that for the preceding year. The curtailment of public lighting rendered necessary by the disaster to the gasholders at the Grasbrook works on the 7th of December, caused the increase in consumption to be somewhat less than had been anticipated. Of the total output of gas, 30.2 per cent. was provided by the Grasbrook works, 39.9 per cent. by the Barmbeck works, and 29.9 per cent. by the Billwärder works. The Grasbrook accident threw a portion of the normal work of that station on to the Barmbeck works, where the carburetted water-gas plant which is intended to be worked in the daytime only (and merely

to take up fluctuations in consumption) had to be worked day and night at full load for some time after the accident.

Since December, 1905, gas has been sold in Hamburg at the uniform price of 14 pf. per cubic metre (say, 4s. per 1000 cubic feet); and it has ceased to be possible, as formerly, to ascertain the proportions consumed for different purposes. There probably, however (the report states), was only a slight increase in the sale of gas for lighting, owing to the wide adoption of the more economical inverted burner quite as much as to the competition of electricity. The consumption of gas for heating (and especially cooking) purposes has, however, advanced very considerably. The unaccounted-for gas amounted to 2.62 per cent. The burning out of the gasholders at the Grasbrook works was responsible for a loss of about 4,600,000 cubic feet of gas. Coal was bought at lower prices than in 1908, and wholly from England, as the Westphalian supplies proved too dear. Coke fetched rather better prices; but ammonia, coal tar, cyanogen sludge, and spent oxide were all lower, and buyers were scarce even at the reduced prices. Oil gas tar sold, however, for better figures than previously.

More machinery was introduced in the retort-houses, with a resultant saving in the wages account. Some of the horizontal retorts were lengthened. The vertical retorts at Grasbrook worked well, and a high make of gas was obtained from the inclined retorts both there and at Billwärder. The large carbonizing chambers, after reconstruction of their superstructure, worked very satisfactorily. A further series of fourteen beds of these chambers has been under construction at the Grasbrook works, and half were finished in the year. The reconstruction of the works was continued, but delays occurred. The work of clearing the old gasholder of 50,000 cubic metres capacity, which was burnt out with the large new one, preparatory to its reconstruction, was put in hand at once.

The number of gas-meters in use at the close of the year was 128,215, which is an increase of 8.6 per cent. The prepayment meter installations were increased in number from 336 to 1429. With each five-light prepayment meter were supplied a two-burner cocker, one or two pendants, and two or one wall brackets—each with incandescent burners. The gas undertaking, however, requires the requisite service pipes to be provided, or at least to call for very small alteration. The price charged for prepayment meter supplies is 16 pf. per cubic metre (4s. 6d. per 1000 cubic feet) as compared with 14 pf. for ordinary supplies (*vide supra*). The length of distributing mains was extended by 4.4 per cent.; and in streets where the subsoil was bad a considerable length of Mannesmann steel mains, from 2 to 10 inches in diameter, were laid. For public lighting, the number of lanterns with four inverted gas-burners was increased, and they will continue to be introduced in streets where there is much traffic. The number of gas-lamps for public and private street lighting was 26,333, of which about 580 (mostly private property) still have flat-flame burners. A large number of the lamps have more than one incandescent burner. There are also used for public lighting 529 arc lamps, 463 electric glow lamps, and 60 Nernst lamps. The gas undertaking passes all new gas services before they are allowed to be used, and all the larger installations are tested by its officers for soundness.

The report gives no fresh information regarding the cause of the collapse of the tank of the new gasholder of 7,100,000 cubic feet capacity, or as to its reconstruction.

### ZÜRICH GAS UNDERTAKING.

#### Report and Accounts for the Year 1909.

We have received through the courtesy of Herr A. Weiss, the Engineer and Manager, a copy of the report and accounts of the gas undertaking of the Corporation of Zürich for the twelve months ended Nov. 30, 1909. As usual, the report contains an immense mass of detailed information and numerous diagrams relating to the working for the year, from which only the more important particulars of general interest have been abstracted in the following *résumé* of its contents.

The success which has attended the installation of Dessau vertical retorts in the No. II. retort-house of the works at Schlieren has led to the decision to equip the No. I. house with similar plant; but the execution of this project is being postponed because the productive capacity of the existing plant is ample for all present requirements. Owing to the lack of suitable workmen's dwellings in the neighbourhood of the Schlieren works, the Corporation have voted a sum for the erection of eight houses adjoining the works; and they will be built in the ensuing year. The distributing system has been extended in the course of the twelve months by the addition of about 8521 yards of mains. The ten settings of vertical retorts were in use continuously during the year; and the fluctuations in gas consumption were taken up entirely by the inclined retorts. With eight-hour shifts, the average number of men employed on the vertical retorts was 8.3 per diem. In this computation are included the stokers who are engaged charging and discharging the retorts, and in clinkering and charging the producers, and the men employed in clearing ascension-pipes and hydraulic-mains, cleaning and lubricating retort-lids, and keeping the stages, settings, and conveying troughs clean.

The total amount of coal carbonized in the year was 89,916 metric tons (= about 88,495 tons), and of cannel 525½ metric tons; and the total make of gas was 30,709,700 cubic metres (= about 1,084,513,100 cubic feet). The average make of gas per ton of material carbonized was therefore 12,186 cubic feet, which is a slight increase on the make per ton in 1908. Of the total coal used, 41,000 tons were carbonized in the vertical retorts, with an average make of 13,299 cubic feet per ton, as compared with a make of 11,264 cubic feet per ton for the coal (including the 525½ metric tons of cannel) carbonized in the inclined retorts. The calorific power of the mixed gas was tested daily, and averaged for the year 517 B.Th.U. net per cubic foot at 60° Fahr. 30 inches and saturated. A Junkers registering calorimeter was used to control the working, and was found satisfactory, provided



its readings were constantly checked. A Lux gas-balance, which was also used, gave less satisfactory results for control purposes.

The cost of coal (including cannel) delivered into the retort-house was 27s. 8d. per ton, which is a trifle lower than in 1908. The total make of gas (*vide supra*) shows an increase of 6.47 per cent. on that for the preceding year; but since the unaccounted-for gas was slightly less (4.22 per cent., against 4.64 per cent. of the make) than in 1908, the increase in the amount of gas sold to private consumers was 6.66 per cent. This compares with an increase of 10.58 per cent. in 1908. The gas consumed for lighting purposes has fallen from 17.16 per cent. of the make in 1908 to 15.99 per cent. in the past year. The gas sold expressly for heating and cooking purposes is now 59.75 per cent. of the make, against 57.77 per cent. in 1908. Public lighting accounts for 8.32 per cent. of the gas made. In connection with the Gordon-Bennett Balloon Competition on Oct. 1 to 4, about 3,895,300 cubic feet of gas were supplied gratis from the works for filling the balloons. The average consumption of gas per head of the population within the city boundary amounted to 4955 cubic feet, as compared with 4686 cubic feet in 1908, exclusive of gas used for public lighting and unaccounted-for gas. The coke consumed in the retort-furnaces amounted to 14 lbs. per 100 lbs. of coal carbonized with the inclined retort-settings, and to 15 lbs. with the vertical retorts, in which a proportion of water gas was made by the admission of steam. The following tabular statement shows the percentages by weight of the bye-products obtained per 100 parts of coal carbonized, during the last four years. Prior to 1908, the coal was carbonized entirely in inclined retorts.

| Year. | Coke. | Real Ammonia. | Tar. | Thick Tar or Pitch. | Producer Clinker. | Retort Scurf. | Prussian Blue. |
|-------|-------|---------------|------|---------------------|-------------------|---------------|----------------|
| 1909  | 72.95 | 0.2389        | 6.15 | 0.40                | 3.62              | 0.637         | 0.056          |
| 1908  | 72.95 | 0.2279        | 6.04 | 0.31                | 3.41              | 0.071         | 0.067          |
| 1907  | 70.11 | 0.2003        | 6.26 | 0.24                | 4.15              | 0.060         | 0.115          |
| 1906  | 73.37 | 0.1975        | 6.34 | 0.37                | 3.68              | 0.093         | 0.083          |

The prices obtained for liquor, cyanogen sludge, and spent purifying material (chiefly Giulini material—an artificial alkaliized oxide of iron) were lower than during the previous year. The cyanogen sludge produced contained 8.1 per cent. of prussian blue and 5.7 per cent. of ammonia. The cyanogen extracted was equivalent to 0.805 oz. of cyanogen per 1000 cubic feet of gas treated. The naphthalene extracted in the oil-washer was equal to 5.6 oz. per 1000 cubic feet of gas. The gas distributed contained on the average, per 100 cubic feet, 18.8 grains of sulphur, 5.7 grains of cyanogen, and 0.025 grain of ammonia.

The experimental gas-making plant, comprising a setting of two horizontal retorts, was brought into use last year; and the results of investigations made with it have already been published.\* Researches were also made on the carbonizing conditions prevailing in vertical retorts, from which it appeared that the gas evolved probably ascends between the coke and the walls of the retort, and not through the core of coal. More gas appears to be produced (the report says) in the vertical retort, because of the more thorough decomposition of the constituents of the gas; while rather more coke, but certainly not more tar and ammonia, results. The thinness of the tar is probably due to its particles having been subjected to a filtration process in passing through the block of coke. An investigation was made on behalf of a private party as to the effect of adding limestone to the coke used as fuel in gas-producers and working the latter with dry air. The intention was to obtain caustic lime, and an addition of carbonic oxide to the producer gas. But it was found that the temperature of the retort-setting fell off rapidly owing to the depth of the bed of coke being insufficient, when the limestone was present, to furnish enough gas and reduce the carbonic acid to carbonic oxide. The lime also was badly burnt. It is possible that the process might answer in a specially constructed producer and setting, with a deep bed of fuel; for though the limestone would not afford any direct gain in heat, it would serve, like the steam admitted to producers, to secure a more favourable distribution of energy in the furnace and setting. The practical importance, if any, of the process, can, however, only be determined by special investigations; and local conditions in respect of the supply of limestone and the disposal of lime would play an important part.

The number of public lamps in use was 6460, containing 8031 burners. The number of automatic lighting and extinguishing appliances fitted to them was increased by 87—making the total 1550. Only 51 lamps had flat-flame burners. The mantle renewals during the year averaged 7.33 per burner, and the chimney renewals 3.27. The experiment begun the previous year of supplying milk to the men on the works at a price of 10 centimes per litre (= about 1.1d. per quart) was continued; but there was a falling off in the quantity sold. A loss of about £45 was incurred in the sale of milk; and coffee, which was supplied gratis, cost about £35. The accounts show a net profit on the year's working of the undertaking of 1,279,501 frs. (about £51,180).

\* See "JOURNAL," Vol. CVIII., p. 184.

**Abertillery Water Board.**—Representatives of the Risca, Abercarn, Mynyddislwyn, and Abertillery District Councils met at Newport on Wednesday last to appoint officers for the new Abertillery District Water Board, which comes into operation on the 12th prox. Mr. George Jones (Abertillery) was appointed Chairman. The question of selecting Engineers was discussed, but no decision was come to. It was decided to hold monthly meetings at Newport. The Board's proposals involve an expenditure of £250,000.

**Berwick Water Supply Scheme.**—The Local Government Board having issued an ultimatum giving the Berwick Council one month to submit satisfactory proposals for a water supply for the borough; and the month expiring on the 3rd inst., a special meeting of the Council was held last Wednesday. It was agreed by 11 votes to 10 to send to the Local Government Board a sectional scheme prepared for supplying Tweedmouth and Spittal alone, costing £14,200. The Treasurer estimated that this would mean a special rate of 3s. 4d. in the pound. The scheme was severely criticized by the minority, who favour a joint scheme, including Berwick, and costing £20,000.

## AUSTRALIAN GASLIGHT COMPANY.

The Annual General Meeting of this Company was held at the Offices, in Sydney, on the 28th of July—Mr. G. J. COHEN, the Chairman of the Company, presiding.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. They stated therein that the profits for the half year ended the 30th of June, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges (including the transfer from reserves towards meeting the loss resulting from the coal strike) amounted, with the balance brought forward, to £69,745; and they recommended the payment of a dividend for the six months of 9s. per share on the old shares, and in proportion on the new shares, free of income-tax. This would absorb £62,450, and leave a balance of £7295 to be carried forward. The report of the Engineer (Mr. T. J. Bush, M.Inst.C.E.) on the Company's plant was stated to be most satisfactory. The coal strike entailed a loss to the Company of upwards of £70,000, notwithstanding that they had six weeks' supply of coal to work upon. They nevertheless bore the loss without increasing the price of gas. Had this been raised, it would have necessitated a charge of 7s. per 1000 cubic feet being made to the public while the strike lasted, to recover the amount. The Board had to take £40,000 from the reserve fund, in addition to a provision made last half year, in order to pay the usual dividend.

The CHAIRMAN, in moving the adoption of the report, said that when he addressed the shareholders on the last occasion, they were in the throes of a coal strike, more disastrous than any previously experienced in the State. The severity of the strike had not to any great extent been felt by the Company during the half year ending December last; but there were signs—owing to a scarcity of coal and the enormously high price ruling for it—that the Company would be called upon to meet heavy losses. The Board, however, hardly anticipated that these would be as great as eventually proved to be the case. Of course, at such times there were always to be found those who could tell what the Company should have done under such circumstances; but it was easy to be wise after the event. He very much questioned whether any gas company of similar magnitude, situate so near coal-fields, kept such a large stock of coal as they did—six weeks' stock, which completely filled the stores, equal to nearly 25,000 tons, when the strike commenced. It was evident that strikes would occur, he said, no matter what laws were enacted; but with the Arbitration Act and Wages Boards in operation, strikes of such duration as the last ought not to be possible. However, the Board had the satisfaction of knowing that the gas supply did not fail, neither was the price of gas raised. The cost to the Company (over £70,000) was severe; and it was felt by the Board that as the consumers had been so generously treated, the shareholders should not suffer by the loss of dividend in consequence, although to maintain the usual rate it had been found necessary to deplete the reserve fund to the extent of £40,000. Notwithstanding this, a certain amount was set aside last half year, which the Directors hoped would be sufficient to meet the additional expenditure consequent upon the strike.

A great deal had appeared in the local Press of late respecting the price charged to consumers for gas, and the dividends paid to the Company's shareholders. He thought the time chosen for making these charges was inopportune, considering the loss sustained by the Company in their successful endeavours to continue the supply of gas at such a critical period without raising the price, as many companies would have done under similar circumstances. He would say, however, that the Directors had always, when possible, reduced the price of gas—in fact, the price would be lower now but for the continued increase of late years in customs duties, wages of workmen, and price of coal. Some writers had erroneously supposed that the use of carburated water gas had tended to cheapen the cost of manufacture; but this was not so, for it cost more to make than ordinary gas. The plant, however, was very convenient in regulating the sale of coke. The quantity of oil used by the Company per annum was about 1,250,000 gallons. This, of course, took the place of shale, of which they formerly used a large quantity.

With reference to the dividend, notwithstanding that the present rate, 15 per cent., had not been altered for many years, the price of gas to private consumers had been reduced from 8s. 6d. to 4s. per 1000 cubic feet, and the public lights from £8 10s. to £4 per lamp per annum, although the agreements in force at the time contained provision for the payment of a higher rate than was charged. He was at a loss to understand the arguments of some people who did not object to a 10 per cent. dividend, yet were adverse to the Company paying 15 per cent. on £6 paid-up shares issued at a premium of £6, or £12 per share in all—thus practically only returning 7½ per cent.—which had been done for many years. But to the present investor, the rate was still further reduced to about 5 per cent., if based on the market price of the shares to-day. The whole of the Company's capital had practically now been subscribed. Before long, power would have to be sought to increase it; and the Directors would be able to approach the Government, when the time arrived, with every confidence, as the result of the satisfactory way they had carried out their obligations to their customers, who really were the general public.

The increase in the consumption of gas for the half year was nearly 8 per cent. The existing mains in several districts were being taxed to the utmost. To cope with the anticipated output for next winter, it had been found necessary to make arrangements for increasing the plant at the manufacturing stations during the present summer. The Directors were sorry to make a charge for the use of subsidiary meters, but were compelled to do so in the interests of the Company. For instance, in suites of offices containing as many as eighty meters, it was found that the majority of them were not in use, and many that were only used a few pence worth of gas per annum. In this way, more than 3000 meters were out; and it was considered that the time had arrived when they should either be returned to the works, or a small rental charge made for their use, if retained. This regulation did not,



of course, apply to "master" meters—these being supplied as heretofore, free of charge, as all ordinary meters were. "Consumers deposits" was another item that seemed to exercise the minds of some people; but it should be known that this was not a fixture. Amounts were paid in, and refunded daily; so that the balance of receipts and refunds during the year was oftentimes exceedingly small. With few exceptions, the time-limit was two years; and in all cases, interest at the rate of 4 per cent. per annum was allowed.

Referring to the Company's operations during the past half year, he said it was pleasing to note that, notwithstanding the adoption by the city and some of the suburbs of electricity for public lighting, the number of gas-lamps was still very satisfactory—being 11,083, or 57 more than six months ago. The sales of cookers had increased 817—making the total number sold by the Company to date 19,916. It was impossible to say how many had been disposed of by private firms; but the number must be very considerable. The day consumption of gas kept about the same as usual—viz., 46 per cent. of the total deliveries. During the half year the Company laid 29 miles of main and service pipes. The total quantity now laid was 2450 miles. The increase in the number of consumers was 2406—making a total in the books of 92,644. The increase in the number of prepayment meter consumers had not been as large as usual, owing to the inability of the Company to at present extend the system to many of the suburbs; but they hoped shortly to do so.

In concluding his remarks, he acknowledged the special services of the Secretary (Mr. R. J. Lukey), the Engineer (Mr. T. J. Bush), and the other members of the staff during the trying period of the strike, which the Directors fully appreciated.

The motion for the adoption of the report, and the payment of the usual dividend, was seconded by the Deputy-Chairman (Hon. Henry Moses, M.L.C.), and carried unanimously.

There being no opposition, the Chairman declared the retiring Directors and Auditors re-elected.

A hearty and enthusiastic vote of thanks was then passed to the Directors and officers for their services during the past half year, special mention being again made of the strenuous times experienced by the Company in connection with the late disastrous coal strike.

## GAS v. ELECTRICITY AT HASTINGS.

The report for the six months to June 30, which was presented at the half-yearly meeting of the Hastings and St. Leonards Gas Company last Thursday, stated that the Bill to legalize the use of the No. 2 "Metropolitan" argand burner for official testing, mentioned in the last report, duly passed all stages in the House of Lords, though opposed by some of the local authorities. It was further opposed in the House of Commons on second reading, and referred to a Select Committee, who, after eleven days' hearing, unanimously declared the preamble proved. The Bill now awaits a third reading in that House. The accounts duly audited showed a profit balance of £13,063. After writing off £1000 on the old works and plant, the Directors recommended that dividends for the half year be declared at the statutory rates per cent. per annum, less income-tax—namely, £6 10s. on the 5 per cent. converted stock, £5 on the 3½ per cent. converted stock, and £6 1s. on the 5 per cent. additional stock—and that the balance be carried to the next account.

Presiding at the meeting, Dr. G. G. Gray, J.P., the Chairman, drawing attention to the statement in the report that the Bill promoted to legalize the No. 2 "Metropolitan" burner had passed the second reading of the House of Commons, remarked on the opposition that was offered by local authorities, Hastings included. At the end, the opposition, he said, had been reduced to two towns—Hastings and Liverpool. The reason for Liverpool's opposition could be understood. But why had Hastings continued to oppose until the bitter end? In what respect did Hastings differ from all the other forty authorities affected by the Bill? He had come to the conclusion that the majority had decided to oppose either through ignorance or through enmity. They either did it because they did not understand what they were doing, or in order to damage the Gas Company in the interests of the electricity undertaking. The old burner was defective, unscientific, extravagant, and out of date. The new burner was scientific and an improvement. It would reduce the consumption of coal, and thus make for economy, of which saving three-quarters would go to the consumers and one-quarter to the stockholders, or, to put it into figures, the consumers would save £1920, and the stockholders £437. So that, while there would be a benefit to the stockholders sufficient to induce the Gas Company to do all they could to reduce the price of gas, a far higher proportion of the benefit derived went into the pockets of the consumers. In attempting to deprive consumers of this benefit, and in putting the ratepayers to the expense of opposition, it was quite evident that the Corporation had not acted in the interests of the consumers. The ratepayers when they came to understand the expense they had been put to—if they ever did understand it; for it was generally given to them in dribbles at different Council meetings—would, he thought, be of the same opinion, that it had not been in their interests. The question naturally arose: Would the Corporation have gone to all this trouble, and would they have incurred all this expenditure, if they had not—most unfortunately for them, and most unfortunately for the ratepayers—been the owners of the electricity undertaking? The fact that other local authorities not possessing electricity undertakings did not oppose, or, if they did, dropped the opposition when they understood what the Bill really meant, suggested that the Hastings Corporation would not have done otherwise. What other inference was there than that they had opposed in order to prevent the price of gas being reduced, because they feared that such reduction would be detrimental to electric light as handicapping it still more in comparison with gas? In other words, because the Corporation could not produce electricity at a reasonable and paying price, therefore, so far as the Corporation could prevent it, the price of gas would not be reduced. Thus an acting majority in the Council showed its greater wisdom or folly than other towns—not only the forty in the

Bills, but the seventy odd companies, and the seventeen local authorities who already possessed the powers sought. Was there any consumer or ratepayer foolish enough to think that, out of all these towns, the acting majority of the Hastings Council were the only ones that possessed wisdom, and that such wisdom would die with them? It might be a good thing for the town if such wisdom and such actions did. They met after a satisfactory half-year's working. The profit was an increase of £251 on the corresponding period last year. This was not due to increased revenue, but to more economical working. There had actually been a decrease in revenue of £952; but expenditure had decreased by £1202—thus accounting for the £251 increase in profits. Owing to the bad state of the coke trade, there had been a decrease in the receipts for the sale of coke of £395. There had been £1326 less spent on coals.

The report was adopted, and the dividends recommended were declared.

## BARNET DISTRICT GAS AND WATER COMPANY.

### Improved Working Results.—Recent Litigation.

The Half-Yearly Meeting of this Company was held yesterday week at the Holborn Restaurant—Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he thought the shareholders would agree with him in regarding the outcome of the past half-year's business of the undertaking—notwithstanding many difficulties and anxieties—as exhibiting very gratifying progress and prosperity, reflecting great credit on their Engineer (Mr. F. J. Bancroft) and the efficient staff working with him. He would deal first with the gas department. In the gas capital account it would be noted that no expenditure appeared for works; the outlay for the half year (£540) being for new mains, services, and meters. In the revenue account, compared with the corresponding period of last year, they had a very pleasing increase—namely, on private lighting £686, on public lighting £40, on rental of meters £48, and on rental of stoves £51. This made a total gain of £825. The number of consumers had been increased by 262; while 227 additional cookers had been sent out, and 73 boiling-rings. He found on inquiry that during the last two years the Company had been able—by persistent effort—to lay 949 new gas-services. This, he considered, was a satisfactory increase, of which they were now beginning to feel the result; and he looked forward to even a further increase from these new consumers. They were now getting more and more the confidence of the consumers; and the show-room attendants and fitters were kept well at work. During the past half year the Company had fixed nearly 1000 gas appliances for their consumers; the principal result being satisfaction to the customer, who obtained first-class and economical goods giving the best effect for the gas consumed. If the gas in a house furnished a poor light, it was so easy to at once blame the gas company; and some even seemed to think the company took a delight in worrying their best friends—the consumers. He was pleased to say they could fairly meet such cases, in two ways especially: (1) The Local Authority had, as the shareholders were aware, appointed an independent Gas Examiner; and this impartial gentleman had certified the gas to have a considerable margin of illumination in excess of the standard prescribed by Parliament for the Company. (2) The fitters, by cleaning the consumers' appliances or by fixing new fittings, conclusively showed to the customers that they had only to make use of the men and appliances the Company had provided to get their illumination and heating effects at the highest efficiency, and at the same time economically. The gas made during the past six months, as compared with the same half of 1909, exhibited an increase of 2,561,000 cubic feet; while the quantity sold was 3,861,000 cubic feet more. The make of gas per ton of coal had been 12,558 cubic feet, against 11,657 cubic feet the previous year; the sale per ton, 11,677 cubic feet, instead of 10,610 cubic feet. The aggregate receipts from residuals (coke, breeze, tar, and sulphate) for the six months were £3425, as compared with £3437 last year. This amounted to 66 per cent. of the cost of the coal. Turning to the expenditure side of the account, he would point out that during the six months coal cost £5176, or £545 less than in the corresponding period. This saving had been effected first, in consequence of the favourable contract the Company made; and, secondly, as a result of improved working, for it must be noted that the gas made in the six months had been 77,493,000 cubic feet, against 74,932,000 cubic feet last year (an increase of 2,561,000 cubic feet), and the quantity carbonized had been reduced from 6428 tons to 6171 tons, or a saving of 257 tons, notwithstanding the increase in the total make of gas. This, the proprietors would agree with him, was a most satisfactory result, and showed excellent management, and the wisdom of the thorough overhaul and reconstruction of the works that had been carried out. The first result of this greater efficiency of the gas undertaking had been given to the consumers, in the shape of 2d. per 1000 cubic feet reduction in price; and this, he hoped, would induce them to increase their use of gas in the many ways in which it was now adapted to minimize work and increase comfort. Purification had cost £53 more; but he trusted they would be able to economize in this direction, owing to the improved plant now erected. Wages at the works also showed a slight increase of £36; and repairs of works were £463 more. Then the repairs of mains had increased by £467, which had been chiefly expended in taking up old mains and in renewing others. As the result of this work, they saw a decrease in the unaccounted-for gas, which was now 6·01 per cent., compared with 7·49 per cent. last year. The only other item to which he need draw attention was rates and taxes, which now amounted to £1000 per half year over the gas section, or equal to 3d. per 1000 cubic feet sold. The net result of the six months' working showed a profit of £3659, against £3368, or an increase of £291.

Referring now to the water department, he would point out that the receipts from water-rates showed an increase of £955. Empties were



slightly less; and the net result was an increase of £958 for the half year. On the expenditure side of the account, repairs of works had cost £102 less, and repairs to mains £595 less; while pumping charges and engineer's and other salaries grouped together were this year £3305, against £3251 in the corresponding half of 1909. The only item under "Management" to which he need specially refer was that of "Law." Under this head, in the past six months they had spent £890, as compared with £117 last year. This had been in connection with the action brought by the Attorney-General against the Company to prevent the sinking of a new well at Tyttenhanger. It would be remembered that in their last report the Directors were able to state that the judgment of the Court of Appeal had been given in favour of the Company. The case was, however, taken to the House of Lords, and, without calling upon the Company to present their arguments, the appeal was dismissed, and judgment delivered on every point in favour of the Company, with costs. In the words of his valued colleague, Mr. A. F. Phillips, when addressing the shareholders twelve months ago: "The Barnet Board from the first had the clear conviction that under their Act of Parliament they had the right to take water at Tyttenhanger; and as, according to an old proverb, 'he who exercises a right does no one an injustice,' the Board felt that they ought, by every lawful means in their power, to secure the rights they believed Parliament intended they should possess. To this there was no alternative—their rights must be maintained and firmly established." In this connection, it was only just to state that the Engineer gave unremitting attention to this anxious business, and rendered most effective service; and the Secretary, also, was in constant attendance during the appeal, and gave valuable help. In addition to this heavy outlay, a Private Bill was introduced into the House of Lords, entitled the Water Supplies Protection Bill, which proposed, on the one hand, to considerably curtail the powers of water companies, and, on the other, to increase their obligations. In particular, it would have inflicted great hardship on the Barnet Company. The Bill was sent to a Hybrid Committee to take evidence; and the Board presented a statement showing how the measure would injure the Company, and the Engineer gave evidence thereon. Other companies, and also corporations, opposed the Bill; and after a protracted hearing, the Committee's proceedings were—briefly summarized—against the measure further proceeding. Directly the Court of Appeal had given judgment in the Company's favour, the work at Tyttenhanger was resumed; and it was being proceeded with as fast as possible. The main was also being laid to convey the water from the well to the reservoir at Arkley; and the whole of the works would be vigorously pushed forward so that at an early date the water might be available to meet the growing necessities of the Company's large and important water area. Under the head of water capital, there was an expenditure during the half year of £9192, nearly the whole of which had been in connection with the new main from Tyttenhanger already referred to. Some £70 had been spent on new meters, &c., making the total capital expenditure for water for the past six months £9262. The quantity pumped into the district was 301,478,000 gallons.

The total profit for the past half year was £14,088—from gas, £3659; from water, £10,301; and from fittings, £127. From this had to be deducted interest and income-tax, £2252, leaving a net profit of £11,836, which was an increase of £1196 when compared with 1909. The payment of the dividends recommended in the report would absorb £9855; and £1000 was carried to the contingency fund. This left a surplus of £981, which, added to the sum of £18,243 brought forward from last year, left a balance of £19,224 to be carried forward to the new account.

Mr. ALFRED LASS seconded the motion.

Mr. C. P. CROOKENDEN, remarking that the decided improvement in the working of the gas department reflected very great credit on the staff, inquired what was the statutory illuminating power. While admitting that the reduction in price which the Board had seen their way to make was satisfactory, he asked whether any discount was allowed on gas used for cooking and heating. In the case of another company in which he was interested this plan had been adopted, and there had been a marvellous increase in consumption. He believed that a rebate of 6d. per 1000 cubic feet was allowed off gas employed for cooking and heating, and that the result had been to send up the consumption some 50 per cent. With the price of gas as at present, unless some special inducement was offered to consumers, he did not think that at Barnet they would get the increase they should in this direction. Referring to the undivided balance carried forward, he said this was rather large, and a good many shareholders, seeing the amount, asked why they could not have a little higher dividend. He was satisfied that the policy of the Board was a good one; but if they carried less forward, and put more to the contingency fund account, the objection he had pointed out might be obviated.

The CHAIRMAN replied that the prescribed illuminating power was 14 candles. With regard to the balance, the Company were incurring heavy expenditure, and it was therefore undesirable that the amount should be reduced. There would be big claims upon this balance almost immediately, which he hoped would place the business in a very fine position.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. FREDERICK LENNARD, dividends were declared, less income-tax, for the half year, at the rates per annum of 7½ per cent. on the "A" and "C" stocks, 6½ per cent. on the "B" stock, and 5½ per cent. on the "D" capital gas and water stocks.

Mr. A. F. PHILLIPS, in proposing a vote of thanks to the staff, remarked that he knew it was the custom of shareholders to pass such votes as an ordinary routine matter, if the accounts were reasonably satisfactory. The proprietors would, however, have gathered from the statements of the Chairman that a special vote of thanks was due to their officers this half year. They had passed through a most anxious time, and had settled questions which had really been vital to the existence of the Company. Mr. Drew had had an immense amount of information to prepare in connection with the litigation; and to Mr. Bancroft their warmest thanks were due for the very able manner in which he had got together the statistics for the appeal to the House of

Lords, and for the valuable evidence which he had given in connection with the Water Supplies Protection Bill. He felt sure that Mr. Bancroft's evidence on this Bill, coupled with that of their friend Mr. W. B. Bryan, had very materially affected the decision at which the Committee arrived. All this time, too, their Engineer had been deeply occupied with the works at Tyttenhanger. There had been the well, which was now just on the point of completion, and there had also been the preparation of the specifications and plans for the pumping plant, the tenders of which had been accepted that morning. The Directors hoped that when they met the shareholders this time next year, they would be able to report that water was being delivered from Tyttenhanger. For all these special services which had been so ably rendered by the staff, he asked the shareholders to accord them a hearty vote of thanks.

Mr. W. B. BRYAN said no one knew better than he himself did the difficulties which they would all have been placed under had the Water Supplies Protection Bill been passed. It should have been "Private Supplies Protection Bill," not public water supplies, because undoubtedly if the Bill had passed it would have hit all the water authorities simply for the protection of private supplies. The staff must have had an immense amount of trouble, labour, and anxiety; and he was pleased to second the vote.

The motion having been heartily seconded, Mr. DREW, Mr. BANCROFT, and Mr. WRIGHT (the Rental Clerk) returned thanks. Mr. Bancroft remarked that the last two years had been a very anxious time, but particularly so the past six months. He had, however, to acknowledge the great assistance he had received from the Board, and particularly from Mr. Phillips, who had devoted a great deal of time to the business. The well-sinking at Tyttenhanger had gone on most satisfactorily. Messrs. Docwra and Son had laid 8 miles of 20-inch water-main in nine weeks—a performance which reflected great credit on them and on the makers of the pipes. He trusted next year to be able to report that they were pumping water from Tyttenhanger.

The proceedings closed with a vote of thanks to the Chairman and Directors, on the proposition of Mr. SAMUEL SPENCER, seconded by Mr. F. R. SMITH.

## SHREWSBURY GAS COMPANY.

At the Annual Meeting of this Company on Thursday, the Directors reported that the profits on the year's working to the 30th of June amounted to £8300; and they recommended a final dividend of 3½ per cent., making, with the interim dividend, 5½ per cent. for the year. The Chairman (Mr. T. F. Poole), in moving the adoption of the report, referred to the loss the Company had sustained by the death of the Deputy-Chairman (Mr. Henry Wade), who had, he mentioned, served the Company for 35 years—20 as Auditor and 15 as Director—and had been most assiduous in his attention to his duties. With regard to the Company's progress, the Directors had great pleasure in being able to submit another favourable report, the more so as the past year had been one of some difficulty. First, he must point out that the Company's business was still flourishing, and they had that day more customers for both light and heat than at the corresponding time last year, though they had had a reduced consumption of nearly 1½ per cent. This was due entirely to the mild season, and especially to the months of January, February, and March, during which they had very little of the usual frost; and in a residential town like Shrewsbury, the consumption of gas was very sensitive to differences of weather. The other features he wished to mention were a good reduction in the cost of coal, due mainly to better results obtained from the mixture of coal used during the year, and the fact that they had renewed all their retorts and furnaces in the new works. On the other hand, there was the continued increase of taxation, and also they had had to contend with a poor market for residual products. For the coming year, they were having to pay an increased price for coal; and in the apprehension of more friction resulting from the Mines (Eight Hours) Act, they thought it advisable to have as large a stock as they conveniently could. They hoped, however, for some improvement in the residuals market, and by careful management to obtain some reduction in working expenses, which they trusted would enable them to present to the shareholders next year a report as satisfactory as the one now before them. The works and plant had been kept in a thorough state of repair and efficiency. The Chairman concluded by making a few remarks on the Standard Burner Bills. The report was adopted, and the dividend recommended declared. Thanks having been accorded to the Chairman and Directors, Mr. Poole responded, and proposed a similar compliment to Mr. William Belton (the Engineer, Secretary, and Manager) and the staff. Acknowledgment of the vote by Mr. Belton brought the meeting to a close.

**Improved Plant and Increased Gas Consumption at Truro.**—At the meeting of the Truro Gas Company on the 27th ult., the Chairman (Mr. J. James), replying to a vote of thanks accorded to the Directors, said it gave him considerable satisfaction to compare the Company now with what it was fifteen years ago. To-day it would bear inspection by any practical man. Fifteen years ago they were weak; now they were strong. They had faced many difficulties; but they tried for years to improve and strengthen their position. They had now transferred their leasehold into freehold property, and had put their buildings and plant into substantial condition. A great deal was due to their Engineer and Manager (Mr. S. J. Ingram) for the way in which he had carried out his work; and they owed very much to him for the satisfactory position in which the Company was to-day. He proposed a vote of thanks to Mr. Ingram and to the Secretary (Mr. W. H. Sainsbury). This having been accorded, Mr. Ingram, in reply, stated that the Company had 1500 consumers. Their output of gas had increased 2½ million cubic feet during the year, which was more than many of the electric lighting companies in the district had for a total output. Mr. Sainsbury also replied.



GAS AND ELECTRIC LIGHTING AT WEYMOUTH.

Some interesting features of the gas supply of Weymouth were brought before the shareholders of the Gas Company by the Chairman (Mr. J. Geach Rowe), in moving the adoption of the report of the Directors at the recent half-yearly meeting. Mr. Rowe has succeeded to the position filled for about seven years by the late Mr. J. E. Robens, to whose memory he paid a fitting tribute—the deceased gentleman having been connected with the Company from the year 1867 to the time of his death. He then passed to the accounts for the six months ended the 30th of June, showing a disposable profit of £4974; the Directors reporting an increase of 1,272,100 cubic feet, or 2·23 per cent., in the quantity of gas sold in the first half of 1909. The Chairman remarked that it would be of interest to every shareholder, and encouraging to every consumer, when he stated that since the electric light was introduced the output of gas of the Company had gradually increased by the enormous total of 25 million cubic feet. With this continued, it would be the pleasure of the Directors in due time to further develop the scale of their service; and though they had lowered the price of gas from 3s. 6d. to 3s. per 1000 cubic feet during the period with which he was dealing, it might still be anticipated that the future would see further reductions. The extensions of the plant were nearing completion; and when they were finished the Company would be possessed of the most modern and efficient gas-works in the southern district.

The Chairman was followed by Mr. S. J. Fowler, one of the Directors, who also alluded to what the Company had done for the consumers since the introduction of the electric light. He said that in the first two years they took off in price no less than £1658, which was circulated and divided among all the consumers who burnt gas. After that, in 1906, they gave them a further allowance of £883. From 1907 to 1910 they took off another 2d., which brought the total to £3391 for the four years. Therefore from 1904 to 1910, they divided among the consumers the sum of £5932. He thought such a record as the Company had was evidence of the feeling existing between them and the town. They acknowledged the abounding support they had received from the town, and the more they had, the quicker would come the time when they would increase the £5932 bonus, and grant them a still further concession.

The report having been adopted, and a dividend for the half year at the rate of 5 per cent. per annum (less income-tax) declared, a vote of thanks was cordially passed to the Chairman and Directors, also to the Engineer and Manager (Mr. D. F. Colson) and the Secretary and Accountant (Mr. E. Y. Wood), for their services. Mr. Colson, in reply, said it was a pleasure to receive such votes of thanks after the work of each half year; and they appreciated the compliment most thoroughly. He would convey to the staff the shareholders' kind expressions of thanks. Mr. Wood, in acknowledging the vote on behalf of the secretarial staff, said it was very gratifying to know that they had done their best, and that the shareholders appreciated their services.

THE PUBLIC LIGHTING OF HARROGATE.

The Gas Company and the Corporation.

A large portion of the speech of the Chairman of the Harrogate Gas Company (Mr. F. Barber), when moving the adoption of the Directors' report at the half-yearly meeting of shareholders on Monday last week, was devoted to a criticism of the action of the Corporation in regard to the electric lighting contract. The facts connected with this matter were given pretty fully, and commented upon, in the "JOURNAL" for the 24th of May; and therefore it is not necessary to follow Mr. Barber through the details of his speech, which were necessary for the information of the proprietors. A few points may, however be noticed. It will probably be remembered that, acting on the understanding that the Public Lighting Committee had had submitted to them by the Electricity Department of the Corporation a scheme for lighting by electricity the whole of the public lamps then lighted by gas, the Company submitted five alternative schemes for the better lighting of the town by their illuminant, at an inclusive annual cost. They were based on the whole of the public lamps being lighted by gas; and this meant the conversion of 321 electric lamps into gas-lamps. The annual sums for which the Company offered to carry out the schemes were: A, £3686; B, £3737; C, £3937; D, £4020; and E, £4122. Had the offer been accepted, the Corporation would at once have effected an annual saving of £543, £432, £232, £149, or £47, according to the one selected. Scheme A would have saved the town a sum equivalent to a rate of 1d. in the pound. The C, D, and E schemes were never compared with the scheme eventually adopted, because, as the Chairman of the Lighting Committee stated in the Town Council, the B scheme was taken for comparison, "as it presented to them the minimum of the requirements, and would compare with the scheme prepared by the Electrical Engineer." After the Company's B scheme appeared in the Press, it turned out that the Corporation scheme only proposed to replace existing gas-lamps with 69 electric lamps, giving from 45 to 50 candles—the standard of the present upright incandescent gas-lamps—against a minimum light of 65 candles to be provided under the Company's scheme, with an illuminating power for the larger lamps greater than any substituted for the old arc lamps. The meaning conveyed by the Chairman's speech was, said Mr. Barber, in direct contradiction of these facts. He then made a comparison between the Company's B scheme and their Electrical Engineer's "original scheme;" but he did not state what this scheme was. Mr. Barber said that he could not, therefore, check his figures; but he undertook to say this, that if his conclusions as to the comparative cost of gas and electricity were true, he was not paying cost price for his electricity. Having dealt with other figures, Mr. Barber said that in the result the whole of the Company's schemes were rejected; and he thought the Chairman of the Committee reserved till the end of his speech the true reason for their rejection when he said: "The Committee felt a great reason for refusing the Gas Company's

scheme was on account of the certain damage that would be done to the town's electric lighting undertaking, which had been extremely profitable to the ratepayers. He thought he need not labour the argument that if they handed over to the Gas Company the whole of the lighting, which the town had installed at a considerable cost, the Company would naturally use that as a tremendous lever and advertisement, and they would suffer in the private house supply." This he (Mr. Barber) thought gave away the case of the Corporation. All the Company's schemes offered more light than that now to be furnished, with an immediate substantial saving to the ratepayers, and they were rejected in favour of a scheme for less light at a cost of £150 a year on capital and of 1½d. per unit on every unit of electricity used. The Chairman of the Electric Lighting Committee claimed that his undertaking should be supported because out of the profits of it £1745 a year had been applied to a reduction of rates; but he (Mr. Barber) put forward a similar plea on behalf of the Gas Company, on the ground that their annual local rates within the borough amounted to £2069, and there was the prospect of a considerable increase. He protested against the hostile attitude of the Corporation towards the Gas Company, as shown by their decision to ask their Member of Parliament to oppose the Standard Burner Bill. The motive underlying this opposition was clearly, therefore, to prevent perfectly legitimate trade competition upon the part of private gas companies, by binding them to obsolete methods, and so preventing them giving to their consumers the fullest advantages of the modern improvements in the means of illumination by gas.

PUBLIC LIGHTING OF WESTMINSTER.

Reply by Mr. Goodenough to the Secretary of the Electric Lighting Company.

"The Times" last Wednesday contained the following letter by Mr. F. W. Goodenough, the Controller of the Gas Sales Department of the Gaslight and Coke Company, in reply to the statement by Mr. E. W. Seale, the Secretary of the Charing Cross, West End, and City Electricity Supply Company, Limited, given in the "JOURNAL" for the 30th ult. (p. 596).

The statement issued by the Charing Cross, West End, and City Electricity Supply Company respecting the pending displacement of electricity by gas in the West-End needs little comment. The facts speak for themselves. It is because the electric light contracts for the Strand and St. George's districts (as mentioned by those seeking to minimize the victory of gas) "do not expire for some years" that gas is, for the present, only displacing a portion of the arc lamps in Westminster. It has been officially stated that the St. George's electric light contract costs the city £10,000 a year more than would efficient gas lighting.

The tenders which led to the recent victory of gas compared as follows (wide report of Works Committee):—

|                       |                    |
|-----------------------|--------------------|
| Gas . . . . .         | £13,800 per annum. |
| Electricity . . . . . | 21,800 "           |

When tenders were invited for the lighting of Aldwych and Kingsway—a new thoroughfare in which new mains had to be laid by whichever party obtained the contract—the comparison of prices (for equal candle power) was—

|                       |                         |
|-----------------------|-------------------------|
| Gas . . . . .         | £15 per lamp per annum. |
| Electricity . . . . . | 27 "                    |

The electricians are welcome to all the consolation they can derive from their amusing calculations as to the price obtained for gas. To see them holding up their hands in horror at (assumed) differential prices charged by a supply company is to be reminded irresistibly of "Satan rebuking sin." When the St. James's Company reduced their price five years ago from £30 to £17 per arc lamp per annum to keep out gas from their streets, I do not remember much being said by electricians about "considerations of advertisements and preference" having "an undue bearing on the composition of the prices tendered."

ELECTRICITY SUPPLY AT HYDE.

Gas Company's Grievance.

At the Tramway Offices, Stalybridge, last Wednesday, Mr. M. K. North, M.Inst.C.E., held an inquiry into an application to the Local Government Board by the Stalybridge, Mossley, Dukinfield, and Hyde Joint Tramway Board for permission to borrow £22,268 for electricity purposes. The application was opposed by the Hyde Gas Company, who were represented by Mr. Brocklehurst.

The Clerk to the Board (Mr. Schofield) explained the objects of the loan. In the first place, £15,000 was required to meet anticipated expenditure for mains to March 31, 1912—a sort of reserve fund for three years, and less balance unexpended from the previous sanction, which amounted to £5192; leaving the amount of the application £9808. Secondly, the loan was to meet anticipated expenditure for transformers to 1912 of £5000, less £2832 balance unexpended from previous loan; leaving £2168. In this case they proposed to make application for £2100. Thirdly, they were making application for £968 for a coal elevator, conveyor, and bunkers. Fourthly, they required £1300 for mechanical stokers. With reductions, the application stood at £14,168. At the same time, they asked permission to be allowed to expend the remaining portions of loans previously sanctioned.

The Engineer (Mr. Blackmore) explained the technical details of the works for which the loan was required, and he was subjected to a long cross-examination by Mr. Brocklehurst. In reply to the first question, he said there had never been a profit since the inception of the scheme, and the total losses in the last seven years came to £81,000. Dealing



with the electricity department, Mr. Brocklehurst asked if there was any immediate prospect of it becoming productive; and the witness replied that there was every prospect. This year there was only a loss of about £500; and it would be perfectly easy to make up this loss in the twelve months. Under their Act, the loss was divided by four, and each of the Corporations concerned paid an equal share.

"Yes," said Mr. Brocklehurst, "but have not the great body of ratepayers been financing the electricity undertaking for the advantage of a small number of consumers?" Witness replied: "I take it that this inquiry is for borrowing money to give the whole of the ratepayers the advantage of a cheap supply. Any money the Board spend is upon a commercial basis. We do not spend money unless it is for the benefit of the ratepayers generally." Witness was next asked if he pledged his word that the electricity undertaking was going to be remunerative next year; and he replied that he did. Mr. Brocklehurst proceeded to question witness as to the prices charged for lighting and motive power purposes; and Mr. Blackmore, in the course of his answers, said the cost of electricity for the tramways undertaking was 0.825d. per unit—the lowest in the kingdom; and they could produce electricity 80 per cent. cheaper than Manchester. They had put by £25,000 as a sinking fund in reduction of their debt; but should they happen to have a fire at the works, they would have to renew out of the ratepayers' pockets. They laid a main at a cost of £905, and had a revenue of about £250 per annum from it.

At this point, the Inspector asked Mr. Brocklehurst why he was objecting to the application. In reply, he said it was extremely difficult to take objection to any particular item, because they had no information as to the mode in which the money was to be spent. All they were informed was that £22,268 was to be applied for. He found, on coming there, that the exact figure was £14,168. This was all the information they had supplied him with; so that in coming there to object he had to deal with the question on general grounds. In the past the undertaking had been launched upon estimates which had proved unsound, and which were enormously exceeded; and in consequence of the high charges upon capital, and of deficits shown year by year, it would be advisable for the Board, instead of launching out into new expenditure, to endeavour to make past outlay remunerative. This was the basis of his general criticism; and he hoped he had been able to make this view of it perfectly clear. Every year since its inception the undertaking had been a burden upon the ratepayers. He would also call attention to the small number of consumers as compared with their 9,500 ratepayers, who from the commencement had been asked to pay, through the medium of the rates, for the cost of providing electricity to 415 consumers of electricity supplied at less than cost price. They (the objectors) considered it bad finance that there should be no provision made for contingencies in the current accounts—that there should be no depreciation fund. They did not think, having regard to the life of electricity undertakings and the dangers of them, that a sinking fund was sufficient to pay off all the financial liabilities. He was instructed by the Hyde Gas Company to appear before the Inspector with a feeling of grievance. The Company were large ratepayers. In the borough of Hyde alone they had a rateable value of nearly £4000; and in one sense they were interested parties, because they found that the Electricity Department of the Joint Board competed with them in lighting, and the Company, as ratepayers, had to pay, through the medium of their rates, to enable the Board to do this. The Company had to finance the Board, so to speak, to supply electric lighting at less than cost price. It did seem to the Company a little hard that they should be compelled to contribute, through the medium of their rates, to financing what was undoubtedly a rival undertaking, which, if it had not been supported out of the rates, would have been wound up before this.

The inquiry then closed.

## RHYL GAS AND WATER SUPPLY.

A recent number of the "Rhyl Record and Advertiser" contained an article showing the development of the town in the past twenty years; and in it the following particulars are given in regard to the gas and water supply.

The gas-works were originally in the hands of a company; but in 1893 they were acquired by the Improvement Commissioners for £35,000. The capacity of the works was about 25 million cubic feet per annum; the sale of gas being less than 20 millions. Additions and improvements have been made at a cost of £18,000; and the works are now quite up to date—the plant being equal to a make of 80 millions per annum. Notwithstanding this expenditure, the payments for interest and the redemption of loans have been brought down from rs. 6d. to less than 11d. per 1000 cubic feet of gas. The annual income at the time of purchase was about £5000; now it is £12,000. The price of gas has been reduced from 3s. 6d. to 3s. per 1000 cubic feet. In 1903, the profits were £796; whereas for the past financial year they were £1782. The working results have each year improved on those of the preceding year. The total expenditure on the works to date is £53,986. The present value of the undertaking, based on 28 years' purchase of the gross profits, may be put down at £125,000; and in slightly more than twelve years the original purchase-money will have been redeemed.

The water-works were acquired in 1893 for £74,000; and they were found to be in a very defective condition. Since then the authorities have been engaged in a continuous struggle to get them into good order. Works of various kinds were carried out at a cost of £24,000; but they did not increase the storage, which was totally inadequate. In 1901, the Urban District Council promoted a Bill, and obtained powers to construct another reservoir on the watershed; and after considerable engineering difficulties, the works were completed in the autumn of 1905; the cost being about £26,000. Since then the only addition of importance to the works has been a water-tower, completed last year, the effect of which has been to give the town constant pressures during the present season. The total expenditure incurred since the purchase of the works has been £52,000; making, with costs and the original

sum, a total outlay of £136,000. There has been a steady growth in the income. At the time of the purchase of the works, it was only £4500 per annum; whereas in the past financial year it was £8500.

It only remains to say that all extensions and improvements, including the new reservoir, since both the gas and water works have been owned by the District Council, have been designed and carried out by the Gas and Water Engineer, Mr. Leonard G. Hall, Assoc. M.Inst.C.E., who has most successfully conducted both undertakings.

## GAS AND ELECTRIC LIGHTING IN THE FAR EAST.

### Success of Gas in Japan.

In the "JOURNAL" for the 16th ult. (p. 480), reference was made to the prospective extension of gas supply in the south of Japan. The following remarks on the position of gas and electric lighting in the Far East appeared in the "Financial Times" last Tuesday.

In every part of the world, beginning from London, gas seems to be making headway over electricity, while at one time it was feared that with the advent of electric lighting gas for illuminating purposes would be a thing of the past. Of course, there are advantages in the one system which are not to be found in the other, and *vice versa*. The very fact that in the squares and prominent streets of London gas lighting is being substituted for electric lighting, goes to prove that gas has certain elements in it which make it advantageous for use as an illuminant for public places. . . . In the East, gas and electricity are equally well patronized, excepting in Japan, where certain conditions go to make the use of gas more convenient. In Japan there was a run for electric enterprises, and electric lighting was decidedly in popular favour some time ago. Now it appears that the tables have been turned, and no less than nineteen companies have been formed for gas manufacture in the provinces, not including the Chiyoda Gas Company, which is to compete with the Tokyo Gas Company. The following is a list of the provincial towns in Japan where gas-works have been commenced, or companies founded or are to be founded in the near future:—

| Place.              | Capital.<br>Yen. | Place.             | Capital.<br>Yen. |
|---------------------|------------------|--------------------|------------------|
| Shimonoseki . . . . | 350,000          | Yamada . . . . .   | 300,000          |
| Kumamoto . . . . .  | 500,000          | Hamamatsu . . . .  | 500,000          |
| Kagoshima . . . . . | 500,000          | Shizuoka . . . . . | 500,000          |
| Omuda . . . . .     | 300,000          | Moji . . . . .     | 300,000          |
| Fukuyama . . . . .  | 300,000          | Sendai . . . . .   | 600,000          |
| Himeji . . . . .    | 500,000          | Okayama . . . . .  | 250,000          |
| Takamatsu . . . . . | 500,000          | Kure . . . . .     | 300,000          |
| Niigata . . . . .   | 500,000          | Kofu . . . . .     | 300,000          |

## FATALITY TO A SHEFFIELD GAS WORKMAN.

### A Surprising Verdict.

On Monday last week, an inquiry was held at Sheffield, by Mr. D. Wightman, into the circumstances attending the death of Robert Baker (59), a workman employed at the Grimesthorpe station of the Sheffield United Gas Company.

According to the evidence given by the Superintendent of the works (Mr. J. Hubert Wright), deceased was a general labourer, and about once a week, for the last four or five years, he had been called upon to empty drums of hydrocarbon oil; and neither he nor any of the men similarly employed had complained. On the 17th of August, Baker was told to empty three 100-gallon drums; and on his completing the task, he complained of illness. After being walked about, however, he recovered sufficiently to walk home, with the assistance of ambulance men. Seeing him at the works on the 20th, Mr. Wright asked him when he was likely to begin again; and he said he did not feel very strong, and thought he would take a few more days off duty. Witness never again saw him alive. Mr. Wright explained that there was no poisonous gas in the oil contained in the drums; but on the 17th of August the deceased was more exposed to the fumes than the other men. He could only suppose that these getting on the man's lungs had affected his heart; for no ordinarily healthy man would be troubled.

The person with whom the deceased lodged was called, and stated that he had complained of pains in his chest after having emptied the drums, and on the last occasion had consulted a doctor, who said the gas was "all over him." She was followed by Dr. Frank Hardy, who had made a postmortem examination of the body, and said he found extensive pleurisy. The blood was fluid everywhere, and was a bright red cherry colour, which suggested to him the possibility of the presence of carbon monoxide. The actual cause of death was failure of the heart's action brought on by a pleural effusion. The heart was displaced in consequence, and its action was bound to be embarrassed owing to the man going about when he ought to have been in bed. In answer to Mr. E. W. Clegg, who appeared for the Gas Company, witness said Dr. Sinclair White agreed with him in believing that a case had never been known in which so long a time as nine days had elapsed before a man who had inhaled carbon monoxide in deadly doses had expired. The usual time was one or two days. There was no reason why Baker should not have recovered from the pleurisy if he had received proper treatment.

The Coroner said the jury could only return a verdict that Baker had died from pleurisy, and leave the question of carbon monoxide to the legal representatives and the Gas Company. If the jury pleased, they could say that death was due to carbon monoxide poisoning, though the evidence did not warrant it.

The Foreman said that while the jury respected the medical evidence, they were still of the unanimous opinion that Baker's death had been hastened; and they returned a verdict of "Death from pleurisy accelerated by gas fumes."



## FATALITY ON THE MANCHESTER PIPE-LINE.

## Alleged Suffocation by Varnish Fumes.

An accident which raises the question of the liability of water engineers in the carrying out of large contracts has occurred on the Thirlmere pipe-line of the Manchester Corporation, in the vicinity of Caton, 4 miles east of Lancaster. The precise spot is the Conder syphon near the Cragg Wood. At present, as readers of the "JOURNAL" are aware, the Manchester Corporation are laying down their third line of pipes from Thirlmere. It extends about 96 miles, of which 45 miles are pipes chiefly 44 inches in diameter, 36½ miles are "cut-and-cover," and 14½ miles tunnels. While the new pipe is being laid, the older pipes are cleaned out. The Contractor for the Caton length is Mr. J. Moffat, of Manchester; and his specification required that the joints and bevells of the old pipes should be cleaned and blackened with varnish approved by the Engineers of the Corporation. A sample of the black varnish was passed before the order was given for it; and since the contract began, a quantity has been kept in the stores.

Last Tuesday, a young labourer named Mistlethwaite, of Caton, was told by a ganger, George Bennett, to clean out a length of pipes; and next day he was ordered to black varnish the joints and bevells 110 yards from a manhole. He started at 6.30 a.m.; but as at half-past eight he did not respond to the call for breakfast, a youth named Bridges was told to go and see what was the matter. When he had gone 50 yards up the pipe, he detected the smell of varnish; and when he got 100 yards up, he found Mistlethwaite lying unconscious. He turned him over, and then went back to the manhole for assistance. The ganger Bennett and James Dennison accompanied him up the pipe. They all felt the effects of the varnish fumes, and with difficulty brought the body of Mistlethwaite down to the manhole, where all the men collapsed. By the aid of artificial respiration the three forming the rescue party rallied; but Mistlethwaite was quite dead.

These facts were borne out at the inquest held by the Lancaster Coroner (Mr. Holden) on Thursday. Dr. Bingham, who made the postmortem examination, said there was evidence in the brain and heart that the man died from asphyxiation. It was dangerous to have to work in varnish fumes in a confined place 110 yards away from a manhole. A pungent odour was emitted from the varnish; and he had no doubt the man died from suffocation by the fumes. Alexander King, the foreman, said deceased was employed on similar work the previous week; and other men had done it for twelve hours. It was a great surprise to them that there was any danger in using the varnish. The deceased worked five chains from a manhole, and other men had worked thirteen chains. Dr. Bingham remarked that there was more ventilation there—a 10-inch air-valve. Witness said the varnish was in store and approved by the Manchester Engineers before he came on the job. The Coroner examined a tin of the varnish, and said it was very strong. Mr. Tilly (for the relatives) asked if there had ever been complaints about the varnish before. Had men been overcome by the fumes? Witness replied that they had had complaints from gangs about the smell of the varnish.

The Coroner said it was evident they could not carry the inquiry further that day, because they had not had responsible witnesses before them, who had given orders for the varnish to be used. They must adjourn, and see whether the varnish was fit to be employed, and who was responsible for its use.

The inquest was adjourned till the 14th inst.

## FINANCES OF THE METROPOLITAN WATER BOARD.

## Possibility of a Deficiency Rate.

In view of the present financial position of the Metropolitan Water Board—the accounts for the year 1909-10 showing a large deficiency following upon one for the preceding year—there is a prospect of the power of the Board to levy a deficiency rate being put in operation. Indications are not wanting that such an action would be opposed by the London County Council, who have lately given publicity to the following report on the subject.

There are certain features which have an important bearing on the question of the need for levying a deficiency rate, but with which the Water Board may perhaps not deal, except at the instance of the Council, or unless further statutory powers are conferred upon the Board. We refer particularly to the inadequate contribution to the revenue of the Board which is made by the extra-London districts. It appears that London contributes to the domestic water-rate of the Board at least 50 per cent. per head of the population more than the outside districts, involving a very large additional burden upon London. Though we do not suggest that population is a suitable basis for water charges, this fact is some indication of the prejudicial effect upon London of the existing basis of charge for domestic supply. The basis of charge is not arrived at under the same law in London and the outside areas. The Valuation (Metropolis) Act, 1869, provides for a quinquennial revaluation of all properties in London. As an example of the importance of this revaluation to the Metropolitan Water Board, we may mention that the last quinquennial revaluation in London had the effect of increasing the Board's income by about £55,000 (less losses on collection), without any increase in expenditure. Outside London there is no regular revaluation of properties, and consequently no guarantee that the standard of assessment is kept up to date; nor is there any periodical increase of revenue from this cause. At the time of the passing of the Metropolitan Water Act, 1902, it was estimated that the rateable value of premises for poor law purposes in extra-London was, on an average, 15 per cent. lower than the London standard. Before the Metropolitan Water Board (Charges) Act, 1907, the Board had power itself outside London to fix the basis on which it should charge. By this Act it was deprived of the power, and the immediate loss of revenue amounted to £26,800. The ultimate loss was more than this; and there seems little

doubt that, if the standard of assessment were the same in extra-London as within London, the Board's revenue would benefit to the extent of between £40,000 and £50,000 a year. Such an additional income would have gone far to ease the financial position.

For the reason explained in the above report, the London Council are once more urging the Water Board to make "an inquiry into the effect on income of the use, as the basis of charge for domestic supplies, of rateable value determined according to two different standards of valuation respectively for London and the other districts within the Board's area."

## SOUTH STAFFORDSHIRE WATER COMPANY.

## Electricity v. Steam—The Proposed National Water Board.

The Half-Yearly General Meeting of this Company was held at the Offices in Birmingham last Wednesday—Mr. C. GABRIEL BEALE in the chair.

The Directors stated in their report that the number of houses laid on during the six months ended the 30th of June was 758; making the total supplied 138,938. The gross amount of water-rates for the past half year was £72,618, against £73,251 in the first half of 1909. There remained for distribution, after the usual provisions, £29,364; and a dividend at the rate of 6½ per cent. per annum (less income-tax) was recommended on the ordinary shares. The amount of this dividend being £20,894, £8469 would be carried forward. The Engineer (Mr. H. Ashton Hill, M.Inst.C.E.) reported that the machinery, plant, and buildings of the Company were in substantial order and repair.

The CHAIRMAN, in moving the adoption of the report, pointed out that, owing to various causes, there had been a great decrease in the trade water supplies, the returns from which had fallen off by £1462. This was not due to any general decline throughout the district, but to the fact that ten large customers had found other means of supplying themselves with water. Another circumstance which accounted for less consumption for industrial purposes was that a number of firms were using to an increasing extent electrical instead of steam power. The obvious result was that the motor came in and the steam-engine, which, of course, used large quantities of water, went out. Thus their water supplies in the Black Country had been influenced to some extent. The building supplies had fallen off only slightly; but on railways the reduction in the use of the Company's water was represented by the figure of £295. This was accounted for by the new working arrangement between the companies, which led to economies in traffic running. Rates and taxes showed an increase of £400. Every year such advances were met with; and on this occasion the larger amount was due chiefly to increased assessment in the Lichfield district. During the half year, £12,500 had been expended on works. This was due chiefly to the ordinary capital expenditure of the Company, which was always increasing as the district grew; but it was also in part due to compensation which they had had to pay under the Act of 1909. This Act was retrospective, and referred to works which the Company carried out years ago, and for which compensation for damage was not paid. For the past twelve months, the Board had been dealing with these claims. They had caused great anxiety; but the Directors now saw the end of them. The Company could issue fresh capital, confident in the knowledge that there were no further claims in the background which would be likely to disturb the prospects of the Company. The Board had reduced the dividend by one-half per cent. They proposed further to build up the capital by a moderate issue of stock, as there were two rather large commitments—an addition to the pumping-station near Wednesbury, involving a total expenditure of £13,000, and boring operations at Maple Brook. As to the Water Supplies (Protection) Bill, the Chairman said that in theory it was to protect the owners of small private supplies from the deprivations of water companies and local authorities who absorbed large quantities of water. It was referred to a Joint Committee of the two Houses, and a great deal of evidence was taken; and in the result it was reported without amendment. This in itself looked alarming, because their Company would be seriously affected. But then the Committee went on to slaughter all the sections of the Bill. They said they were impracticable, and could not be worked. It might, therefore, be taken that the Bill was dead. But the important result of the Committee's investigations was that they had reported their conviction that the question of the water supply of the country should be thoroughly overhauled, with a view to the whole country being mapped out into areas under the control of Water Boards. This was a question of vast importance. Time after time it had been suggested by Committees and Commissions that, if the population were to continue increasing at the old rate, the means of conserving all possible means of obtaining pure water must be carefully considered. It was for investors in water undertakings to look to their position; but he did not think if Water Boards were established any injustice could be done to those companies who had complete and well-arranged undertakings. He did not think there need be any anxiety about this; but anyone who had had to do with supplying water to such areas as that of Birmingham could have no doubt as to the seriousness of the question, or the desirability of regulating water supply from a national rather than a local point of view. He was not apprehensive that the legislation on this would follow immediately; but if it came, and the Company had to be bought out, they might rely upon it that their successors would do the best they could for the then shareholders.

Mr. F. H. LLOYD seconded the motion; and it was agreed to unanimously.

The dividend recommended was then approved; and a vote of thanks to the Directors concluded the meeting.

Owing to a fault at one of the sub-sections of the Scarborough electric lighting system, the Londesborough Theatre, the Theatre Royal, and the Hippodrome were deprived of electric light for from fifteen to twenty minutes last Tuesday night.



## WATER SUPPLY OF LONDON.

### A Defence of the Metropolitan Water Board.

The Twenty-Fifth Annual Conference of the Sanitary Inspectors' Association was held at the Fishmongers' Hall, E.C., last week, under the presidency of Sir James Crichton-Browne; and on Friday, a paper was read by Mr. E. B. Barnard, the Chairman of the Metropolitan Water Board, on the "Water Supply of the Metropolis." It was to a large extent a defence of the Board.

Mr. Barnard traced the history of the events leading up to the formation of the Water Board, and, illustrating the magnitude of the task imposed upon them, said the population they were supplying with a necessary of life and trade was nearly equal to that of the two kingdoms of Norway and Sweden, about the same as the Dominion of Canada, 2 millions more than Australia and New Zealand put together, and larger by about a million than the whole population of Scotland and Wales. The average daily supply was upwards of 225½ million gallons. If they could build a tank the size of Trafalgar Square (2½ acres), and the height of Nelson's Column, London would empty such a tank twice in every 24 hours. The average supply per head per day was 32 gallons, and in the summer 36 gallons, or a barrel of water every day per man, woman, and child in a population which represents 16 per cent. of that of Great Britain and Ireland. The water-mains alone would reach from Liverpool to New York and back again; and it would take the *Mauretania* ten days to race along the whole length.

Turning to the Board's financial position, Mr. Barnard said that in addition to the net debt of £47,000,000 with which they were endowed when they came into existence, they had to spend some £1,500,000 in new works of an imperative nature. Further, the Board were bearing an annual charge of £69,000 for superannuations, pensions, and compensation allowances to officers and servants of the Water Companies. This brought him to the subject of the attacks made upon the Board in connection with their revised charges. He said a new era began when these charges came into operation in April, 1908. He was unable to say what the ultimate effect of the equalization of water-rates would be. The Board might have to levy a deficiency rate; but it was yet too early to make any authoritative statement concerning it. Whatever the financial result of the Charges Act might be, the Board could certainly claim a large dividend in improved sanitation, so far as water supply affected it. Their charges were inclusive, and the irritating extras for sanitary necessities had been got rid of. They had reduced the charges for water for public purposes, including sewer flushing and road watering, to a figure only a little more than their net debt burden. The interest and rent charges of their capital debt amounted to nearly £1,500,000, equivalent to 43d. per 1000 gallons supplied; and they were letting the public authorities have water at 6d. per 1000 gallons. Their charges were low in comparison with those levied elsewhere; but because certain properties were not charged enough in the past and now suffered from an equalized charge, which Parliament deliberately levied, notwithstanding the most strenuous opposition of the parties affected, they heard of the sinking of wells in all directions. Railway companies, owners of valuable City properties, and others with large rateable values, were attempting to evade their charges for water supply, and in this way were ensuring the certainty of a deficiency. They avoided paying a water-rate; yet what would the Fire Insurance Companies be demanding of them if the Board's mains were not in the abutting streets fully charged with water? Supposing that some of these independent City properties were to catch fire, and there was no water in the mains, the imagination boggled at the extent of their indignant outcries. Why should the ordinary householder be taxed for their benefit?

Referring to the measures taken to ensure the purity of the supply, Mr. Barnard pointed out that since the Board came into existence and took over the works of the Water Companies, there had been an improvement in the quality and an increase in the quantity of water supplied. In the year ending March 31 last, more than 13,000 samples of water were examined, either chemically or bacteriologically, in the ordinary routine of the Board's work, exclusive of 1100 samples collected for special purposes. This led him to the subject of storage; and he pointed out that, in order to provide for the ever-growing demands made upon them, the Board had found it necessary to construct large reservoirs. These served a double purpose. Originally they were built solely with the idea of storing water when it was in abundance, so that it might be utilized in periods of drought. It was then found that water so stored greatly improved in quality; and an exhaustive series of experiments proved that storage reduced the number of bacteria of all sorts, devitalized the microbes of water-borne diseases, and reduced the amount of suspended matter. The discovery was made by Dr. Houston, the Board's Director of Water Examination, that if raw river water is artificially infected with millions of cholera vibrios, the vast majority die in storage within one week. In spite of the increased consumption of water, the Board had, by strict attention to waste prevention, reduced by nearly 1½ gallons the average quantity supplied per head daily. They had hopes of making even further reductions.

With regard to the future, Mr. Barnard said the Board had to face a daily increasing population within what was called Water London. Various schemes had been investigated, and the Welsh scheme had been ruled out on economic grounds. In the result, the Board had adopted what was known as the Staines reservoirs extension scheme, for the provision of additional reservoirs in that part of the Thames Valley. Here was an abundant supply—a waste product running by, belonging to no one, and only requiring to be impounded in order to serve more than one great public benefit. Calculations had been made to show that the water so impounded would last until 1941, with an estimated population amounting to 12 millions. This scheme, which possessed features presenting an overwhelming advantage over the Wales scheme, contemplated a capital expenditure of about £6,273,000, which would be spread over a number of years.

In conclusion, Mr. Barnard remarked: I think I have said enough to show that the Board started life with a lapful of difficulties, and that we

have mastered them. We did not call ourselves into being; we did not incur the vast debt we have to carry; we did not create the disabilities we have laboured under. We have honestly tried to do our best; and though Parliament saw fit to handicap us in the ways I have indicated, I think that the assumption of so many responsibilities by the Board seven years ago has been a success. I have endeavoured to explain that the matter of our charges, which is, in point of fact, the sole subject of the attacks made upon us, marks a transition stage in our history, and that it will be cured in the interests of public equity and not of class favouritism, however powerful or spiteful. As regards the future, I hope that I have demonstrated to you, and through you to the general public, that the Metropolitan Water Board is alive to its onerous responsibilities, and has, so far as human foresight and human forethought can command, framed a policy which, on engineering, financial, and scientific grounds, justifies, and will continue to justify, the confidence of the myriad inhabitants of this huge Metropolis.

A vote of thanks having been proposed to Mr. Barnard, the President expressed his appreciation of the paper, which he said was an exceedingly able vindication of the policy of the Board the author represented. He thought, however, Mr. Barnard was rather sanguine in anticipating a reduced consumption. Water was the first essential of sound sanitation; and he did not think the domestic bath had yet reached its maximum.

Subsequently, on the invitation of the Water Board, the members of the Association left London Bridge Pier in a steam launch on a visit to the Board's works at Hampton. They were received by Mr. Barnard, and, under the care of several guides, inspected the reservoirs, filter-beds, intakes, and pumping machinery.

## NOTES FROM SCOTLAND.

### From Our Own Correspondent.

Saturday.

A Special Committee of the Glasgow Town Council, which was appointed to inquire into any process of gas making which would produce a form of coal residue available for use in ordinary domestic grates, have recommended: (1) That the Gas Engineer be instructed to proceed with his experiments with steam-quenched coke and "Coal-exld;" (2) that the Engineer be authorized to supply this for use in ordinary domestic grates; and (3) that an exhibit of "Coalexld" be sent to the forthcoming Smoke Abatement Exhibition, with a view to orders being obtained for it.

The community of Dumfries has been greatly agitated over the appointment of a Gas Manager to succeed Mr. J. M. Smith, who has gone to Stirling. The Gas Committee recommended that Mr. S. Dickie, who has been joint Manager with Mr. Smith for several years, be appointed sole Manager. This recommendation has been carried; but there is much to take note of before that point is reached. A week ago, the annual report of the joint Managers for the year ending May 15 last was published. From the report, it appeared that the quantity of coal carbonized during the year was 11,442 tons, the average price of which was 13s. 9½d. per ton. Benzol was used for enriching to the amount of 12,320 gallons. The average cost of coal and benzol per ton was 14s. 3½d. In the previous year, 11,902 tons of coal and 7411 gallons of benzol were used, at an average price of 15s. 7½d. Last year, the quantity of gas manufactured was 111,570,000 cubic feet, being an average of 9758 cubic feet per ton, against 112,547,000 cubic feet, at an average of 9456 cubic feet per ton. Gas sold last year amounted to 105,175,813 cubic feet, at an average of 9192 cubic feet per ton, compared with 104,096,717 cubic feet, at an average of 8746 cubic feet per ton. The increase on sales in the past year was 1,079,096 cubic feet. Gas was unaccounted for to the extent of 5.73 per cent., or 1.83 per cent. less than in the preceding year, and the lowest percentage of loss during the burgh's management of the works. Mains and service-pipes had been renewed or repaired at a cost of £692. A large number of meters were tested, and defective ones replaced by new ones, at a cost of £544. The reserve fund amounts to £3353, from which there falls to be deducted £2999 15s., being the balance of the renewal portion of the extension applicable to the reserve account. This leaves the reserve fund at £355. It would be advisable to again place £1500 to the reserve fund, which was allowed for in the estimates for the current year. The sulphate plant had been worked very satisfactorily. The net sums received for sales amounted to £1102—an increase of £39. After deducting annual depreciation, interest, and working expenses, the net profit on the Gas Department for the year amounted to £336. Tar had been sold to Messrs. W. G. Walker and Sons, of Ayr, at a slightly increased price. A tar-distilling plant was erected to meet the requirements of the burgh, and was giving every satisfaction. Acting upon the Manager's report last year, a deputation appointed by the Council, along with the Managers, visited several gas-works for the purpose of inspecting the various methods of carbonizing. Following upon their report, plans and specifications were prepared, and during the year a complete reconstruction of the retort-house had taken place. The old erection had been replaced by a substantial building, which was being fitted up with an up-to-date carbonizing system, together with stoking machinery and coal-handling plant of the most modern type. The plant is not yet ready for gas manufacture, but will be completed in time to meet winter requirements. New coal-stores (for which estimates have already been accepted) will be commenced as soon as possible, probably in the early spring. In the estimate for the current year, after allowing for interest, sinking and reserve funds, and all working expenses, it is anticipated that there will be a balance of £576. Although this would allow of a reduction of 1d. in the price of gas, the Managers thought it right to draw the attention of the Council to the fact that the sum of £786, being principal and interest on the new loan, was included in the estimate, and falls to be paid this year; whereas only a small return for the use of the new plant will be available this year to meet that sum. Next year the plant will, of course, be in full working order, and the full financial benefit will be received. On Monday evening, a crowded meeting of ratepayers, convened by Provost Lennox, on the requisition of the Citizens' Union, was held in the Town Hall to consider the subject of the gas manager-



ship. The meeting lasted for two-and-a-half hours, during which time a great deal was said, both for and against Mr. Dickie. The most significant of all the statements made was unmistakably that which was contained in a letter written by the late Mr. George Malam, the then Gas Engineer at Dumfries, some years ago, in support of an application by Mr. Dickie for an appointment as gas manager. In his letter, Mr. Malam stated that Mr. Dickie served his apprenticeship under him, and that he considered him specially qualified for the post. This represents Mr. Dickie in a capacity altogether different from that of clerk, which it has been the fashion of some to regard him as. As the result of the deliberations of the public meeting, a resolution was adopted, by a very large majority, to the effect that it would be in the best interests of the public that a skilled engineer be appointed along with Mr. Dickie as joint Manager. The amendment was simply a proposal to leave the matter in the hands of the Council. The Town Council met on Thursday evening, and had before them, among other business, the filling up of the vacancy. The resolution of Monday evening was read to the Council, and then Judge Thomson, the Convener of the Gas Committee, who characterized the Monday evening meeting as inconclusive, moved the recommendation of the Committee, that Mr. Dickie be appointed. Provost Lennox moved that they should advertise for a Works Manager and Engineer to act as joint Manager with Mr. Dickie. It was also moved that the subject be delayed for a month. After long discussion, Provost Lennox's motion was lost by 12 votes to 9; and then the motion to appoint Mr. Dickie was carried, as against delay, by 13 votes to 10. It was agreed to take up in Committee the question of appointing a works foreman.

The Aberdeen Corporation gas accounts, which are summarized in another column, contain a record of progress which is quite creditable to the management. A year ago, the price of gas was reduced by 1d. per 1000 cubic feet, which accounts for the decrease in revenue; but the make of gas has since gone up nearly 10 million cubic feet, which is quite satisfactory. The Gas Committee have resolved to continue the price of gas at 2s. 6d. per 1000 cubic feet for lighting, heating, and cooking, and 2s. 3d. for motive power.

A laudable effort is being made by Mr. W. Geddes, the Hon. Secretary and Treasurer of the Scottish Junior Gas Association (Eastern District) to extend the influence of the Association. The means adopted—that of issuing circulars to gas managers and others interested—is the most direct method of approaching probable candidates for membership. The circular might have enumerated, as part of the benefit to be derived from membership, the number of good things which fall in the way of those who take an active part in the work of the Junior Associations. The latest of these is found in the promotion of Mr. A. Masterton, who was the first President of the Eastern District, to be Engineer and Manager of the Edinburgh and Leith Corporations gas undertaking, in succession to Mr. W. R. Herring. With such prizes in store, the junior who does not associate himself with the Junior movement is assuredly standing in his own light. It is to be hoped that Mr. Geddes' effort will meet with marked success, and that there will be a large accession to the membership during the session, which, to judge from the syllabus which is published, bids fair to be an exceedingly interesting one.

The Helensburgh Town Council last night resolved to reduce the prices of gas by 5d. per 1000 cubic feet, making the price for ordinary consumers 2s. 11d., and for prepayment meter consumers 3s. 4d., per 1000 cubic feet. The reduction in price, it was stated, is equal to 3d. per £1 in the burgh assessments.

The Turriff Gas Company, Limited, have paid a dividend of 5 per cent., and have fixed the prices of gas at 6s. 3d. per 1000 cubic feet for ordinary consumers, and at 5s. 3d. for cooking, heating, &c.

The Wick Gaslight Company have paid a dividend of 6 per cent., and have reduced the prices of gas by 2½d. per 1000 cubic feet; making them 5s. 2½d. for lighting, and 4s. for cooking and power purposes.

The Kirkcudbright Town Council have let a contract for the supply and erection of a pump, pipes, and standards, for the conveyance of tar and liquor from the gas-works to the railway station, to Messrs. Stewarts and Lloyds, Limited, at £175. There is to be an annual payment to the Railway Company of the sum of 5s., as wayleave for the plant.

The following somewhat enigmatical statement was published in the "Dundee Advertiser" on Tuesday last, under the heading of "Cupar": "The lighting of Cupar was a subject that led to considerable discussion at the meeting of the Town Council last week, and with winter fast approaching it was not inappropriate that this question should have been brought up. In the long winter evenings, the town has not much to attract its citizens in the way of amusement, and well-lit streets would go a long way to make up for this much-felt want. Notwithstanding the higher rate which is being paid for lighting purposes, in the past it cannot be said that the streets of Cupar have been over-lighted; and it is to be hoped that the present move will have beneficial results. When it is pointed out that during the course of last year over 45 dozen incandescent mantles were destroyed, the wonder is that a proposal to enter into an arrangement with the Gas Company to do the turning on and turning off of the lights has not been given effect to sooner."

Miss Elizabeth Baddeley was suffocated in bed at Silverdale, Staffordshire, last Thursday, owing to the breaking of a gas-pipe. It is supposed that mining operations caused her house to subside, and that this broke the pipe.

The half-yearly conference of the Richmond Gas Stove and Meter Company, Limited, was held at their works at Warrington last Tuesday and Wednesday—Mr. Horace M. Thornton presiding. The forthcoming gas-fire season formed the chief topic for consideration. On the first evening, the representatives and Managing-Directors dined together; and, at the invitation of the Company, Mr. E. W. Smith, M.Sc., of Leeds University, and Chemist to the Gas Heating Research Committee, gave a *résumé* of the report presented to the Institution of Gas Engineers at the annual meeting in June. The heads of all the works departments were invited to be present; and a general discussion followed Mr. Smith's remarks.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 3.

### Sulphate of Ammonia.

At the commencement of the week there was still a hardening tendency in the market, and a further small advance was scored. All August requirements having been covered, however, the tone has become quieter, though prices are maintained at the highest point reached. The values at the close are £12 6s. 3d. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 8s. 9d. per ton f.o.b. Leith. No new business has been reported for future delivery; buyers evidently being disinclined to operate ahead at the level of prices now attained.

### Nitrate of Soda.

The market for this article continues very firm; but no further increase in values has taken place, and the quotations on spot remain 9s. 4½d. per cwt. for ordinary and 9s. 7½d. for 96 per cent. quality.

### Tar Products.

LONDON, Sept. 5.

The market for tar products have been fairly steady throughout the past week. Pitch has shown signs of further improvement, and the improved prices have been paid. Creosote is steady, and there is a fair amount of inquiry for export. Benzols remain unchanged. Crude carbolic is still of very little interest.

The average values during the week were: Tar, 19s. to 23s., *ex* works. Pitch, London, 38s. to 38s. 6d.; east coast, 38s. to 38s. 6d.; west coast, 36s. 6d. to 37s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6½d. to 7d.; North, 6d. to 6½d.; 50-90 per cent., casks included, London, 7½d.; North, 7d. to 7½d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11d. to 1s.; North, 10d. to 11d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

### Sulphate of Ammonia.

There has been a further slight improvement in this article during the past week, and prices are a little better in nearly all parts. Actual Beckton to-day is quoted at £11 15s. to £11 16s. 3d. Outside London makes are £11 10s. In Hull, the price is £12 5s.; Liverpool, £12 5s.; Leith, £12 8s. 9d. to £12 10s.; and Middlesbrough, £12 5s. to £12 6s. 3d.

A Trade correspondent writes: During the past week the prices of pitch have considerably improved, and the equivalent to 40s. 6d. Liverpool has been paid. There is a fair demand for creosote, and prices are about the same. Solvent naphtha is in great demand, and prices need not fall. Crude carbolic acid continues in about the same position. The average values for the week are: Pitch, 40s. London, 40s. east coast, and 40s. 6d. per ton Liverpool. Benzol, 90 per cent., 7d. per gallon, casks free; 50-90 per cent., 7½d. per gallon, casks free. Toluol, 9½d. per gallon, casks free. Crude naphtha, 3½d. per gallon, naked. Light oil, 3½d. per gallon, naked. Creosote, 2½d. to 2½d. per gallon, in bulk. Heavy oil, 3½d. per gallon. Carbolic acid, 60's, 1s. per gallon.

## COAL TRADE REPORTS.

### Northern Coal Trade.

The coal trade shows ease, and for some kinds of coal the prices are a little lower—the production at the present time being very heavy. In the steam coal trade, best Northumbrians are about 9s. 9d. to 9s. 10½d. per ton f.o.b.; second-class steams are about 9s.; and steam smalls from 5s. 6d. to 6s. 9d. The shipments are fair for this season. In the gas coal trade, the demand is now steadily increasing for home consumption, and the quantities sent to the great Companies in the South are heavier; while the exports are tolerably good. Durham gas coals vary in price from 9s. to 9s. 9d. per ton f.o.b. for the usual classes, according to quality; while for "Wear" specials, up to 10s. 6d. is quoted. There are not many large contracts now in the market, but some sales are being made for delivery over next year at some of the ports of the Mediterranean. The prices offered are from 15s. 5d. to 16s. 5d. per ton delivered at Genoa; but there is still a little hesitation about the acceptance of such prices by coalowners, who have sold at times a considerable part of their output, while the buyers look to a plentiful supply of some classes of gas coal. Coke is steady; but gas coke is in increasing output, and may now be quoted from 15s. to 15s. 3d. per ton f.o.b. in the Tyne.

### Scotch Coal Trade.

The market continues in a dull state. Coal for export is in poor request, and the home demand is far from brisk, except for smaller sorts. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 333,157 tons—a decrease of 6934 tons upon the preceding week, and of 32,567 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,631,480 tons—an increase of 877,523 tons.

The profits of Messrs. Read Holliday and Sons, Limited, of Huddersfield, for the year ended the 30th of June were £35,021, and £3173 was brought forward. Of the total, £500 has been added to the private insurance fund, and £16,923 appropriated for depreciation. Debenture interest absorbs £2740, and a dividend of 10 per cent. is proposed on the ordinary shares—adding to the reserve fund £2000, and carrying forward £6167.



## Aberdeen Corporation Gas Accounts.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 have been made up and issued. They show a total revenue of £121,049, a decrease of £1588. Gas and meter rents produced £92,417, made up as follows: Ordinary consumers, £73,835; motive power, £6694; prepayment meters, £11,887; and meter-rents, £27. Residual products realized £26,041 (coke, £15,498; and tar and liquor, £10,543); house-services, £817; gas-stoves, £1610; and rents and feu-duties, £132. The expenditure amounted to £98,076—a decrease of £1808. The balance to net revenue amounts to £22,972, as compared with £22,753 a year ago. Coal cost £53,094, as compared with £94,976. Oil and coke for carburetted water gas cost £6056; and purifying materials, £1436. The salaries of the gas engineer, analyst, and the officers at the works amounted to £983; the wages of stokers and labourers, to £12,054; and the maintenance of plant, to £4845. The total expenditure in the manufacture of gas was £79,679; while the outlay on distribution was £4909. Gas-stoves cost £1689, to which there is added £898 of wages and other expenditure; and there is written off £790 for depreciation. Rents, feu-duties, and taxes amounted to £4367; management, to £1962; and discount and bad debts, to £3955. Annuities paid came to £4063; and interest on mortgages, bank accounts, reserve fund, &c., to £4052. There was carried to sinking fund for redemption of mortgages £10,259; for redemption of annuities, £650; and to the reserve and fire insurance fund, £300. There is placed to the renewal fund £3000; and £648 is to be carried to the current year's account. During the year, 69,424 tons of coal were carbonized; the yield of gas from which was 632,597,000 cubic feet. Of carburetted water gas, 112,178,000 cubic feet were made. Gas accounted for totalled 745,861,000 cubic feet; and gas unaccounted for, to 48,914,000 feet—equal to 6.15 per cent., as compared with 5.96 per cent. in the preceding year. The prices charged for gas were 2s. 6d. and 2s. 3d. per 1000 cubic feet.

**Waltham Abbey and Cheshunt Gas Company.**—Owing to depression in trade and the large number of empty houses in the district of this Company, there was only a small increase in the gas consumption in the six months ended the 30th of June. There was nevertheless a profit of £3168 available for distribution; and at the recent half-yearly meeting dividends at the rates of 8½ and 6½ per cent. per annum were declared. These, with the debenture interest, required £2442; and left a balance of £726. The whole of the plant had been well maintained by the Engineer and Secretary, Mr. W. Bince Randall.

**Guiseley District Council and the Water Supply.**—At the meeting of the Guiseley District Council last Wednesday, a long discussion took place on a resolution brought forward by Mr. Gladwin pledging the Council to "make a full inquiry into the question of the water supply, with a view to purchasing the same in the interests of the ratepayers." This proposition, which related mainly to the supply of the Guiseley Water Company, was ultimately withdrawn in favour of one inviting the Yeadon and Rawdon Councils to meet the Guiseley Council in conference, for the purpose of discussing the question of the joint purchase of the undertakings of both the Yeadon and Guiseley Companies.

## Tiverton Gas-Works.

Mr. H. S. Bidwell, a Local Government Board Inspector, conducted an inquiry at Tiverton, last Wednesday, into an application by the Town Council for leave to borrow £4000 for purposes of the gas undertaking. The statistics submitted showed that the area of the borough was 17,680 acres; the population last census, 10,382; the estimated present population, 10,700; the gross estimated rental of the parish, £68,084; the rateable value, £57,438; the assessable value, £41,816; the district rate, 3s. 4d. in the pound; the poor-rate, 3s. 2d.; and the product of a penny on the district rate, £160. It was explained that the loan was required, in respect of gas-works, for regenerative settings and other items, which the great expansion of business in the past two years had rendered necessary, and which results had justified. The amount included £200 overspent on a loan sanctioned in 1906. The period of repayment of the original loan in 1897, under which the gas-works were taken over by the Council, had about half expired. The Borough Surveyor (Mr. J. Siddalls), replying to the Inspector, said that there was no competition at present with electric light. The Council had no intention of establishing electricity works, as it was found cheaper to do the public lighting with gas. The present annual cost of street lighting was £2 17s. per lamp of about 60-candle power. The Gas Manager (Mr. Clark Jeffery) explained that the new settings would effect a saving of about £150 per annum in labour and repairs. The works would also then manufacture 500 cubic feet more gas per ton of coal than under the old system. The price of gas was now 3s. 6d. per 1000 cubic feet; and the cost of coal delivered was about £1 per ton. Mr. J. Thorne (the Chairman of the Lighting Committee) remarked that, though practically the same amount of gas was manufactured last year as previously, the sales were 800,000 cubic feet more, giving a gross profit of £500. This was attributed, in great measure, to the new regenerative retorts, which had been in use for about six months. The Council were able to make a contribution of £443 to the rates. The price of gas when the works were taken over was 4s. 3d. per 1000 cubic feet. The present charge of 3s. 6d. compared favourably with other towns, particularly Taunton, where the price was 3s. 9d., though the output of gas was nearly double. Mr. W. H. Martin (a member of the Council) spoke in favour of the surpluses of profit from time to time being devoted to the extinction of the debt, instead of being placed to the borough fund. The Inspector paid a visit to the works which have been carried out or are in contemplation.

**Leeds Water-Rates.**—At the meeting of the Leeds City Council this week, a resolution will be submitted having for its object the increase of the water-rates of the city by about 35 per cent. The effect of the change, it is pointed out, is bound to be a serious one for all concerned; though manufacturers and other users of large quantities of water for business purposes will be hit the hardest. The justification put forward is the great cost of the new water-works at Leighton. A large annual sum will now have to be found for interest and sinking fund in respect of these works; and to meet this, it is proposed to derive an additional annual income of about £55,000 from increased charges. Under this arrangement, there will still be left the annual surplus of about £15,000 to be devoted to the relief of the rates.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 635.

| Issue.     | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. | Issue.    | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME.                     | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. |
|------------|--------|--------------------|-------------------------------|----------------------------|-----------------|---------------------|--------------------------|-----------|--------|--------------------|-------------------------------|---------------------------|-----------------|---------------------|--------------------------|
| £          | Stk.   | Apl                | p.c.                          | Alliance & Dublin Ord.     | 81-84           | +1                  | £ s. d.                  | £         | Stk.   | May 12             | p.c.                          | Imperial Continental      | 184-186         | ..                  | £ s. d.                  |
| 1,474,000  | Stk.   | July 14            | 5                             | Do. 4 p.c. Deb.            | 97-99           | ..                  | 4 0 10                   | 1,235,000 | Stk.   | Aug 12             | 3½                            | Do. 3½ p.c. Deb. Red.     | 52-94           | ..                  | 3 14 5                   |
| 310,000    | Stk.   | May 12             | 7                             | Bombay, Ltd.               | 63-65           | ..                  | 5 7 7                    | 200,242   | Stk.   | Aug 31             | 6                             | Lea Bridge Ord. 5 p.c.    | 119-121*        | ..                  | 4 19 2                   |
| 200,000    | Stk.   | ..                 | 7                             | Do. New, £4 paid.          | 48-52           | ..                  | 5 9 3                    | 561,000   | Stk.   | ..                 | 10                            | Liverpool United A.       | 214-216*        | ..                  | 4 12 7                   |
| 40,000     | Stk.   | ..                 | 15                            | Bourne- ) to p.c. . . .    | 28½-29½         | ..                  | 5 1 8                    | 718,100   | Stk.   | ..                 | 7                             | Do. B.                    | 161½-163½       | ..                  | 4 5 8                    |
| 50,000     | Stk.   | Aug. 31            | 17                            | mouth Gas ) B 7 p.c. . .   | 16-16½          | ..                  | 4 4 10                   | 306,083   | Stk.   | June 29            | 4                             | Do. Deb. Stk.             | 104-106         | ..                  | 3 15 6                   |
| 311,810    | Stk.   | ..                 | 6                             | and Water ) Pref. 6 p.c. . | 14½-15½         | ..                  | 3 18 8                   | 75,000    | Stk.   | June 29            | 6                             | Malta & Mediterranean.    | 4½-4½           | ..                  | 6 4 8                    |
| 75,000     | Stk.   | ..                 | 12½                           | Brentford Consolidated     | 240-249         | ..                  | 5 0 5                    | 560,000   | Stk.   | Apr. 1             | 5                             | Met. of 15 p.c. Deb.      | 100-102         | ..                  | 4 18 0                   |
| 380,000    | Stk.   | ..                 | 9½                            | Do. New                    | 184-186         | ..                  | 5 2 2                    | 250,000   | Stk.   | ..                 | 4½                            | Melbourne 4½ p.c. Deb.    | 100-102         | ..                  | 4 8 3                    |
| 330,000    | Stk.   | ..                 | 5                             | Do. 5 p.c. Pref.           | ..              | ..                  | ..                       | 541,920   | Stk.   | May 27             | 3½                            | Monte Video, Ltd.         | 12½-13          | ..                  | 5 7 8                    |
| 200,250    | Stk.   | June 10            | 11                            | Do. 4 p.c. Deb.            | 99-101          | ..                  | 3 19 3                   | 1,775,892 | Stk.   | July 28            | 4½                            | Newcastle & G'tesh'd Con. | 101½-102½       | ..                  | 4 5 4                    |
| 220,000    | Stk.   | Aug. 31            | 11                            | Brighton & Hove Orig.      | 209-212*        | ..                  | 5 3 9                    | 529,435   | Stk.   | June 29            | 3½                            | Do. 3½ p.c. Deb.          | 90-91           | ..                  | 3 16 11                  |
| 246,320    | Stk.   | ..                 | 8                             | Do. A Ord. Stk.            | 150-153*        | +1                  | 5 4 7                    | 55,940    | Stk.   | Aug. 31            | 7                             | North Middlesex 7 p.c.    | 13-13½          | ..                  | 5 3 8                    |
| 460,000    | Stk.   | Apl. 1             | 18                            | British                    | 44½-45½         | ..                  | 4 13 5                   | 300,000   | Stk.   | Apl. 29            | 8                             | Oriental, Ltd.            | 138-140         | ..                  | 5 14 4                   |
| 109,000    | Stk.   | Aug. 1             | 6                             | Bromley, A 5 p.c.          | 117-119         | ..                  | 5 0 10                   | 60,000    | Stk.   | Apl. 1             | 8                             | Ottoman, Ltd.             | 64-64½          | ..                  | 6 3 1                    |
| 165,700    | Stk.   | ..                 | 4½                            | Do. B 3½ p.c.              | 85-90           | ..                  | 5 0 0                    | 31,800    | Stk.   | Aug. 31            | 13                            | Portsea Island A.         | 131-133*        | ..                  | 5 3 0                    |
| 82,278     | Stk.   | ..                 | 5½                            | Do. C 5 p.c.               | 105-108         | ..                  | 5 1 0                    | 60,000    | Stk.   | ..                 | 12                            | Do. B.                    | 124-126*        | ..                  | 5 3 2                    |
| 55,000     | Stk.   | June 29            | 3½                            | Do. 3½ p.c. Deb.           | 85-87           | ..                  | 4 0 6                    | 100,000   | Stk.   | ..                 | 10                            | Do. C.                    | 117-119*        | ..                  | 5 0 10                   |
| 250,000    | Stk.   | ..                 | 4                             | Buenos Ayres 4 p.c. Deb.   | 97-99           | ..                  | 4 0 10                   | 114,800   | Stk.   | ..                 | 10                            | Do. D and E.              | 99-101*         | ..                  | 4 19 0                   |
| 100,000    | Stk.   | ..                 | —                             | Cape Town & Dis., Ltd.     | 3-4             | ..                  | ..                       | 398,490   | Stk.   | Apr. 29            | 7                             | Primitiva Ord.            | 72-74           | +½                  | 4 13 4                   |
| 100,000    | Stk.   | ..                 | 6                             | Do. 4½ p.c. Pref.          | 54-64           | ..                  | ..                       | 796,980   | Stk.   | June 29            | 5                             | Do. 5 p.c. Pref.          | 58-58½          | ..                  | 4 13 0                   |
| 50,000     | Stk.   | May 3              | 6                             | Do. 6 p.c. 1st Mort.       | 49-50           | ..                  | 6 0 0                    | 488,900   | Stk.   | June 1             | 4                             | Do. 4 p.c. Deb.           | 97-99           | ..                  | 4 0 10                   |
| 100,000    | Stk.   | June 29            | 4½                            | Do. 4½ p.c. Deb. Stk.      | 88-90           | ..                  | 5 0 0                    | 312,650   | Stk.   | June 29            | 4                             | River Plate 4 p.c. Deb.   | 97-99           | ..                  | 4 0 10                   |
| 157,150    | Stk.   | Aug. 12            | 5                             | Chester 5 p.c. Ord.        | 109-111         | +½                  | 4 10 1                   | 250,000   | Stk.   | Apl. 1             | 9                             | San Paulo, Ltd.           | 152-162         | ..                  | 5 10 9                   |
| 1,513,280  | Stk.   | ..                 | 5½                            | Commercial 4 p.c. Stk.     | 105-107         | ..                  | 4 17 2                   | 62,500    | Stk.   | ..                 | 6                             | Do. 6 p.c. Pref.          | 112-122         | ..                  | 4 18 0                   |
| 560,000    | Stk.   | ..                 | 5                             | Do. 3½ p.c. do.            | 101-103         | ..                  | 4 17 1                   | 125,000   | Stk.   | July 1             | 5                             | Do. 5 p.c. Deb.           | 51-52           | ..                  | 4 16 2                   |
| 475,000    | Stk.   | June 29            | 3                             | Do. 3 p.c. Deb. Stk.       | 80-82           | ..                  | 3 13 2                   | 135,000   | Stk.   | Mar. 16            | 10                            | Sheffield A.              | 234-236         | ..                  | 4 4 9                    |
| 800,000    | Stk.   | June 10            | 5                             | Continental Union, Ltd.    | 95-97           | ..                  | 5 3 1                    | 209,984   | Stk.   | ..                 | 10                            | Do. B.                    | 234-236         | ..                  | 4 4 9                    |
| 200,000    | Stk.   | ..                 | 7                             | Do. 7 p.c. Pref.           | 135-137         | ..                  | 5 2 2                    | 523,500   | Stk.   | ..                 | 10                            | Do. C.                    | 234-236         | ..                  | 4 4 9                    |
| 492,270    | Stk.   | ..                 | 5½                            | Derby Con. Stk.            | 122-124         | ..                  | 4 8 9                    | 70,000    | Stk.   | May 27             | 7                             | South African             | 11-11½          | ..                  | 6 1 9                    |
| 55,000     | Stk.   | ..                 | 4                             | Do. Deb. Stk.              | 104-105         | ..                  | 3 16 2                   | 6,429,895 | Stk.   | Aug. 12            | 5/9/4                         | South Met., 4 p.c. Ord.   | 120-122         | ..                  | 4 9 7                    |
| 148,995    | Stk.   | Apl. 1             | 5                             | East Hull 5 p.c. Ord.      | 96-98           | ..                  | 5 2 0                    | 1,895,445 | Stk.   | July 14            | 3                             | Do. 3 p.c. Deb.           | 79-81           | ..                  | 3 14 1                   |
| 486,090    | Stk.   | July 14            | 12                            | European, Ltd.             | 23½-24          | ..                  | 5 0 0                    | 209,823   | Stk.   | Aug. 31            | 8                             | South Shields Con. Stk.   | 153-154*        | ..                  | 5 3 11                   |
| 354,060    | Stk.   | ..                 | 12                            | Do. £7 ros. paid.          | 173-184         | ..                  | 4 18 8                   | 605,000   | Stk.   | Aug. 12            | 5½                            | S'th Suburb'n Ord. 5 p.c. | 120-122         | ..                  | 4 12 9                   |
| 16,179,445 | Stk.   | Aug. 12            | 4½                            | Gas 4 p.c. Ord.            | 105-106         | ..                  | 4 8 0                    | 60,000    | Stk.   | ..                 | 5                             | Do. 5 p.c. Pref.          | 120-122         | ..                  | 4 2 0                    |
| 2,600,000  | Stk.   | ..                 | 3½                            | light 3½ p.c. max.         | 87-89           | ..                  | 3 18 8                   | 117,058   | Stk.   | July 14            | 5                             | Do. 5 p.c. Deb. Stk.      | 121-123         | ..                  | 4 1 4                    |
| 4,062,235  | Stk.   | ..                 | 4                             | and 4 p.c. Con. Pref.      | 102-104         | ..                  | 3 16 11                  | 502,310   | Stk.   | May 12             | 5                             | Southampton Ord.          | 110-112         | ..                  | 4 9 3                    |
| 4,531,705  | Stk.   | June 29            | 3                             | Coke 3 p.c. Con. Deb.      | 80-82           | ..                  | 3 13 2                   | 120,000   | Stk.   | Aug. 12            | 7                             | Tottenham A 5 p.c.        | 136-138         | ..                  | 5 1 5                    |
| 258,740    | Stk.   | Mar. 16            | 5                             | Hastings & St. L. 3½ p.c.  | 94-96           | ..                  | 5 4 2                    | 483,940   | Stk.   | ..                 | 5½                            | and B 3½ p.c.             | 111-113         | ..                  | 4 17 4                   |
| 82,500     | Stk.   | ..                 | 6½                            | Do. do. 5 p.c.             | 117-119         | ..                  | 5 9 3                    | 149,470   | Stk.   | June 29            | 4                             | Edmonton 4 p.c. Deb.      | 57-59           | ..                  | 4 0 10                   |
| 70,000     | Stk.   | Apl. 29            | 11                            | Hongkong & China, Ltd.     | 17-17½          | ..                  | 6 5 9                    | 182,380   | Stk.   | June 10            | 8                             | Tuscan, Ltd.              | 9-9½            | ..                  | 8 8 6                    |
| 131,070    | Stk.   | Mar. 16            | 2½                            | Ilford A and C             | 147-150         | ..                  | 4 18 4                   | 149,900   | Stk.   | July 1             | 5                             | Do. 5 p.c. Deb. Red.      | 97-99           | ..                  | 5 1 0                    |
| 65,780     | Stk.   | ..                 | 5½                            | Do. B                      | 114-116         | ..                  | 5 1 3                    | 236,476   | Stk.   | Aug. 31            | 5                             | Tynemouth, 5 p.c. max.    | 111-113*        | +½                  | 4 8 6                    |
| 65,500     | Stk.   | June 29            | 4                             | Do. 4 p.c. Deb.            | 93-100          | ..                  | 4 0 0                    | 55,636    | Stk.   | Aug. 31            | 6½                            | Wands- B 3½ p.c.          | 136-138*        | +½                  | 4 17 10                  |
|            |        |                    |                               |                            |                 |                     |                          | 85,766    | Stk.   | June 29            | 3                             | worth 3 p.c. Deb. Stk.    | 73-75           | ..                  | 4 0 0                    |

Prices marked \* are "Ex div."

† Next dividend will be at this rate.



### Natural Gas: From Sussex to China.

Under this heading, the following remarks appeared in the "Chat on 'Change'" in the "Daily Mail" yesterday. "When the further attempt at financing the South of England natural gas enterprise of Heathfield, Sussex, was made some months ago, we had some criticisms to offer. Apparently by no means all the shares were placed by the Company, and the result is now one of the most curious circulars ever issued to a body of shareholders. It emanates, not from the Directors, but from the Asiatic Protection Society of Great Britain and China, Bank Chambers, 14, Shepherd's Bush Green! It explains that negotiations are proceeding between the Society and the South of England Natural Gas and Petroleum Company, Limited, 'for the purpose of introducing the various governors and officials of the districts of China to the South of England Natural Gas Company, and inducing them to accept this Company as the principal exploration company for the purpose of exploring and developing the natural gas resources in China.' According to this remarkable circular, the shareholders must understand clearly that it is not sent out 'as an inducement by us for you to obtain more shares.' Several foreign banks have been approached in the matter of taking up the shares; and the Asiatic Protection Society thinks it only fair that the shareholders of the South of England Natural Gas Company should have the first refusal of the balance. It does not definitely say whether the several foreign banks have refused or not. 'When the Company have obtained the necessary capital and have sunk their 2000-feet shaft, there will be a great surprise, which we are perfectly certain will drive the shares to a high premium; and it would then be a pity for the Continental holders to reap the benefit.' It is scarcely necessary to quote more from the amusing circular. It seems to us to make it clear that, far from subscribing for any more shares, the shareholders had better take the opportunity of getting rid of those they have to the 'several foreign banks'—that is, if any such opportunity is presented."

**Inclined Retorts at Wolverhampton.**—At the recent half-yearly meeting of the Wolverhampton Gas Company, the Chairman (Mr. B. Orlando Clark), in moving the adoption of the report, which showed a net profit of £10,406, remarked that it was slightly better than last year—a condition of things they all hoped would continue. The balance carried forward was better than the previous one; and he was able to assure the shareholders that the works (under the supervision of Mr. P. G. Winstanley, the Manager) had been kept thoroughly in order. The new sloping retorts were working more satisfactorily than ever; and it was worth mention that every time they replaced them—whether or not it was because the men got to understand the building of them better he could not say—they made more gas with the same quantity of coal. The report was adopted; and it was agreed to declare dividends at the rates of 3 per cent. on the preference stock, £5 2s. 6d. per cent. on the consolidated stock, and £3 2s. 6d. per cent. on the new ordinary stock, less income-tax.

**The Supply of Gas to Derbyshire Villages.**—The Company recently formed to acquire the gas-works at Chapel-en-le-Frith from the owner, and to put down new works for the supply of gas to Chinley, Bugsworth, and district, will pay £12,500 for the existing undertaking at Chapel-en-le-Frith. There is also an agreement to the effect that the Company shall sell their undertaking to the District Council, should that body at some future time decide to purchase the same. It is proposed by the Company to construct new works at Bugsworth, and to ultimately extend the gas supply to Dove Holes.

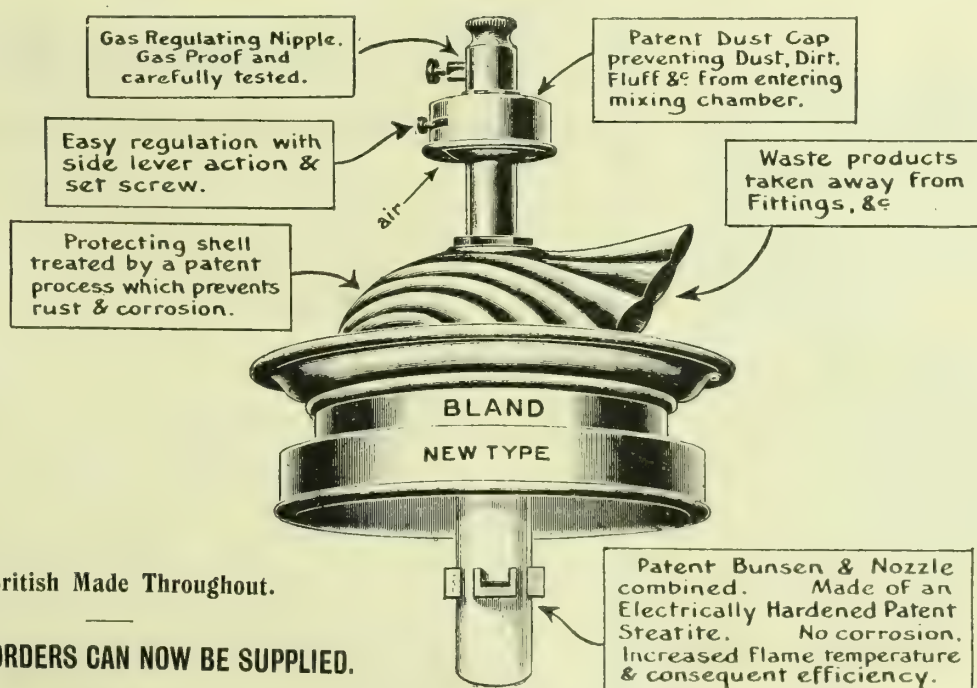
**Ottoman Gas Company, Limited.**—At the meeting of this Company next Tuesday, the Directors will report that the gas-rental for the six months ended the 30th of June amounted to £18,607, compared with £17,082 for the first half of 1909. The net profit is £4205, against £4203. The amount standing at the credit of the profit and loss account is £11,971; and the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free, leaving a balance of £9076 to be carried forward.

**Bodmin Gas Company.**—The annual general meeting of this Company was held on the 26th ult.—Mr. H. D. Foster in the chair. In moving the adoption of the Directors' report, he said the financial position of the Company was much more satisfactory now than it was this time last year. The policy of the Board had been to bring the works up to date, and in this they had had the excellent assistance of the Manager (Mr. R. Greenaway), to whom they were indebted. Having dealt with various items in the balance-sheet, the Chairman referred to the fact that the quantity of gas unaccounted for was now only 8.17 per cent.; whereas it had been as high as 13 per cent. and upwards. The report was adopted; and dividends of 7s. 4d. per share on the ordinary shares and 1s. 7d. per share on the "B" shares—equal to 8 per cent., the same as last year—were declared.

**Improvements at the Camborne Gas-Works.**—Speaking at the annual meeting of the Camborne Gas Company on the effect of the improvements carried out at the works, Mr. S. J. Ingram, of Truro, the Consulting Engineer to the Company, said they had had an increase in every direction. Notwithstanding competition by other illuminants, the sale of gas last year was no less than 3 million cubic feet in excess of that of the previous twelve months. Several large consumers had been added, and no fewer than 300 small ones. The output of coke increased by upwards of 1000 tons; and there was additional profit from the sulphate of ammonia plant. On the other hand, there had been an increase in the expenditure on repairs. This money had been wisely and judiciously laid out. They had commenced a systematic overhauling of the meters—a very necessary thing, for 95 per cent. of those which were defective were registering against the Company. Mr. C. Bryant, one of the Directors, remarked that the whole of the improvements had been carried out without a single charge by the contractors for extras. This was remarkable evidence of the care with which the plans and specifications were drawn up.

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**Harrow and Stanmore Gas Company.**—At the half-yearly meeting of this Company yesterday, the Directors reported the continued progress of the undertaking. The balance on the profit and loss account was £10,677; and the Directors recommended dividends for the six months ended the 30th of June at the rates of £10 10s., £7 7s., and £7 per cent. per annum on the three classes of capital and guaranteed shares, all less income-tax, and the addition of £458 to the reserve fund. This will leave £4885 to be carried forward.

**Gas in Iceland.**—According to a paragraph in the "Daily Mail," at a recent meeting of the Town Council of Reykjavik, the capital of Iceland, half of the members of which are women (the Mayor having the casting vote), the question under consideration was whether the town should be lighted by gas or by electricity. The women voted unanimously for gas, in order that they might utilize it in cooking-stoves. The men went solid for electricity. The Mayor was in a dilemma; but he finally gave his vote for the women. It is stated that arrangements are now being made for the manufacture of gas.

**Elsecar, Wentworth, and Hoyland Gas Company.**—At the annual general meeting of this Company on Wednesday week, the Directors reported that the quantity of gas manufactured during the year ended the 30th of June showed a decrease of 723,800 cubic feet; while the sale was down by 559,500 cubic feet. There was a decrease of 1,751,900 cubic feet through ordinary meters; but prepayment meters showed an increase of 1,160,200 cubic feet, and the public lamps one of 26,200 cubic feet. The amount of profit for the year was £1292, which, with the balance from last year, made £1213. The net profit was £2506, from which the Directors proposed to pay a dividend of 10 per cent. per annum, less income-tax, and carry the balance forward. During the year, the Hoyland Nether Urban District Council approached the Company, and made terms for the sale of their undertaking; but when the Council appealed to the ratepayers for permission to promote a Bill, it was refused by an overwhelming majority. The Council afterwards let the matter drop.

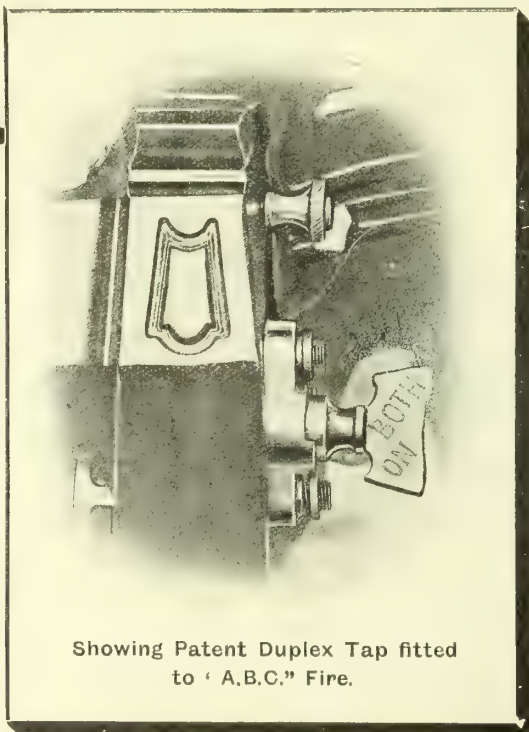
**Southend Gas Company.**—At the half-yearly meeting of this Company last Tuesday, the Directors reported that the balance on the profit and loss account for the six months ended the 30th of June was £10,227; and they recommended the payment of dividends at the rate of 5½ per cent. per annum on the original consolidated and new ordinary stocks, and of 5½ per cent. per annum on the new ordinary "B" stock (less income-tax), amounting together to £7303, and leaving £2924 to be carried forward. The increased sale of gas during the half year, as compared with the corresponding period of 1909, was 3,841,100 cubic feet, or equal to 2·43 per cent. The number of consumers increased by 649; there being now 12,705, of which 9088 are on the prepayment system. A reduction of 2d. per 1000 cubic feet in the price of gas was made from Lady Day last. The report of the Engineer and Manager (Mr. F. Clark) for the half year was to the effect that the plant was in efficient condition. Additions and improvements had been effected, and were in course of progress, which would reduce the cost of working. The report was adopted.

**Rugby Gas Company.**—The half-yearly meeting of this Company was held last Wednesday—Mr. A. J. Lawrence presiding. In their report, the Directors stated that the receipts on revenue account for the six months ended June 30 amounted to £12,131, and the expenditure to £8291; leaving £3840 to be carried to the profit and loss account. The net balance was £13,958; and the Directors recommended a dividend for the half year on the original share capital at the rate of 14½ per cent. per annum (less income-tax), amounting to £2560; and likewise a dividend on the additional capital at the rate of 11½ per cent. per annum, which would amount to £303. The report was adopted.

**Bishop's Stortford and District Gas Company.**—At the ordinary general meeting of this Company last month, the Directors reported that, compared with the six months ended the 30th of June, 1909, there was an increase of 690,400 cubic feet, or 2·9 per cent., in the sale of gas in the past half year; and that the sale of residuals had brought a better return. There was a disposable balance of £2041; and the Directors recommended the payment of dividends at the rates of 4 and 5 per cent. per annum on the preference stocks, and of £7 15s. and £7 10s. 6d. per cent. per annum on the original and additional ordinary stocks, less income-tax. These dividends required £1224, and left a balance of £817 to be carried forward. The Directors expressed their pleasure in reporting that the Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill had received the Royal Assent. By the provisions of the Act, the amalgamation of the undertakings belonging to the Bishop's Stortford, Harlow and Sawbridgeworth, Epping and Ongar Gas Companies, and the purchase of those belonging to the Newport and Much Hadham Gas Companies, will take effect on and from Jan. 1, 1911.

**The Water Question in the Rhymney Valley.**—At a recent private meeting of the Gelligaer Urban District Council, it was decided to join the Caerphilly District Council in promoting a Bill next session for the purchase of the undertaking of the Rhymney and Aber Valleys Gas and Water Company, to which reference was made last week (p. 598). Mr. Raikes (Messrs. Wilcox and Raikes, of Birmingham) was present. It transpired that, in accordance with a report made by him to a previous joint conference of the authorities in the Rhymney Valley, efforts should be made to get a sufficient water supply for Caerphilly and the lower portions of Gelligaer from the Merthyr Corporation, who own the Taf Fychan source, which is regarded as the finest in South Wales. There is a surplus supply here to meet the demands of three times the present population of Merthyr and afterwards satisfy the needs of the inhabitants of the valley. It was reported at the meeting that a joint conference between the deputation from the valley and the members of the Corporation had been held the previous day; but that Merthyr put on a prohibitive charge for the surplus water. The members of the Gelligaer Council strongly denounced this dog-in-the-manger policy, and decided that, in the event of Merthyr not coming to a more amicable arrangement, a new and independent source of supply should be tapped near the Brecon Beacons.

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**Woking Water and Gas Company.**—At the meeting of the Company yesterday, the Directors reported that the balance at the credit of the profit and loss account for the six months ended the 30th of June was £5326, out of which they recommended the payment of a dividend at the rate of 5 per cent. per annum (less income-tax) for the half year. This would absorb £3961, and leave £1365 to be carried forward. During the six months, 84 additional house and 15 meter connections were made; and the mains were extended by about 3305 yards.

**The Fire at the Brussels Exhibition.**—In view of what has been said in the "JOURNAL" on this subject, we give, under reserve, a statement which appeared in the papers last week, to the effect that the Electric Supply Publicity Committee, of Moorgate Court, E.C., have had the personal assurance of the Engineer and Director of the Electrical Department of the City of Brussels, that the fire was not caused electrically, and, further, that the supply of electricity had been cut off in the buildings where the trouble started some hours prior to the commencement of the fire.

**Watford Gas Company.**—At the recent half-yearly meeting of this Company, the Chairman (Mr. E. J. Slinn), in moving the adoption of the Directors' report, referred to the low cost of producing gas (£450 per million cubic feet), and to the increased make per ton of coal compared with ten years ago. It was then 10,400 cubic feet, whereas now it was 12,500 feet. The sale of gas had realized £500 less than before; but as the price had been reduced 2d. per 1000 feet since the previous meeting, the Company were actually £400 better off. This showed that their customers always responded well to a decrease in price. The co-partnership scheme had been very successful; practically the whole of the staff having gone in for it. The report showed a profit of £4101 on the revenue account, and a balance of £6284 available for distribution; and the Chairman proposed that dividends of 7½ and 5½ per cent. be declared for the past half year. This was agreed to.

**Leigh-on-Sea Gas Finances.**—At the meeting of the Leigh-on-Sea Urban District Council last Wednesday, the Gas Committee reported that they had considered the statement of the amount overspent on the gas capital account—viz., £2442—and suggested that the Finance Committee should be asked to recommend that application be made to the Local Government Board to sanction the borrowing of £1442 to repay part of the total, and that the remaining £1000 be debited to the gas revenue account. The Finance Committee, however, were of opinion that, inasmuch as the proposed course would be at variance with the previous decision of the Council, they could not properly recommend its acceptance. The Gas Committee added that they had considered the question of the sums which would be likely to be required for works chargeable to capital and new stock during the ensuing twelve months, and had resolved to ask the Finance Committee to recommend that application be made to the Local Government Board for sanction to a loan of £3881. The Finance Committee approved this proposal. A long discussion took place on the matter; but in the end the recommendation was approved—some of the items, however, being increased to allow for contingencies.

**Suicide by Gas.**—At an inquest at St. Pancras on the body of James Gilby, a carman, who died of coal-gas poisoning, a daughter stated that deceased worried through losing his work. She found him on the floor of his room with an overcoat over his head, and under this a pillow-case, in which was a gas-ring. The tap was turned full on.

**Cost of Water Diviners.**—The Chairman and several members of the Redcar Urban Council recently received notice to meet the official auditor with reference to certain items of expenditure which it is understood may be surcharged against those who signed cheques. Some of the items relate to the engagement of a water diver to advise the Water Committee as to new sources of supply for the parish.

**Bideford Water Supply.**—It was decided by the Bideford Town Council at their last meeting to apply to the Local Government Board for permission to borrow £2000 for the purpose of relaying the water-mains. It was urged by some of the councillors that the provision of a more adequate supply of water was of great importance. The Mayor (Mr. J. Heywood) said the relaying of the mains was necessary, apart from the question of the improvement of the supply, and to defer it would be a great blunder. A long time would elapse before a new supply could be obtained and brought into use; but the mains could be relaid as opportunity served, and the work spread over a longer or shorter period.

**Bolton's Increased Water Charges.**—The proposal of the Bolton Corporation to increase the charge for water for trade purposes from 6d. to 9d. per 1000 gallons to Bolton consumers, and from 9d. to 1s. 1½d. to out-district consumers, is being opposed by the authorities in the several districts included in the supply area of the Corporation. At a conference of representatives of the out-districts, a deputation was appointed to wait upon the Water Committee, to protest against the proposed increase in the charges; and Counsel's opinion is to be obtained as to the legality of the Corporation charging consumers in the borough only 6d. per 1000 gallons, whereas the cost to themselves was 6½d.—the deficiency being made up by the extra charge to consumers outside the borough.

**Hartlepool Gas and Water Supply.**—At the annual meeting of the Hartlepool Gas and Water Company last Tuesday, the report of the Directors showed that the total receipts on revenue account for the year were £86,346, and the expenses £50,481; leaving a balance of £35,865 to the credit of the profit and loss account. Of this sum, £3339 had been paid for interest on loans, and £15,822 as interim dividend. The Directors recommended that out of the balance of £16,704 the sum of £750 should be appropriated to meet the cost of the renewal of water-mains, and a dividend paid for the past half year at the rate of 5 per cent. per annum, less income-tax. The Directors reported that the trade of the district, while showing some slight improvement, was still far from satisfactory. It was gratifying, however, to note that through the local iron-works being fully employed, there had been an increase in the consumption of water. The reservoirs and wells continued to yield a supply much in excess of present requirements. The report was adopted.

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**Effect of the Tarring of Roads.**—The "Estates Gazette" says: "We never remember to have seen the highways of England in such comparatively splendid condition as they have been during the summer that is nearing its close. The tarring of roads must be given credit for a very great deal of the vastly improved condition of things."

**Leakage of a Reservoir Caused by Moles.**—Considerable trouble has been caused at Totnes by the leaking of the Bowden reservoir. The Water Committee of the Corporation recently visited the place and had the ground opened, with the result that they came to the conclusion that the leakage was caused by moles burrowing in the bank. It was decided that a sheet of iron of thick gauge should be put in on each of the clay dams, and be well puddled with clay. By this means it is hoped to exclude the moles and prevent the leakage, which has been going on for some years.

**New Joint Stock Companies Registered.**—The Chapel-en-le-Frith, Chinley, and District Gas Company, Limited, has been registered with a capital of £20,000, in £1 shares, to acquire from Mr. W. Walker, of Gomersal, the undertaking known as Chapel-en-le-Frith Gas-Works, Derby, including the benefit of the Chapel-en-le-Frith Gas Order, 1876. The United Lighting Maintenance Company, Limited, has been registered with a capital of £2000, in £1 shares, to take over the business of electricians, &c., carried on by S. Mundler at No. 35, Cock Lane, E.C., as the National Lighting Company.

**Another Lamplighting Device.**—According to an article in the "South Wales Echo" for the 29th ult., two Cardiff watchmakers have patented a device for lighting incandescent street-lamps simultaneously by touching an electric button. It is claimed by the inventors that all the street-lamps in the borough, or in any particular area, can be lighted or extinguished simultaneously by their invention, which can also regulate the quantity of gas admitted to the burner. The proposal involves, of course, the connection of all the gas-lamps by electric wires with the central station. It is stated that a small apparatus placed in every lamp will, when the current is sent through by pressing a button at the central station, turn on the gas and create a spark just sufficient to ignite it.

**Wallasey Water Supply.**—The Wallasey Urban District Council, whose area comprises the rapidly developing places of New Brighton, Liscard, Egremont, Seacombe, and Wallasey, have recently received a Charter of Incorporation. Up to eight years ago, the district derived its water supply from deep wells sunk on the confines of the district. But the phenomenal growth of all the townships caused them to apply to the Liverpool Corporation for a supply of water from their Vyrnwy system; and a pipe-line, 30 miles in length, was laid from the Vyrnwy aqueduct, where it passes through Delamere Forest, to the Wallasey boundary at Leasowe. The Wallasey Council have been taking, up to the present, 500,000 gallons of water daily; but the Water Committee have passed a resolution asking for an increase to 750,000 gallons. The agreement between the Liverpool Corporation and Council provides for an ultimate delivery of 2 million gallons per day.

**City of Chichester Gas Company.**—At the half-yearly general meeting of this Company last Tuesday, the accounts presented showed a balance of £1961 standing to the credit of the profit and loss account, out of which the Directors recommended dividends at the rates of £8 and £5 12s. per cent. per annum, less income-tax. They expressed regret that the Chichester Corporation had given notice to determine the existing contract (dated Dec. 10, 1909) for lighting the public lamps of the city, at the end of the first year of the term of five years therein mentioned. The Engineer (Mr. T. Ebenezer Pye, F.C.S.) reported that the works and mains were in good repair and condition. The Chairman (Mr. Alfred Lass), in moving the adoption of the report, referred at great length to the action of the Corporation in accepting the tender of the Electric Light Company; but, in reply to a question, he said that, in consequence of the low price at which the Company had supplied gas for public lighting, the termination of the contract would have very little effect upon the profits. The report was adopted.

The Directors of the Antwerp Water-Works Company, Limited, announce their intention to pay an interim dividend of 5½ per cent. for the half year ended the 30th of June.

At a meeting of the Water Committee of the Manchester Corporation last Thursday, it was reported that, estimating the average daily consumption of water at 42,000,000 gallons, there was in stock a supply equal to 128 days.

A proposal has been made by the Frimley and Farnborough Water Company to extend their service so as to connect Hook with the Eversley district. An application in connection with this suggested extension is now being considered by the Hartley Wintney Parish Council.

The bursting of a 3-inch water-main caused both consternation and inconvenience to the inhabitants of the Stoke Road district, Slough, on Wednesday last. The discovery was made owing to a subsidence in the centre of the roadway; and when an examination took place, it was found that one length of pipe had snapped off owing to the loosening of the earth below and the giving way of planks which were put in some time ago when the sewer was laid underneath the water-main. In some places, there was a dropping of the surface to the extent of 2 feet.

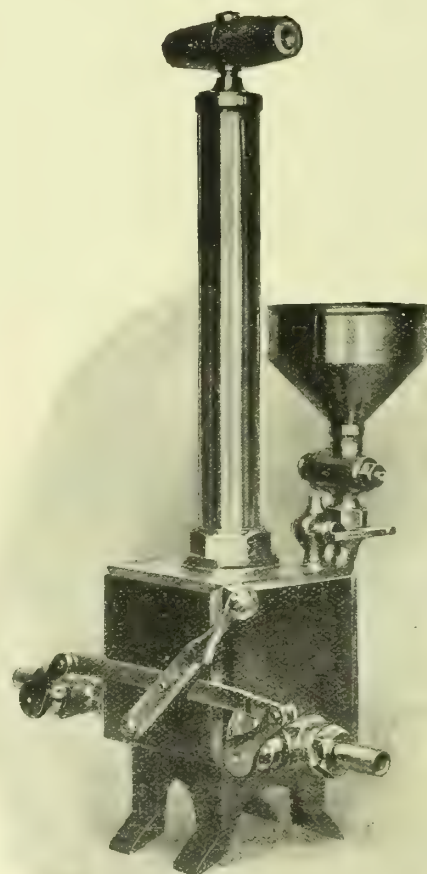
Early on the morning of the 23rd ult., a fire occurred in the historic hostelry, the Star Hotel, at Newport (I. of W.), which destroyed the building and the Friendly Societies' Assembly Hall connected with it, and jeopardized the lives of the tenant, Mr. E. H. Walker, his young daughter, and the barmaid. The premises were left apparently safe when Mr. Walker and the others retired for the night; and there having been no fire or gas light in the part of the premises where the outbreak seemingly occurred—the private room behind the bar—it is conjectured that the electric light wires fused, and caused the fire. The electric light had become defective, and orders had been given for the overhaul of the installation.

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specially equipped for Systematic Instruction.  
Prospectus may be had free on Application from the  
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The next Session begins on Oct. 4, 1910, on which day  
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W. F. HUSBAND,  
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The one Machine which Discharges and Charges  
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**SALE OF STREET LAMPS, &c., BY PRIVATE**  
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**THE Carmarthen Town Council have**  
for DISPOSAL about 230 STREET GAS LAMPS,  
COLUMNS, and BRACKETS, and a Number of IN-  
CANDESCENT BURNERS. Offers are invited for  
the whole or part. All Particulars can be obtained at  
the Borough Surveyor's Office, John Street.  
Tenders, marked "Tenders for Lamp Posts, &c.," to  
be sent to the undersigned not later than the 15th of  
October, 1910.  
The highest or any Tender not necessarily accepted.  
JAMES JOHN,  
Town Clerk.

Town Clerk's Office, Carmarthen,  
Aug. 18, 1910.

**COUNTY BOROUGH OF DEVONPORT.**  
(GAS DEPARTMENT.)

**TENDERS are invited for the Supply**  
and Erection of Two 60,000 Cubic Feet EX-  
HAUSTERS.  
Further Particulars may be obtained from the  
undersigned.  
Tenders, endorsed "Exhausters," addressed to the  
Town Clerk, Devonport, must be delivered on or before  
Sept. 10, 1910.  
W. P. TERVET,  
Engineer and Manager.



**OFFERS** wanted for the Files of the "JOURNAL OF GAS LIGHTING," "GAS WORLD," and "CHEMICAL TRADE JOURNAL," for the Years 1905 to 1909, inclusive, unbound.  
Address BROTHERTON AND COMPANY, LIMITED, City Chambers, LEEDS.

**CITY AND COUNTY BOROUGH OF BELFAST.**  
(GAS DEPARTMENT.)

**TENDERS** are invited for the Supply of DRY METERS (Ordinary and Prepayment), also GAS COOKERS, HEATING STOVES, &c., for One Year from the 1st of October, 1910.

Conditions and Forms of Tender may be had on Application to the Engineer and Manager at the Gas-Works.

Tenders, endorsed "Tender for Meters," or "Tender for Gas Appliances," will be received by the undersigned not later than Twelve o'clock, on the 16th of September, 1910.

The lowest or any Tender not necessarily accepted.

R. MEYER,  
Town Clerk.

**COKE.**

**THE Directors of the Wandsworth and Putney Gaslight and Coke Company** invite TENDERS for the Removal of about 15,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth, between Oct. 1 next and March 31, 1911.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than Sept. 16.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,  
Secretary.

Wandsworth and Putney Gaslight  
and Coke Company, Fairfield Street,  
Wandsworth, S.W.

**CORPORATION OF GLASGOW.**  
(GAS DEPARTMENT.)

**THE Corporation** invite Tenders for Supplying the following MATERIALS, as may be required by the Gas Department, for Twelve Months from date of acceptance—viz:

1. Birch Brooms.
2. Brass Couplers and Stop Cocks.
3. Cast-Iron Pipes and Special Castings.
4. Cast-Iron Retort Mountings and other Castings.
5. Cast-Iron Screwed Saddles, and Double Faucet Stop Cocks.
6. Corks and Bungs.
7. Gas Hot-Plates for Kitchen Ranges.
8. Gun-Metal, &c., Castings.
9. Hay.
10. Limestone.
11. Malleable Iron Tube and Fittings.
12. Malleable and Cast Steel Castings, Bogie Wheels, and Rake Heads.
13. Meter Boards and Wood Rhones.
14. Tin Pans and Grids.

Also TENDERS for:—

1. Cartage of Ashes, &c., at Provan and Tradeston Gas-Works.
2. Cartage for Street Mains and Workshops Departments.

Specifications and Forms of Tender may be obtained, and Samples examined, on Application to Mr. Alex. Wilson, Gas Engineer, 45, John Street, Glasgow.

Sealed Tenders, marked outside "Gas Department, Tender for —," must be lodged with the Subscriber, on or before Tuesday, the 27th of September current.

The lowest or any Tender may not necessarily be accepted.

A. W. MYLES,  
Town Clerk.

City Chambers, Glasgow,  
Sept. 3, 1910.

**BRITISH GASLIGHT COMPANY, LIMITED.**

**NOTICE** is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 21st inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect Two Directors in the place of those who go out by rotation; and to appoint Two Auditors.

NOTICE is HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 10th inst. and RE-OPENED on the 22nd inst.

By order of the Court of Directors,

A. W. BROOKES,  
Secretary.

Chief Office: No. 11, George Yard,  
Lombard Street, London, E.C.  
Sept. 2, 1910.

**OTTOMAN GAS COMPANY, LIMITED.**

**NOTICE** is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 13, 1910, at One o'clock precisely, to receive the Report of the Directors, and Statement of Accounts for the Half Year ended the 30th of June last; to declare a Dividend; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Sept. 6, to Sept. 13, both days inclusive.

By order of the Board,

THOMAS GUYATT,  
Secretary.

9, Queen Street Place,  
Cannon Street, London, E.C.,  
Aug. 30, 1910.

**SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS** beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

**THE Owners of British Patents Nos.**

20,643, of 1906, entitled "IMPROVEMENTS IN AND CONNECTED WITH HIGH PRESSURE AND OTHER BUNSEN BURNERS," and 21,158, of 1906, entitled "IMPROVEMENTS IN BUNSEN BURNERS FOR ILLUMINATING AND HEATING PURPOSES," are desirous of DISPOSING of the Patents or Entering into a WORKING ARRANGEMENT, under LICENSE, with Firms likely to be interested in the same. In the alternative, the Owners would be open to consider Proposals to MANUFACTURE THE INVENTIONS, to fill any requirements of the Market in Great Britain, on Terms to be arranged. The Patents cover Inventions interesting to Gas Burner Makers, especially those suitable for High-Pressure Gas for Heating purposes. Detailed Information as to the inventions will be found in the Patent Specifications, of which copies will be supplied to any interested party on request.

Full Particulars can be obtained from, and Offers made (for transmission to the Owners) to, MARKS AND CLERK, 57 & 58, Lincoln's Inn Fields, LONDON, W.C.

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Sperm Value 87.8-85 lbs. per Ton.

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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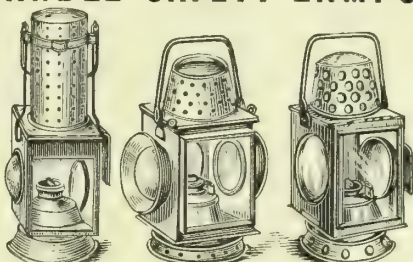
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1. 20-Candle Power more light without increase in the consumption of gas.
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3. Automatic Gas Regulator, ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. Accurate Regulation of the Air Supply.
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6. The brass casing is heatproof, and, it occasionally cleaned with warm water, will not become discoloured.

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From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

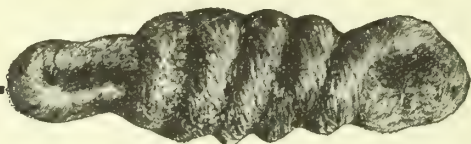
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**VOL. CX.**

OF THE

**JOURNAL OF GAS LIGHTING,  
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Every Skein of equal weight and length.  
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Lead Wool requires no melting and can be used in water without risk.

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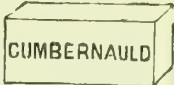
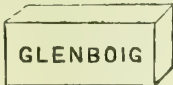
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Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

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	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362 F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. — I am, yours faithfully,

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List of Munich Chamber Furnaces in Operation and under Construction:—

TOWNS.	No. of Settings.	Coal capacity per 24 hours.	No. of Chambers.	TOWNS.	No. of Settings.	Coal capacity per 24 hours.	No. of Chambers.
Munich, Kierchstein	5	48'5 Tons	15	Rome	20	350 Tons	60
Munich, Moosach (1st Order)	6	117 "	18	Paris, Genevilliers	20	272 "	60
Munich, " (2nd Order)	6	117 "	18	Leipsiz, Connewitz	8	156 "	24
Hamburg, Grassbrook (1st Order)	10	195 "	30	Hanau	8	110 "	24
Hamburg, " (2nd Order)	14	310 "	42	Regensburg	5	87 "	15
Berlin, Tegel	27	526 "	81				

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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

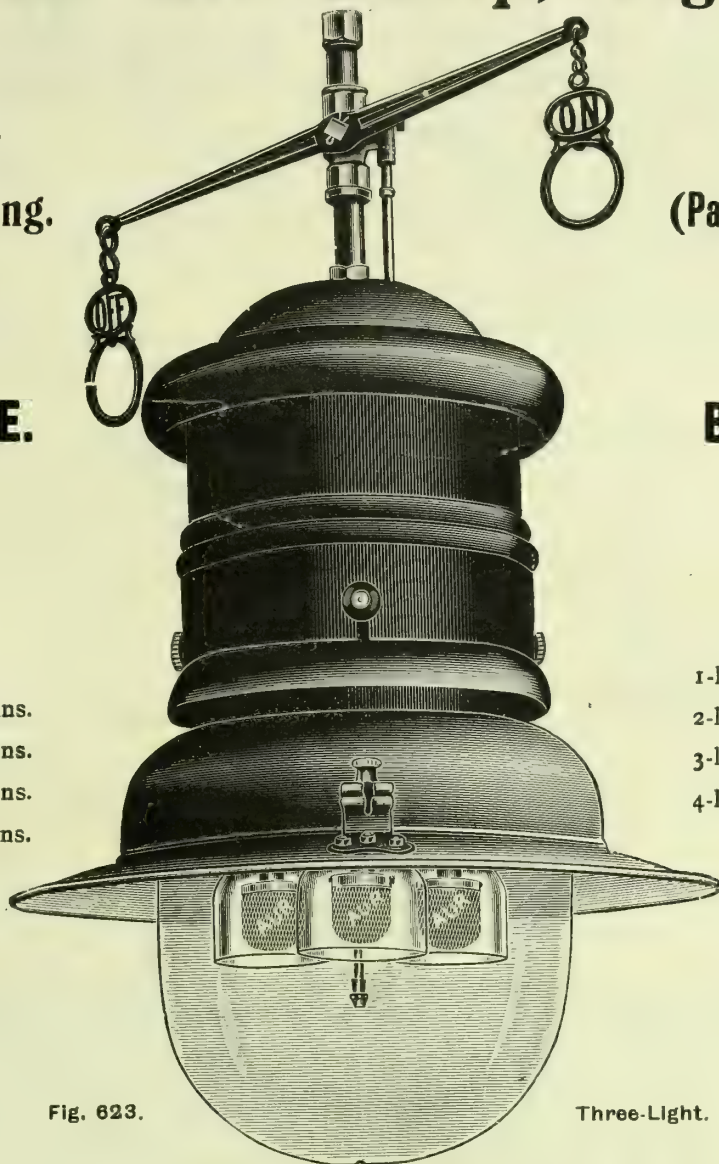


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, 4½d. each, or 4s. 3d. per dozen,				subject as usual.

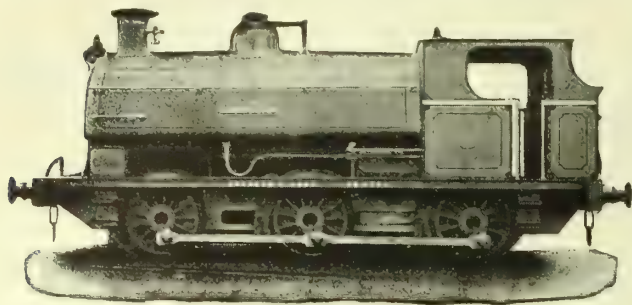
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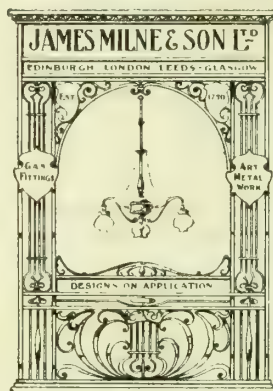
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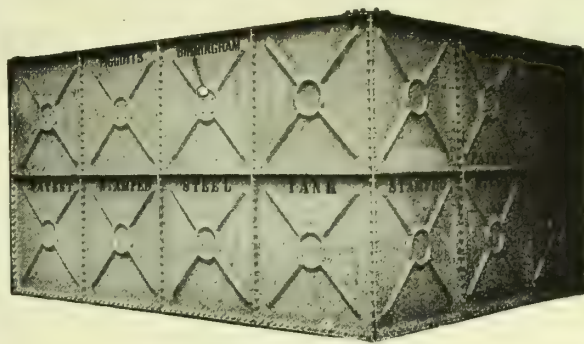
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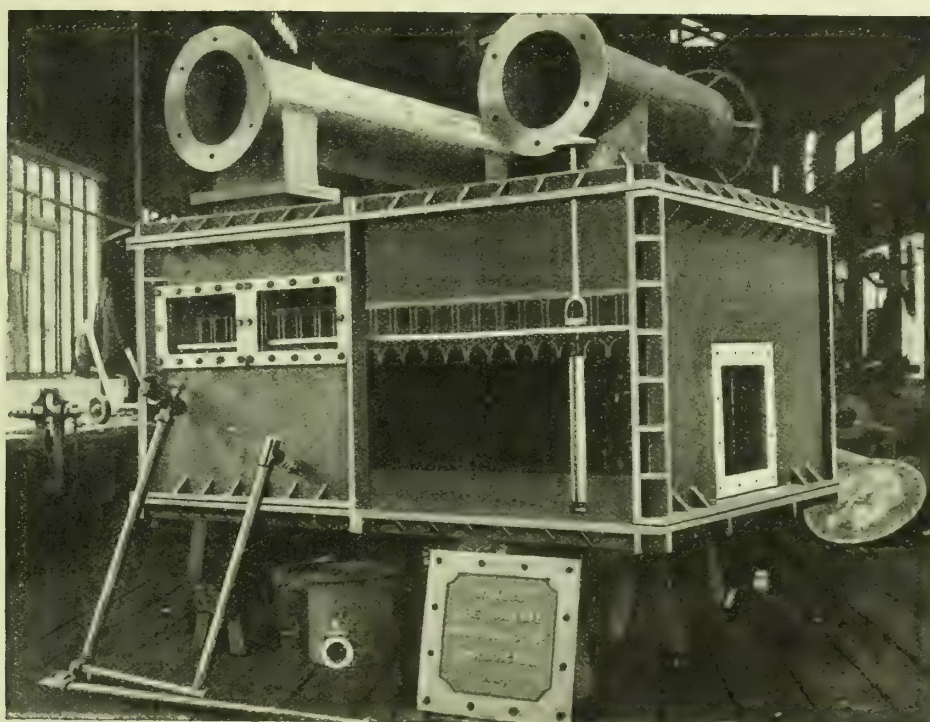
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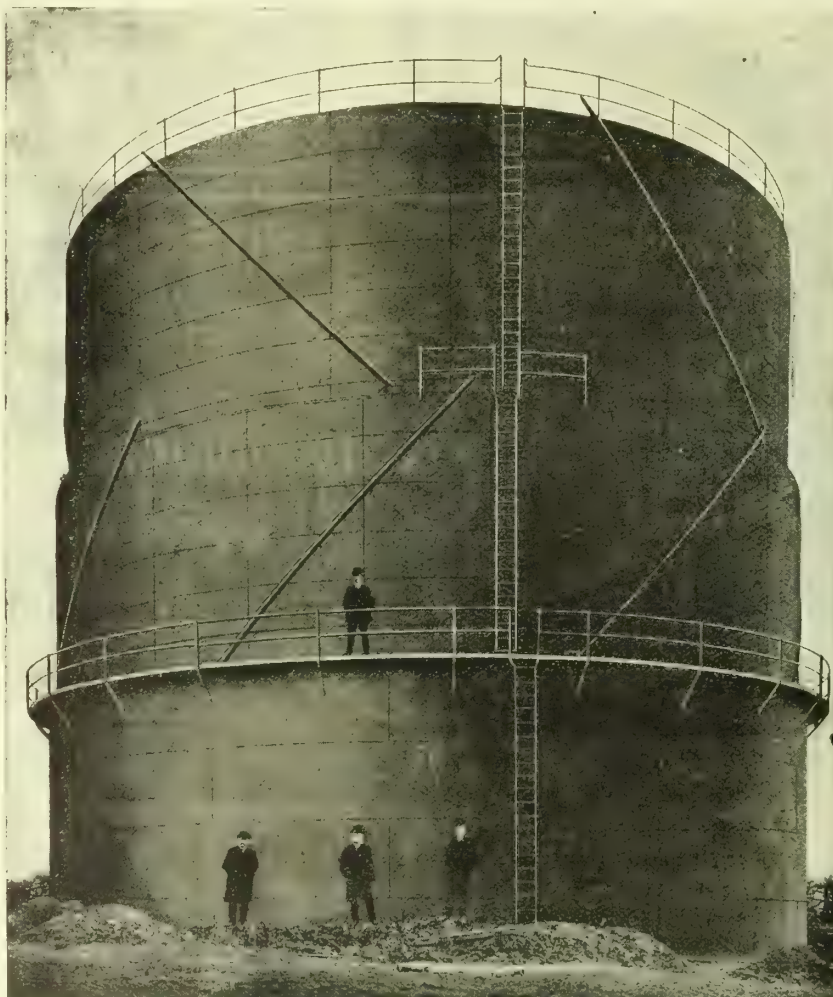
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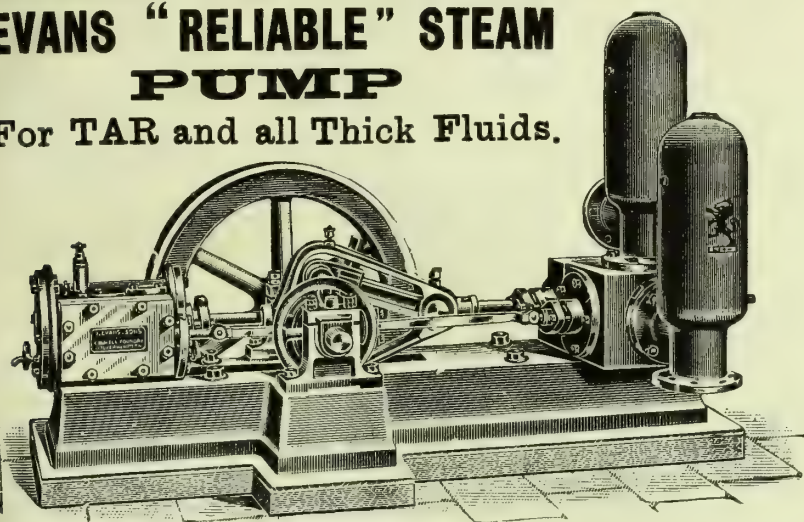
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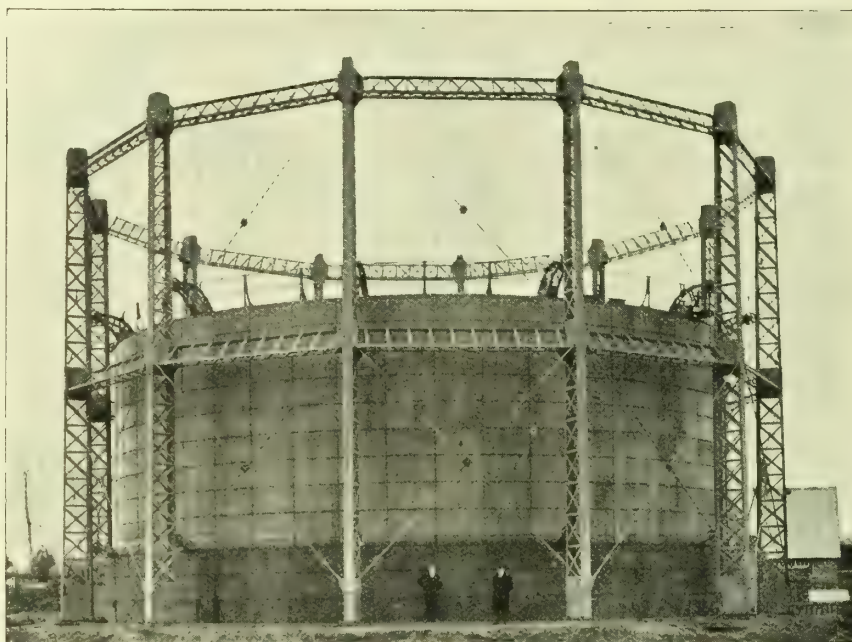
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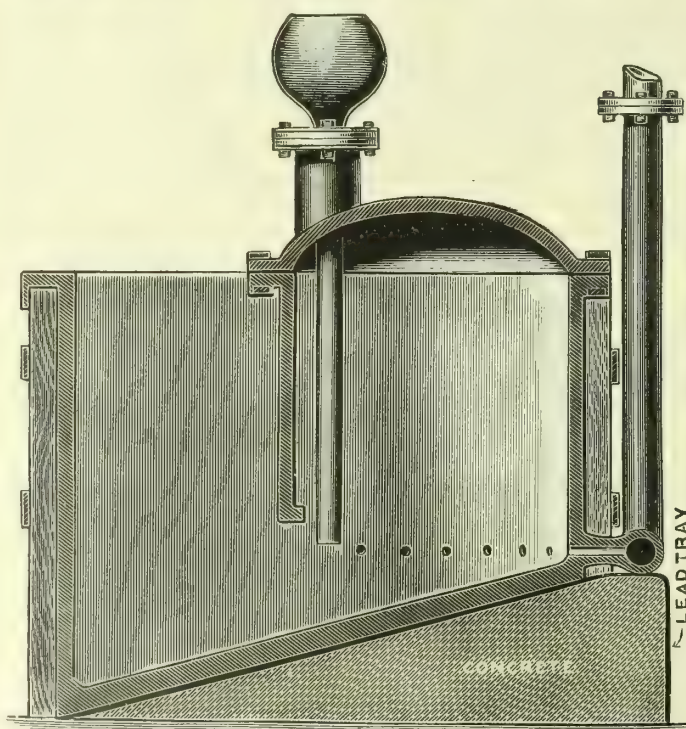
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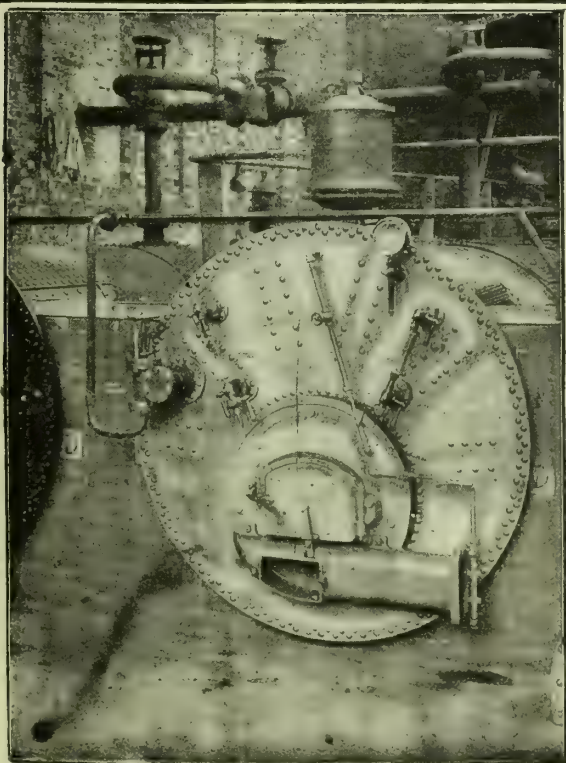
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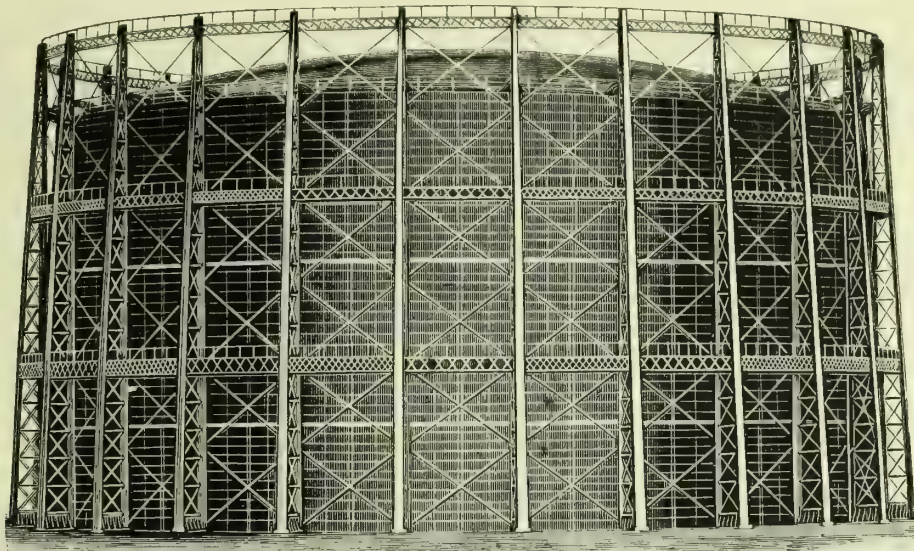
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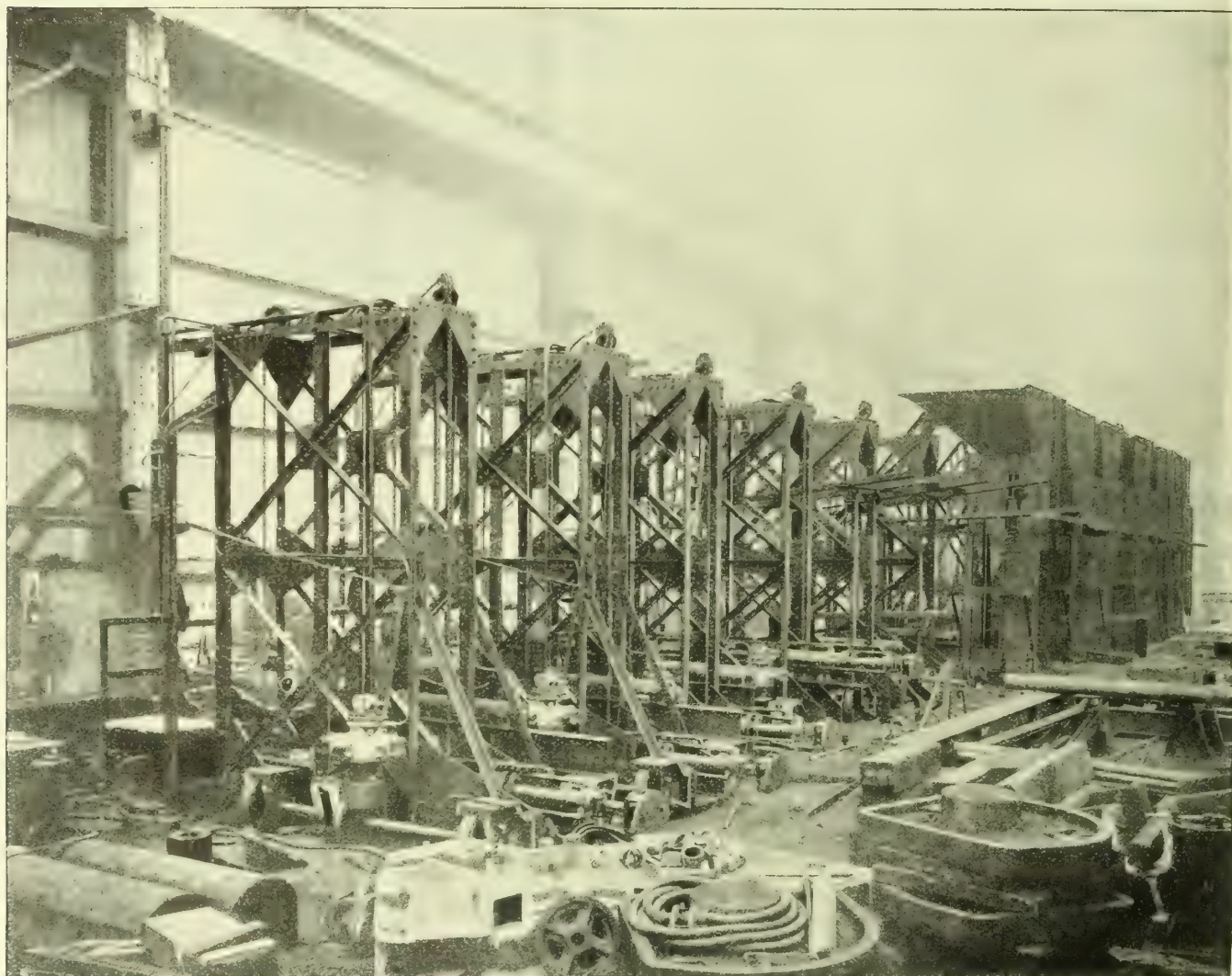


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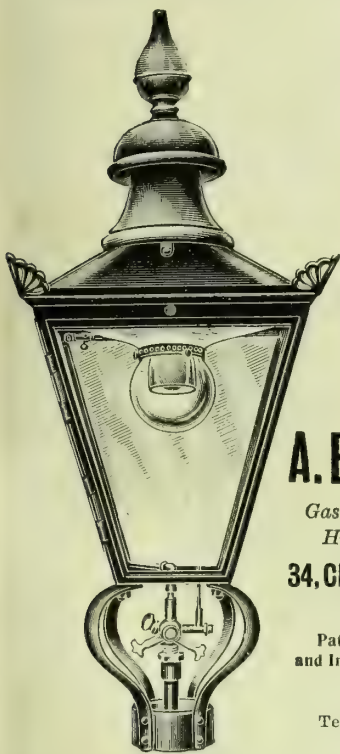
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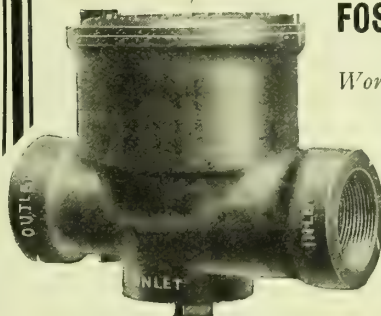
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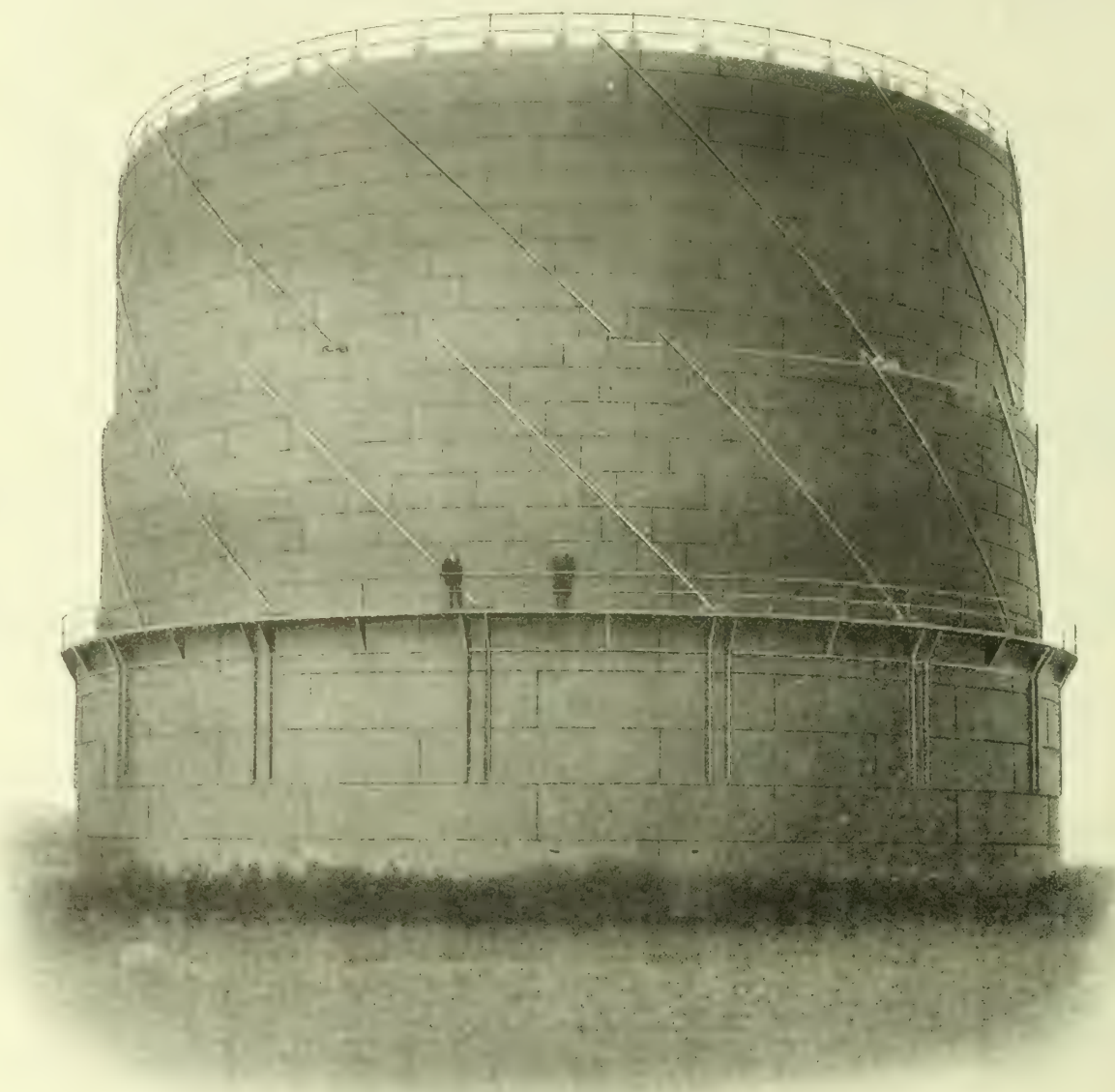
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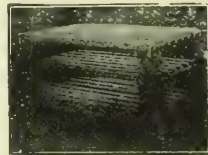


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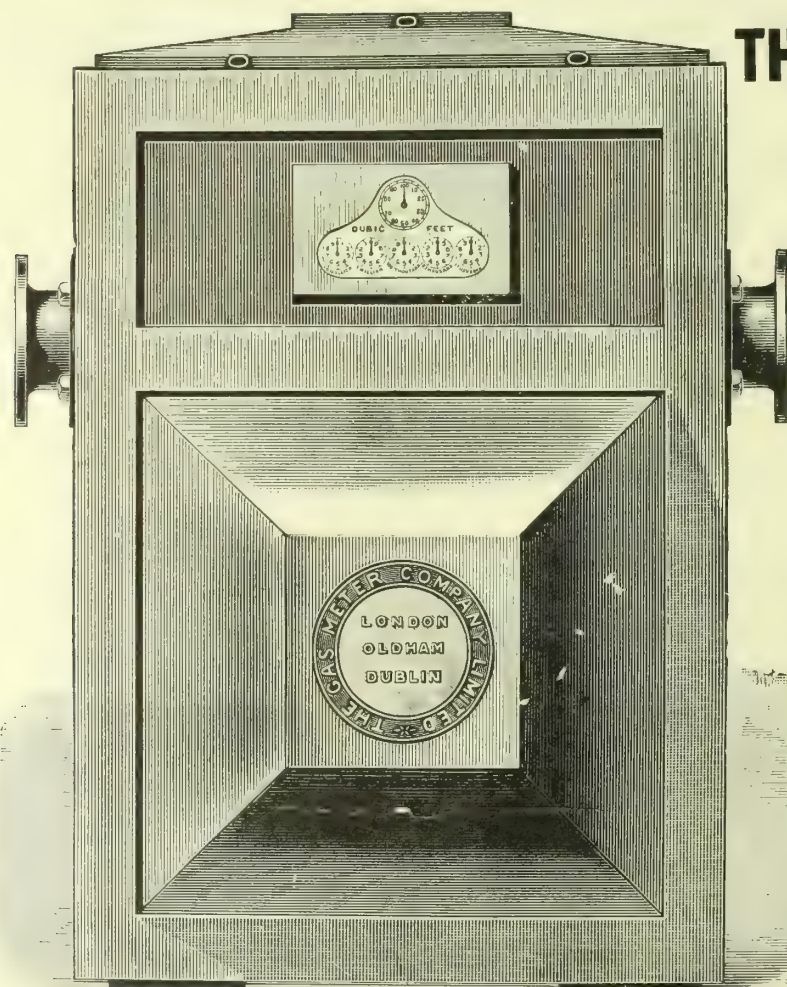
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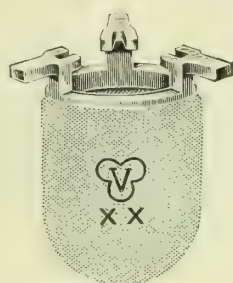
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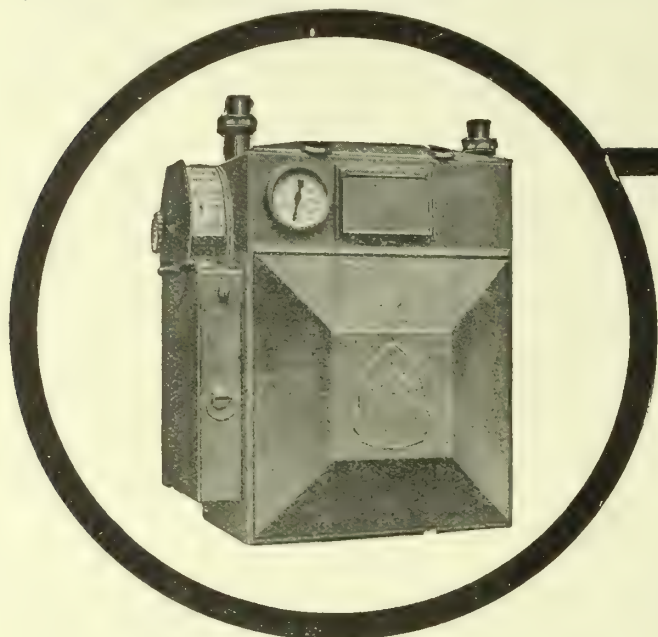
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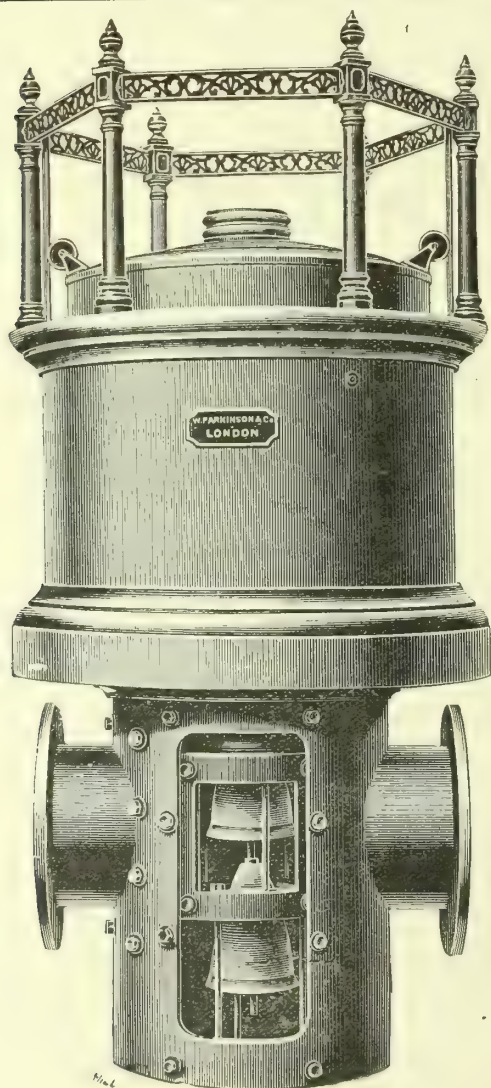
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VOL. CXI., No. 2470.—TUESDAY, SEPTEMBER 13, 1910.

EDITORIAL NOTES—GAS, &c.

The Improvidence of Professor Armstrong.

ABOVE the whole technical experience and knowledge of the gas industry of the world, and above all the knowledge of the industry's managers regarding commercial conditions and utilitarian requirements affecting the primary and the secondary products of gas manufacture—experience and knowledge gathered from the expenditure of millions upon millions of capital, from an annual carbonization of coal to an extent to be referred to only in terms of millions of tons, and from a commercial connection that it would require much work to even approximately measure—towers, on a pedestal of his own making, Professor H. E. Armstrong, accusing the gas industry of, and condemning it for, wrongdoing in all its primary work. The technicians of the gas industry have, in his judgment, taken a wrong turning; the whole of the course of their fundamental operations is a mistake; and the fact that the industry has been eminently prosperous, and continues to be so, must be regarded as a pure accident.

Professor Armstrong believes he knows the way to set things right for the industry. He was to have read a paper on the "Provident Use of Coal" at the meeting of the British Association at Sheffield. He read a paper; but it was in a large measure inconsistent with its title. There were some ancient generalizations in the opening about the crude uses of coal; and then the author dropped precipitately into the advocacy of low-temperature carbonization (as practised in the ill-fated coalite process) of the coal used for domestic and for gas-making purposes. So far as the gas industry is concerned, the advocacy of Professor Armstrong rides solely on the conclusions drawn from his academical and theoretical studies, without any consideration for practical and commercial interests. We had thought that the gas industry had reached high scientific and economic stages in its work; but, as a matter of fact, the carbonizing procedure of the gas industry, in Professor Armstrong's view, has gone all astray. And the glory of taking second place to another well-known professor in pointing this out to the industry is distinctly his. But we are afraid in this, as in the former instance, the effect will not be great. Since counsel came from other lips at the Society of Arts, the gas industry has, in its technical work, been hardening its heart, and has been pursuing high temperature carbonization with greater ardour than before, and with considerable financial benefit to consumers and proprietors alike. Professor Armstrong's head appears to have been turned by what he has found in coalite tar; but that he has not yet reached any very definite stage in his investigation may be gathered from the fact that, within a fifteen or sixteen line paragraph of his paper, we find supposition and inconclusiveness thickly strewn by the use of such phrases as "it must be supposed," "I am inclined to think," "the proportions . . . appear," "the phenols are presumably," and "the greater proportion of benzene in ordinary coal tar is probably due." The Professor certainly seems to be more than a little premature in his advocacy; and there are several other material things of commercial and utilitarian character that he must take into the reckoning before he can say that there is economic value in his proposition. There is one thing—and one thing only—about which he appears to be really definite; and it is that the gas given off in the coalite process is very rich. Granted; but from the point of view of the gas industry, that very fact cannot be ascribed to any economic or provident use of the coal employed.

However, there is no doubt that in Professor Armstrong's mind—untutored in the practical and commercial interests of the gas industry—the technicians of the industry are altogether wrong in their procedure. He is not particular how he rubs in his views. Apparently the more raucous the tone the better. Gas of the character of that of coalite gas

should be substituted for the "rubbish" now produced by carbonizing coal at high temperatures in order to realize the maximum yield of gas. It is clear Professor Armstrong should carry his current investigations to the question of the combustion of gas for the purposes to which it is now applied; for we firmly believe he would find such investigation educational. The gas industry has applied science to the use of gas, as well as to its production; and in doing this, all the reasons that formerly obtained in regard to the supply of rich gas have vanished. And by applying high temperatures to the production of gas, and so increasing the yield of the coal, the gas industry is enabled to supply gas for lighting and fuel purposes at economical rates, and at the same time make a profitable thing out of it. Nevertheless, all the gas industry is doing in producing economy is a huge mistake in the judgment of the Professor. He talks airily about the provident use of coal; and yet he advocates for the industry a process whereby they would have to purchase, convey, and use—and improvidently use—millions of tons of coal more a year to supply the gas required, increase the costs of production, increase the charges to gas consumers for a commodity of a nature they do not require, and add to the supplies of a lot of commodities for which there would be no adequate demand.

It is asserted by Professor Armstrong that since the sulphur clauses in the comparatively few Gas Acts in which they appeared have been abrogated, there has been a steady depreciation in the quality of the coal gas supplied; and the damage done to furniture in consequence is most serious. It would have been fairer on the part of Professor Armstrong had he stated that only the sulphur compounds clause has been repealed, and not that referring to sulphuretted hydrogen. However, experience in the same district of gas supply as that in which the Professor resides does not confirm his declarations as to damage; and the official returns show that of late a great improvement in respect of sulphur content of the gas has occurred. As so much else pertinent to this question is manifestly not within his knowledge, it may also be external to his information that since full, or approximately full, retort charges have been adopted with high-temperature carbonization, there has been a material reduction of the sulphur compounds in gas. There is obviously much for him to learn in association with modern gas-manufacturing practices and modern uses of gas.

To follow the revolutionary Professor Armstrong would be to make a complete wreck of the gas industry. Plain it is that he does not understand the practical and commercial interests underlying the industry's present procedure. Or, on second thought, perhaps he has some financial interest in the electrical industry; and so has a selfish motive for suggesting that the gas industry should turn away from the high roads paved with economy and prosperity to those that would in these times bring upon it positive disaster. However, Professor Armstrong is harmless; and no one at the meeting appears to have paid much serious heed to his counsel to the industry to adopt as its fundamental system one that is compassed about by so much impracticability and uncertainty.

Internal Combustion Research.

THE British Association Committee on "Gaseous Explosions" are still, as the "JOURNAL" showed last week, pegging away, with good elucidating effect, at their highly technical task. The early builders of internal combustion engines could hardly have suspected that around their productions clustered so much intricate problem that would require some of the most brilliant talent of the land to unravel. But so it is. The art of gas-engine building needs, for progress, considerable light and leading from Science; and Science appears willing to give it. But looking at the report presented on this occasion, it is evident the Committee are determined to go slowly, and, in so doing, to go surely. The position of gas-engine investigation had reached such a chaotic

condition that the only possible hope of arriving at settled and approved determinations was to have a Committee of the highest rank in the necessary specialized qualification to set things in order; and there is every confidence that, though on this occasion the Committee have confined their attention to the one important factor in heat flow—radiation—the progress in knowledge will be much faster on systematic lines than when left to the work and the inclination of the individual. Not only are the Committee by their labour clearing up moot points, and, by collective wisdom and methodical inquiry, solving problems, but they are advancing knowledge. They have, as Mr. Dugald Clerk pointed out, when he was discussing the report presented by Professor Bertram Hopkinson, shown that the radiation losses in a gas-engine are larger than have hitherto been thought; and they have also exposed the danger of applying the laws governing the loss of heat in a fixed and closed vessel to a vessel which contains a moving piston. There will be agreement with the Committee that perhaps there is no service Science can at the present time render the gas-engine builder that would be of greater importance than to establish definitely the principles on which depends the heat flow from hot gases into cold metal with which they are in contact, and thus enable him to predict the effect on heat-flow of changes in the temperature, density, or compression of the charge, and in the state of the cylinder walls. It is a large question; and radiation is but a single factor in it. So it may be expected that the work will be long and exacting to which the Committee have put their hands; but every stage with such a Committee should produce some advantage. By many who have interest in the efficiencies of gas-engines, the work will appear abstruse. But even such will find many educational points by perusing the report. It is not, for example, everybody who knows that a large flame radiates more per unit of area than a small one, because a flame is to a great extent transparent even to its own radiation; so that radiation is received not only from the molecules at the surface of the flame, but also from those at a depth within it. Nor is it also appreciated that the cooling of the gas is slower in a large flame than in a small one. The work of the Committee bids fair to give for a time to come an annual supply of material from the higher realms of research that will have much practical value.

Quickened Combustion.

A CONSIDERABLE part of the "JOURNAL" last week was occupied by the reproduction of the report presented by Dr. William A. Bone, to the Physical Science and Chemical Sections of the British Association, on "Gaseous Combustion." Long as the report is, it is merely a compendious review of the vast amount of work that has been done in this field of fascinating research by both the physicist and the chemist. The compilation expresses the thoroughness with which Dr. Bone has set about the work of compressing into convenient form the lines of investigation, the conclusions, and the conflicting views of the workers of the past and the present; and it testifies to the completeness with which the chemical aspects of the extensive subject have been studied. But it is extremely difficult for anyone who has not made special and profound research into the various phases of the subject, as dealt with by Dr. Bone, to either attempt to criticize or accept anything as altogether conclusive until the seal of a common ratification is set on it by specialists. The difficulty is attested by the inconclusive general remarks made at the meeting by certain known lights in scientific realms by way of discussing Dr. Bone's report. The report ought really to be taken as the new starting-point from which to make more pronounced endeavour than hitherto to reach the goal of definite explanation of the phenomena in the different directions of investigation and of solution of the divers problems. The chemist has done a large amount of work so far; but doubt, inconclusiveness, and contrary opinion still exist. And, as Professor Arthur Smithells says, a point has now been reached in regard to the investigation of the general subject where the fuller assistance of the physicist is indispensable.

The two subjects in the report that have the largest practical interest for our readers refer to the influence of moisture upon combustion, and the influence of hot surfaces upon combustion. Concerning the former, there is still much disagreement between chemists themselves; and, in regard to the latter, there is some difference of opinion between the scientist and practical man, but not so much

as has been suggested. The section of the report dealing with the latter matter does not advance it much, if anything, beyond the point where Dr. Bone left it at the time he delivered his lecture before the North of England Gas Managers' Association in 1909. We will not therefore here attempt, by the extraction of passages from the lecture, to delineate the past and current view. The question is one of practical importance to all users of furnaces, gas-fires, and the like in which combustion of gases takes place for the purpose of obtaining heat. And in this line of research into gaseous combustion, we have one in which perhaps more than in all others, the consensus of competent opinion is favourable to the dictum of Dr. Bone that "heated surfaces have 'undoubtedly a marked influence in accelerating not only 'combustion, but all chemical interchanges in gaseous 'systems.'" This is iterated in the words: "I have reason 'to believe that, in the firing of furnaces, and so forth, the 'surface plays a very important part in the development of 'the concentration of heat."

But while this view is now generally accepted by technologists, there is the danger, through misconception in other quarters of terms and practice, of an undeserved decrying of the general conclusion at which long since some of the early experimentalists arrived, and which Dr. Bone confirms in the light of accumulated knowledge and of the results of experimental work under the more advantageous conditions of the present time. Mr. F. Siemens, more than twenty years ago, put forward the theory that the proper heating of a furnace is entirely due to radiation in contradistinction to actual flame-contact, and that in connection with gas-fires, for the attainment of maximum efficiency, radiation from a free burning flame must be relied upon. Had it not been for this theory, there would have been less said to-day as to the divergence between practice and the accepted scientific view, that surface-contact is favourable to the acceleration of combustion. Consider the combustion of gases in retort-benches to-day, there is a tremendous amount of combustion going forward in every setting in contact with heated surfaces; and the efficiency of the heating is great. Consider, too, the ordinary fuel gas-fire, there is (though the form of the fuel has changed to the straight elongated type) a large amount of heated surface provided by which combustion may be readily accelerated. In the last report by Mr. E. W. Smith to the Gas-Heating Research Committee of the Institution, he stated—perhaps the point has some slight bearing—that, in using half-fuels (cut vertically) in the same position as they would occupy had the complete fuel been used—thus having practically a free-burning flame—instead of the radiant efficiency being increased by the removal of the front of the fuel, it was actually slightly decreased. But when the half-fuels were rearranged, in order to catch the flames better than they did when in their usual place, the radiant efficiency increased to the figure obtained when whole fuels were employed. But all this goes to show that, in this matter, there is in reality no great divergence between practice and scientific view.

There is much more work to be done in this connection. The fact of hot surfaces accelerating combustion is being generally scientifically endorsed; but, perhaps of academic more than immediate practical interest, there now falls the elucidation of the factors that are operative in surface combustion. Dr. Bone defines the lines of investigation in order to arrive at determination in this connection; but there are many pitfalls in the way by which there may be vitiation of result. The avoidance of these would be best secured by systematic research under adequate supervision.

Failures of Gas and Electrical Machinery.

IN an article appearing in other columns, we have dipped into the annual report of Mr. Michael Longridge, M.A., M.Inst.C.E., the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited, upon the failures of gas and electrical machinery that came under the observation of the Company's experts during the year. These reports are always instructive; but it is somewhat strange that, with all the accumulation of experience regarding failures, and taking into consideration also the numerous new engines and other machinery that go to swell the total of the insured plant, the ratio of the breakdowns to the total keeps at an almost level line. In this report, the proportion of one failure to every 10.4 gas and oil engines insured is but a slight variation from the returns for immediate past years. The failures are distributed over several causes—among

which are weakness and bad design, metallic defects, and neglect on the part of the users. The weakest parts of gas-engines are undoubtedly the crank-shafts; and the question is asked by Mr. Longridge whether the time has not arrived when these parts should be built-up, instead of being forged in a single piece. There is no question, too, that makers must pay more attention to the character of the metal of which the different parts are constructed, in order to enable them to withstand the various stresses to which they are constantly exposed. But there is evidence that manufacturers of plant built-up of metal parts pay considerably more attention to this important matter of metal composition than was their wont only a few years since. For example, among others, pipe-founders and gas-fire makers have discovered the advantage of this. By scientific investigation in this regard, and the adoption of proper mixtures, good reputations for durability are now being secured; and some reward will follow. But in connection with the failures, the manufacturers of gas-engines must not be apportioned more than their due share of blame; for at least a quarter of the breakdowns recorded during the year were due to neglect on the part of users. They have only themselves to reproach for this; and it is a great pity they do not take to heart the fact that all mechanical contrivances require proper care and treatment. Cleanliness and thorough upkeep are repaid by efficiency and by escape from the worry and loss attendant on disablement. In the case of electric motors, the proportion of failures was rather worse than in that of gas and oil engines. The ratio was with motors on continuous current 1 in 8·2, and on alternating current 1 in 9·5. Users' neglect is also responsible in these cases for a goodly part of the breakdowns. But a notable feature of the figures is the growth year by year of the unascertained causes of motor failure. Many things, it is notorious, happen in connection with electricity, the causes of which are inscrutable.

The Clapham Catastrophe.

There was a strange little paragraph in the "Electrical Times" last week, under the heading of "Sequel to the Clapham Fire," in which paragraph "Meteor" seems to have been soliloquizing, and to have allowed his thoughts to wander at random between the unfortunate Robinson Crusoe, the electrical and the gas press, and the tragic fire last Christmas at Messrs. Arding and Hobbs at Clapham. That fire, the jury who inquired into the cause of the deaths of the several victims, positively declared was due to an electric lamp, though the "Electrical Times" persist in referring to this as the "alleged" cause, just as we suppose it would do if it were alluding to the Accrington fire, to one of those that has recently occurred at Brixton, and to others that might be mentioned. But the intended cardinal point of the vapoury paragraph is not Robinson Crusoe nor the cause of the Clapham fire; but that Messrs. Arding and Hobbs are in their new premises about to spend some £3000 on the installation of the electric light. From this circumstance our electrical contemporary concludes that "electric light, after all, is the safest method to adopt if artificial lighting has to be used at all." If this is the only fact on which conclusion is based, then "Meteor" must surely have been sojourning for a considerable time like Robinson Crusoe on a desert island, and has not heard of other lamentable occurrences that have helped to give the "safest" theory its death blow. We suggest that other considerations may have had some influence with Messrs. Arding and Hobbs. It was impossible, after what has occurred, for the Battersea Borough Council Electricity Department to allow the firm to have their new premises lighted by gas; and so the Department made the tempting offer of a supply of electricity at 2d. per unit, which is a price at which other private lighting consumers cannot get electricity from the Borough Council. It does not require any very great stretch of the imagination, too, to suggest that, the Borough Council and the rating authority being closely identified, Messrs. Arding and Hobbs had no desire to fall-foul of the Electricity Department by transferring their custom at this particular juncture. And the firm have also the comforting knowledge that the Electricity Department and the Insurance Companies (who have been badly hit lately through electric lighting) will keep a sharp eye on the new installation, so that all that is humanly possible may be done to prevent a recurrence of the terrible disaster that caused such widespread sorrow and gloom last Christmas.

Politics in Municipal Government.

The idea of local government on political party lines is not one that commends itself to everybody; but Sir Edward Russell, in a speech delivered at Liverpool last week, showed that he is among the number who regard it as the ideal method of carrying on a town's municipal business. In presenting his argument, he admitted that many persons disagreed with party men in carrying politics into municipal elections; and he "recognized that these persons claimed to be very superior persons indeed, and were very sure that they were right," and that "there was a disposition to accept this idea as one which all intelligent folks ought to be ready to agree with." We must ourselves plead guilty to having, on occasion, expressed the view that politics might with advantage be separated from municipal affairs. But whether, after this overwhelming avalanche of—sarcasm, should it be called?—we shall ever again give voice to the same opinion, time alone will show. Sir Edward himself prefers the old practice of both political parties working up their strength to the utmost in the wards of a city, as being a good thing for local politics, and a firm foundation for interest in Imperial politics—in short, as the best course which could be taken considering the existing circumstances. In a free and democratic country every citizen was, he argued, a trustee for the past, the present, and the future of the city and the country; and if a citizen failed to realize, and to act up to, his trust, in which he had a life interest, he endangered the continuance of citizenship and of present blessings and gains to posterity. The first duty of the electors was to send the right men into the Council; and, secondly, it was their duty to select the right men on grounds of party fealty and party intelligence. With the first of these objects, there can be no disagreement whatever; the only point is as to how it can best be done. Sir Edward says, in his second clause, that the right men should be selected "on grounds of party fealty and party intelligence;" while the "superior persons" might claim that a better way would be to vote for a candidate strictly and only on the grounds of his personal fitness for the position of a councillor. Which idea is the more likely to conduce to the efficiency of the administration of city affairs?

Party Considerations.

It would doubtless be argued by those holding Sir Edward Russell's opinions that the party leaders would be careful to select suitable candidates. But, even so, the candidate of one political colour might be far and away more suitable than the nominee of another; and if this more suitable man is kept out of the council because the majority of the electors happen to differ from him in politics, is it likely that citizenship or the city can be the gainer thereby? Has Imperial Government on strictly party lines proved such a huge success on all occasions that the universal incursion of its cast-iron methods into municipal affairs can be conclusively accepted as an unmixed good? It is true that Sir Edward asserts it is the best course which could be taken "considering the existing circumstances;" but the qualification is one that can hardly be taken into account without knowing what other circumstances might be contemplated. However, the speech referred to was delivered to the Liverpool Liberal Federal Council; and perhaps this paragraph may be fittingly concluded with an extract from it: "What was practically the aim of Liverpool voters when they gave their vote as a party vote? Their main aim was, to put it in plain terms, 'to get the Town Hall'—and a very good aim, too, because those who got the Town Hall exercised great influence upon public opinion and upon public measures, and they kept their side up, so that, whatever exigencies arose, and whatever might be the necessary course at any particular moment in reference either to local or general politics, they had a 'vantage ground, and were in a position from which they could most serviceably and usefully act for their party. But the advantages to be derived from a successful assailing of the Town Hall were not the only objective of the Liberal party in Liverpool. The Liberal party had very seldom got the Town Hall, and only for a comparatively short time when they had got it. But did it follow from this that the Liberal party had been inoperative, inactive, and without influence on the public affairs of the city? He had watched these affairs for a good many years; and he felt that they were entitled to regard the influence of the Liberal party as among the greatest factors for good in the city."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 735.)

BUSINESS last week on the Stock Exchange was almost a dead-calm. Whether it will prove a record in quietude remains to be seen; but at any rate it will be difficult to beat in point of stagnation. And yet the tone continued wonderfully cheerful as a general rule, except where (as in Railways, for instance) special circumstances arose to depress the feeling. On Monday, business opened in very sluggish mood; but the tendency was firm. Gilt-edged securities were cheered by cheap money, Railways brightened up a bit on labour difficulties promising a solution, and Wall Street was shut and ceased to agitate. Several gas quotations advanced. Tuesday, things continued just about the same, with unimpaired cheerfulness. Consols had a small rise, Railway prices ruled higher, and the Foreign Market was firm. Americans were steady until near the close. Gas again was in good demand. On Wednesday, the lack of business was beginning to dull the cheerful tone, but not much. Government issues were fairly steady; but Railways were somewhat dashed by the non-settlement of the labour trouble, and Americans were rather poor. On Thursday, there was hardly anything doing—approaching absolute inertia; but the tone recovered a little. Excepting Railways, pretty well all lines were firm, and Gas again was in great request. Friday was quieter than ever—so some members said; but that seemed almost impossible. Gilt-edged were firm, and the Foreign Market steady; but the protracted contest in the North depressed Rails. Saturday was very quiet, of course, and brought no change to speak of. In the Money Market, there was an abundant supply, and rates relaxed considerably. Discount eased also; but it steadied again before the close. Business in the Gas Market was quite up to the mark considering the time of year; and the tendency was all in favour of higher prices—several quotations scoring nice advances. In Gaslight and Coke issues, the ordinary was strong, with transactions at from 105½ to 106¼—a rise of ½. In the secured issues, the preference realized 103 and 104, and the debenture 80¾ and 81. South Metropolitan was quiet but firm, changing hands at from 120½ to 122½—a rise of 1. The debenture marked 79½. There was only one transaction in Commercials, a bargain in the 4 per cent. stock at 108—a rise of ½. Among the Suburban and Provincial group, Bournemouth "B" was done at from 16¼ to 16⅞, British at 45½ (a rise of ½), Brighton original at 216 (a rise of 5), ditto ordinary at 156 (a rise of 4), Ilford "A" at 149½, Portsea "A" at 132 and 133, South Suburban at 120½, and ditto debenture at 121½. On the local Exchanges, Liverpool "A" marked 216; and Sheffield "C," 229. In the Continental companies, Imperial realized from 185½ to 187 (a rise of 2), ditto debenture from 92¾ to 93¼, Union 96½ and 97 (a rise of 3), ditto preference 138 (a rise of 2), and European 231½. Among the undertakings of the remoter world, Cape Town debenture marked 89, Melbourne 4½ per cent. 102½ (a rise of 1), Monte Video 12¾, Primitiva 7¼ and 7½, ditto preference from 5¼ to 5½½, ditto debenture 97½, River Plate debenture 98½.

ELECTRICITY SUPPLY MEMORANDA.

Comparing Old-Style Vertical Gas-Burners with Metallic Filament Lamps—Results of Correction to Current Conditions—Improved "Therol" Water-Heater—On Lamp Columns—The Facts of Alderman Blagdon Richards—The Anglers at Holmfirth.

THE shock that the inverted gas-burner has given our electrical friends in public lighting is causing them to leave no stone unturned to mitigate the (to them) evil effects. One of these evil effects is that the successes of gas have not tended to the hardening of the price of the capital stocks and shares of electricity supply companies; and so an attempt has been made in the "Financial News" to provide a set-off against the successes of gas in competition by quoting what is being done at Marylebone, Hampstead, and Shoreditch, which boroughs are not supplied with electricity by companies, but by the Councils' own undertakings. This fact is worth consideration by financial contemporaries when invited to devote the best part of a column of space to the publication of material that, so far as gas is concerned, has no application to the new order of conditions brought about by the later types of inverted gas-burners. A second fact might also be noted by them—that the price charged for current by their municipal illustrations is not the price charged to private consumers. In the case of Marylebone, for instance, the price allowed for current used in the double and triple lanterns, fitted with 55 and 88 watt electric lamps, is only 142d. per unit, which is pence below the figure paid by all private consumers for lighting purposes. The price stands in queer contrast with the grotesque figures recently published by Mr. Seale and others regarding the charges for gas by the Gaslight and Coke Company, and on which figures criticism was passed in our editorial columns last week.

The next point our financial contemporaries might note is that the comparisons as to costs (such as the "Financial News" has published) are based upon the old type vertical form of gas-burner with the newest types of metallic filament electric lamps; while the comparison that should be made is between the newest forms of inverted gas-burner and metallic filament lamp. It will

suffice to take Marylebone as an illustration; and use the recent tender made to the Holborn Borough Council by the Gaslight and Coke Company—a private concern depending solely upon their profits for dividends—as an example of what they can offer with the newest inverted gas-burners. Only one portion of the street lighting of Marylebone is dealt with in the article that has appeared in the "Financial News." This portion comprises 1114 single-burner lamps, 827 double-burner ones, and 23 triple-burner ones; and, on the Holborn figures, it is easy to show that, on this section of lighting alone, the ratepayers annually (without taking into account the enormous capital expenditure involved in conversion from gas to electricity) will lose a considerable sum, and be also deprived of the considerable additional illuminating power in their streets that would be obtained if inverted gas-burners were being installed instead of the metallic filament lamps. In the single-burner lamps, the old style gas lighting was by vertical burners, each costing £3 7s. 6d. a year. These are superseded by two 35-watt metallic filament lamps (giving together 56-candle power) at a cost of £3 2s. 9d. per annum, whereas the Gaslight Company quoted the Holborn Council for the new style inverted gas-lamps £2 7s. 6d., each giving 80-candle power. In price, there is a difference here in favour of gas of 15s. 3d. per lamp (remember the low price charged per unit of electricity for street lighting); and in illuminating power, of 24 candles per lamp. On the 1114 single-burner lamps, the difference in cost per annum is £849 8s. 6d.; and 24 candles per lamp additional illuminating power on 1114 lamps represent a total of 26,736 candles. These are the annual and the illuminating power losses to the ratepayers on these lamps alone.

In the same section of lighting, we have the 827 double-burner lamps. The original cost of each of these with the old-type gas-burners was £5 19s. 5d. The annual running cost for two 55-watt metallic filament lamps is £4 9s. 6d.; and the two lamps together represent only about 90-candle power. For two 80-candle power inverted gas-lamps (160-candle power per post), the quotation to Holborn was £3 18s.—the difference in cost between the Marylebone electricity charge and the Holborn inverted gas-burner tender being 11s. 6d. per lamp, and in illuminating power 70 candles. The total losses, therefore, on these 827 lamps is in cost per annum £475 10s. 6d.; and in illuminating power, 57,890 candles. The last-named figure requires altering somewhat, because the Council found the lighting by the two 55-watt metallic filament lamps so "unsatisfactory" that they put in their place two 88-watt (70-candle power) lamps in important thoroughfares—the change representing a loss to the electricity undertaking per post so altered (assuming 4000 hours lighting a year) of 264 units of electricity per annum. But we may ask if two 55-watt lamps were found unsatisfactory, what must the illumination be like by two 35-watt lamps with which the major part of the standards are fitted? Then we have the 23 triple-burner lamps. The cost per annum with the old type gas-burners was £8 16s. 11d. They are superseded by three 88-watt (70-candle power) metallic filament lamps, giving a total of 210-candle power, and costing £6 14s. 6d. The Holborn quotation for triple-burner lamps (80-candle power per burner, or 240 candles for the three) is £6. Thus the losses on these figures to the Marylebone ratepayers is in money cost 14s. 6d. per lamp, and in illuminating power 30 candles; or on the 23 lamps £16 13s. 6d. per annum, and 690-candle power. Summing up, on this one section of the Marylebone lighting, comparing with the Holborn inverted gas-burner tender, we have an annual running loss of £1341 12s. 6d., and of illuminating power of 85,316 candles. As already mentioned, an allowance on the candle-power figure has to be made for the change in a number of the 55-watt lamps to 88-watt ones. It will therefore be seen that the Marylebone ratepayers stand to lose a considerable sum and a considerable quantity of illumination when the lighting conversion scheme is completely carried out—that is in contrast with what can be done with the new inverted gas-burner, and not by comparing, as in the article which has given rise to this comment, what can be done by old-style gas-burners and what can be done (only with low prices per unit for current) with metallic filament lamps. A little examination by our financial contemporaries of the figures quoted here, will enable them to appreciate the value of taking in this matter the common level of current circumstances for both illuminants.

When the "Therol" electric water-heater first saw the light of day, we ventured to call attention to its limitations. It will be remembered that it was solemnly trumpeted by our electrical contemporaries as a great boon and blessing to every household; while it appealed to us as one of the most humorous inventions of the age. The householder who had installed a 200-watt-per-hour "Therol," and who wanted a bath, could—assuming that some one had just used up the stored warm water—before it would furnish another sufficient supply of warm water for the bath, travel from (say) Brighton to Edinburgh and back; and if there were seven members in his family, as only one person per day could have a bath of 25 to 30 gallons of water at 110° Fahr., he could then take a week's holiday before his turn to use the bath would come round again, and always providing no water was used for any other purpose in the meantime. The same "Therol" could only give 9 gallons of boiling water per twenty-four hours. And "if a sudden call was made on a heater for 3 gallons of boiling water at once, it may respond quite satisfactorily. But should a further 3 gallons or so be required at boiling-point within (say) an hour or so, it might not be available, since the temperature of the heat storage block might not be high enough

to give the further amount *for some hours*, as it only provides sufficient energy to raise every hour a gallon of water to 110° Fabr., but permits 9 gallons of boiling water to be drawn off in all during the day." This inefficient heater, with all its limitations, which make it impracticable for use in the household, takes 4.8 units of electricity per twenty-four hours. But there has been a development in the heater which raises its energy-consuming capacity, and its yield in warm or boiling water. The very criticism that we passed when the heater was introduced is justified by the development. It has now been arranged to insert a supplementary heating coil—taking (say) 1000 watts an hour—which is switched into parallel with the original unit by means of a thermal contact and relay. "With" [the "Electrical Times" will excuse quotation from it] "1200 units passing through the iron block [per hour], it is *not long* before the temperature is again raised to the required maximum, when the supplementary heating coils are cut out, and the consumption drops to the usual 200 watts." The original form of heater was not a success—it was not economical; and it was not a practical adjunct for the household. Neither is the form as developed an economical and rapid means of obtaining hot water. The gas water-heater would not have risen into popularity as it has done if it suffered the limitations of its "Therol" competitor. The range of invention that our electrical friends pack under the headings of "practical" and "economical" is really most ludicrous.

Some of the original gas-lamp standards have not much about them in regard to artistic merit of which to boast; but the newer types of standards are certainly a great improvement upon the old. When electricity was first employed for public lighting by means of arc lamps, there was gentle scoffing on our part at the cumbrous creations—creations of great girth and height, and not pretty to look upon—that electricians introduced into the streets. Now that the electric metallic filament lamp has come, and electricians are finding them more economical in their over-all costs, though less efficient from the consumption and lighting power point of view, they are magnifying in places the incongruous proportions of standard to lamp, by removing the arc lamps, and putting at the head a single metallic filament lamp or a cluster. Whereat one cannot refrain from smiling. Apart from being hideous, it reminds one of the old simile as to the use of elephants for picking up pins. Now where special standards are made for metallic filament lamps, the designers seem to have gone to the extreme in plainness and economical structure. Some of those we have seen appear to be built up of varying diameters of plain tubing—decreasing upwards, and finished with a swan neck. "A Visitor" to Carmarthen has recently written to the "Welshman," and has had something to say as to the inartistic character of the standards that have been set up in the streets, and their unfitness in the old-world character of the town. He describes the standards as "frightfully aggressive" and "hideously ugly," and he thinks that, if electric lighting was "a necessity," some system more artistic and more in character with the place could have been installed quite as cheaply and as efficiently, without offending every canon of good taste. From what has been seen in other places, we have no doubt this correspondent is not by any means captious or hyperbolic in his criticism. But he goes further, and asserts that the electric lighting installation is the most crude and primitive that he has seen. He is not alone in his opinion.

The Carmarthen Town Council wanted the electric light; and now they have got it the inhabitants are not altogether satisfied—judging from the letters and comments in the "Welshman." Among the letters, Mr. B. A. Lewis, the Manager and Secretary of the Gas Company, has shown how, in the public lighting, the town is losing annually, as compared with gas, owing to the cost of the service; and we undertake to say that the service is less efficient than it would be using the modern form of inverted gas-burners. But note-book in hand, a representative of our Welsh contemporary has given Mr. Alderman H. E. Blagdon Richards an opportunity of defending the electric light. Than he, "no public man within the ancient borough is better acquainted with the facts." If the interviewer has faithfully transferred to the public what Mr. Blagdon Richards said at the interview, then we cannot congratulate the latter gentleman, nor the ancient borough on a knowledge of facts by some of its public men. The Alderman appears to think gas managers and others interested in gas are, as a class, eminent for their want of veracity, because he says: "I have noticed that all arguments advanced that gas is cheaper than electricity are merely statements emanating from gas managers and those largely interested in gas; and those inflations of statements are easily understood." That is a nasty and discourteous reflection. But the Alderman shrewdly avoids showing, by concrete example, wherein the inflation arises. We do not think Alderman Blagdon Richards exhibits himself in a good light as a judge of the ethics of this matter, as he himself says that, before gas can compete with electricity at 5d. per unit, it will have to be reduced to 3s. or 2s. 9d. per 1000 cubic feet. This is an exaggeration that is unpardonable in the public man who above all others in Carmarthen is "acquainted with the facts." But let us see. With the best metallic filament lamp, one can only secure 800 candle-hours (taking an efficiency of 1.25 watts per candle power) by the expenditure of a unit of electricity. With gas at 3s. per 1000 cubic feet, 5d. will purchase 138 cubic feet; and with an inverted burner, one can get an efficiency of at least 20 candles per cubic foot of gas consumed per hour, and more with certain makes of burner. Therefore, the fivepennyworth of gas will give 2760 candle-hours. We ask

Alderman Blagdon Richards whether this is an inflation, and whether it cannot be substantiated. If he puts us into the class to which he has arbitrarily consigned all gas managers and others interested in gas, we will challenge him to disprove our statement. Meanwhile, we fancy over this question that the Alderman shows "inflation" in more senses than one, which is not nice in a public man who is supposed to be better acquainted with the facts than anyone else. We are not surprised that in Carmarthen there is not general gratification over the electric light.

The tradesmen of Holmfirth had better make sure as to their ground before they proceed further than the general resolution they have passed, at a meeting convened by their own Association, to support the District Council in going in for an electric lighting scheme. The Yorkshire Electric Power Company are prepared, on a sufficient guarantee being forthcoming, to extend their cables and supply the Council with electricity in bulk; but before the tradesmen give any definite guarantee regarding their patronage, they had better ascertain thoroughly, and not in the superficial manner that was done at the meeting in question, what electric lighting will mean to them as individuals in the matters of installation expenses, and running and renewal costs, and what it may mean to them as ratepayers if the concern does not turn out to be successful. Brighouse was quoted at the meeting as a place where electricity supply is provided in bulk to the local authority by the Yorkshire Company. But at Brighouse there has been electricity supply since 1897, and a bulk supply since April, 1909. Though all these years have passed, there are at present only 112 consumers; and the charge for lighting is 5d. per unit, and for power 4d., 3d., and 2d., although the price paid for a supply in bulk is only 1½d., with a sliding-scale according to the load-factor. It will thus be seen there is a large difference between the price per unit of bulk supply, and the price that must necessarily be charged by the local authority. It will be well to investigate the financial records of Brighouse to ascertain what has occurred there in regard to deficits and profits. At the tradesmen's meeting, the Brothers Mitchell, of Brockholes and Huddersfield, who are presumably experts in the electrical business, were present in order to give information to the tradesmen, who were so thoroughly enamoured of their specious statements that the resolution already referred to went through. So as to vindicate the use of the word "specious," we may refer to this statement of Mr. Herbert Mitchell as an example: "Taking 4d. per unit as the standard price, they could use a 16-candle power metallic filament lamp for sixty hours for 4d." Now do the Holmfirth tradesmen know what a 16-candle power light is like? They would feel sick if they tried to light any of their rooms by one. Furthermore, we calculate that a unit of electricity would last, with one of these tiny illuminating power lamps, fifty hours not sixty; and there is no guarantee Holmfirth is going to get electricity at 4d. per unit. On the other hand, with gas at 3s. 1d. per 1000 cubic feet, a 20-candle power bijou inverted light can be run on the 108 cubic feet of gas purchasable for 4d., for 108 hours. Again, Mr. Mitchell said that eight of the 25-candle power electric lights would adequately light the Council Chamber. This only represents a total of 200-candle power. We believe the Council Chamber is at the present time lit by eight inverted burners, each consuming 3 cubic feet of gas per hour, which will give a total of 480-candle power on less than a pennyworth of gas (at the Holmfirth price) per hour! Comparison need not be carried further. The tradesmen of Holmfirth, however, will see from these figures that there are two sides to this lighting question; and that the greatest economy is on the side of gas.

PERSONAL.

Mr. H. WILKINSON, of Cleator Moor, has been appointed Working Manager of the Arlecdon and Frizington Urban District Council's Gas-Works.

Mr. WILLIAM EWING, who recently resigned the management of the Greenock Corporation Gas-Works, after holding the appointment for eight years, has been unanimously chosen as Engineer and Manager to the Lochgelly Gas Company, Limited, Fifeshire, in succession to Mr. J. D. Keillor, who has been appointed Manager at Ardrossan.

Alderman F. S. PHILLIPS, J.P., the Chairman of the Salford Corporation Gas Committee, has accepted the invitation of the Town Council to become Mayor of the borough for next year. Alderman Phillips has been a member of the Town Council for 25 years, and, as Chairman of the Gas Committee, has rendered valuable service to the ratepayers.

Mr. A. S. B. LITTLE, son of Mr. Gilbert Little, who, it will be remembered, left England some time ago and took up the position of Engineer and Manager of the Howard Evens Company, gas engineers and fire-brick manufacturers, of St. Louis (Mo.), has, we learn, been appointed General Manager and Chief Engineer of the Consolidated Gas Plant and Chemical Engineering Company, of Nashville (Tennessee).

As our readers will remember, Mr. W. R. HERRING, in order to devote more time to practice as a Consulting Engineer, has resigned his position as Chief Engineer and General Manager of the Edinburgh and Leith Corporations Gas Commissioners' undertakings (though retained by the Commissioners as Supervizing Consultant). As a still further step in the projected

transference to London, Mr. Herring has now taken offices in Palace Chambers, Bridge Street, Westminster, from which he will conduct his future practice. To that address, all future communications relating to professional affairs should be sent.

Mr. J. D. KEILLOR, who, as already stated, is leaving Lochgelly to take up the position of Gas Manager at Ardrossan, was a few days ago waited upon by the workmen of the Lochgelly Gas Company, when Mr. Peter Heggie presented him with a silver cigarette-case and a gold-mounted umbrella with an inscription, also an umbrella for Mrs. Keillor. In making the presentation, Mr. Heggie referred to Mr. Keillor's abilities as a Gas Manager and Engineer, and to his considerateness towards his workmen, who had shown how they appreciated and esteemed him by subscribing for the presents. He hoped these small tokens would remind Mr. and Mrs. Keillor of their sojourn in Lochgelly. Mr. Keillor, in reply, thanked the workmen for their presents, and assured them that he valued them highly, as showing their good feeling towards him. He was glad to say that his position as Manager had been a pleasant one so far as the workmen were concerned, as he considered, by the manner in which they discharged their various duties, he had one of the best staffs of workmen in a small gas-works in Scotland. Mrs. Keillor afterwards entertained the workmen, when a pleasant evening was spent.

OBITUARY.

THOMAS WHIMSTER.

MR. THOMAS WHIMSTER, F.R.S.S.A., formerly Gas Engineer and Manager at Perth, died at his residence in York Place, on the afternoon of Wednesday last, in his 92nd year. Mr. Whimster was born at Kinghorn, in Fifeshire, in 1819. He spent his youth in Dundee. Taking an interest in gas manufacture, which was then a young industry, he (in 1847) entered the service of one of the two Gas Companies which then supplied the City of Perth. In 1851, he became Manager of the undertaking; and for the long period of forty-four years he acted in that capacity—first in the employ of the Company, and afterwards with the Corporation, who acquired both undertakings in 1871. In 1895—after he had, by request, submitted a report upon the subject of erecting new gas-works at Perth—he resigned his post, and had since lived in retirement, in Perth.

When he went to Perth the price of gas was 7s. 6d. per 1000 cubic feet; when he retired, it was being sold at 2s. 9d. In 1847, the annual consumption of gas in Perth was about 24 million cubic feet; in 1895, it was about 124 million cubic feet. Previous to Mr. Whimster's appointment, the unaccounted-for gas was as high as 33 per cent. in the Old Company's works, and 45 per cent. in the case of the New Company. But, under his careful management great improvement was made; the leakage having been reduced to less than 10 per cent. In 1868, the two Companies were amalgamated, Mr. Whimster being retained as Manager; and, as stated above, in 1871 the Corporation acquired the undertaking. In 1873, the works of the New Company were sold, and the works of the Old Company, in Canal Street, were extended. Mr. Whimster's management was of the progressive order. He was always ready to adopt new methods of working, in illustration of which it may be stated that in 1883 he had the Peebles oil-gas process introduced into the works at Perth. He retired before the new gas-works at Friarton were agreed upon; but at their inauguration (in April 1901) the Corporation did not forget Mr. Whimster's long and honourable service to the City. The ceremony of opening the new works was preceded by the closing of the old works in Canal Street, which was done by Mr. Whimster stopping the exhauster. He was then presented by the Corporation with a silver salver, suitably inscribed, as a token of appreciation.

Mr. Whimster was, in his day, an active member of the North British Association of Gas Managers, of which body he was twice President—in 1865 and in 1883. He continued to enjoy good health till last spring, when he had a serious illness, from which he never altogether recovered. Up to that time, notwithstanding his great age, he was able to move about with wonderful freedom.

Natural gas fuel is reported, says the "Engineer," as being used for the locomotives of the Texas, Arkansas, and Louisiana Railway. The gas is carried in a tank on the tender; sufficient tank capacity being provided for six hours' run. The line has two locomotives and one car, and is credited with 8 miles of track.

The Newcastle-on-Tyne Association of Students of the Institution of Civil Engineers, have, by permission of the Directors of the Sunderland and South Shields Water-Works Company, and of Mr. A. B. E. Blackburn, Assoc.M.Inst.C.E., the Engineering Manager, lately made a visit to various pumping-stations and water-works belonging to the Company. At the Ryhope pumping-station, an inspection was made of the beam-engines which pump the water from a well 250 feet deep into a service reservoir of 3,500,000 gallons capacity. The North Dalton pumping-station, in course of construction, was then visited. Two wells have been sunk 240 feet deep, below which there are two 33-inch bore-holes taken to a further depth of 220 feet. The pumping machinery now being fixed (which will pump the water into the Dalton reservoir) was also inspected. A visit was then made to the Dalton and Thorpe pumping-stations.

A LOCAL TAXATION RETURN.

The Lighting and Watching Act.

THERE was issued as a Blue-Book a few days ago Part III. of the Local Taxation Returns for the financial year 1907-8, which contains abstracts of returns made by Rural District Councils, Parish Councils, Parish Meetings, Joint Committees appointed wholly by Parish Councils and Parish Meetings, and Lighting Inspectors and Committees.

At the commencement of the year beginning on April 1, 1907, there were 656 Rural District Councils in England and Wales; and their receipts (exclusive of borrowed money) amounted in the aggregate to £4,292,454. Of this, £3,006,082 was from rates, and £354,041 under the Agricultural Rates Act. From water-works, there was a revenue of £174,136; and various other items made up the balance. A sum of £276 was received from an electric lighting undertaking; and £1048 from gas-works. The total receipts, when compared with the preceding year, show an increase of £58,958. Expenditure not defrayed out of loans was £4,341,095, and included £298,299 from water-works; the total outgoings being £184,122 more than the year before. The expenditure on electric lighting (excluding cost of public electric lighting) was £1700; on gas-works, £690; on public electric lighting, £3161; on other public lighting, £20,025. Nearly 500 of the Rural District Councils incurred expenditure in respect of water supply. At the commencement of the year under review, the aggregate length of the roads under the supervision of the Rural District Councils was 101,644 miles. The receipts from loans in the year 1907-8 totalled £516,361, of which £179,924 was for water-works purposes; and the expenditure out of loans was £507,483, of which £165,278 was for water-works. The total outstanding loans on March 31, 1908, was £5,866,971; that for water-works being £1,738,140. The rates raised so as to meet the general expenses of Rural District Councils were equivalent to an average rate of 1s. in the pound on the total assessable value for these purposes. Comparing the year 1903-4 with that of 1907-8, it is seen that the total receipts (other than from loans) of Rural District Councils were greater in the latter year than in the former by nearly 5 per cent. The receipts from rates levied for general expenses show an annual decrease since 1904-5; but during the whole period of five years, the income from rates levied for special expenses exhibit a marked yearly increase. The total expenditure (other than out of borrowed money) was greater in 1907-8 than in any of the other four years; and by far the larger portion of the outlay is in respect of highways. The outstanding loans increased by 28 per cent. in the period referred to.

The total number of rural parishes in England and Wales during the year 1907-8 was 12,935, of which 7234 were entitled to Parish Councils. But only 6662 Parish Councils had financial transactions during the year; and of the Parish Meetings of the 5701 rural parishes not having Parish Councils those of only 385 had financial transactions. The number of Parish Councils having transactions under the Lighting and Watching Act (1833) was 942; the number of Parish Meetings similarly engaged was six. The total receipts under the Act were £76,121; and the expenditure, including loan charges, was £75,338. In parishes in which the Act was administered by Inspectors and Committees, sums amounting to £2706 were expended, in addition to the above-named amount. Under the Act, rates were raised for 889 Parish Councils and four Parish Meetings. The rates raised for Parish Councils were equivalent to a rate in the pound on buildings and other hereditaments not being land or tithes of 3d. or under in 552 cases, over 3d. but not more than 9d. in 331 cases, and more than 9d. in six cases. The highest were a rate of 1s. 6d. in the pound in the parish of Sandy (Beds.), and rates of 1s. in the pound raised for the expenses respectively of the Parish Councils of Potton (Beds.) and Deeping Market (Lincoln-Kesteven).

As to the accounts of Inspectors and Committees appointed to exercise the powers of Inspectors, under the Lighting and Watching Act, it may be remarked that in April, 1907, there were 21 parishes in which Lighting Inspectors were still appointed under the Act; and there were also six Joint Committees appointed under the Local Government Act of 1894 to exercise the powers of Lighting Inspectors in areas comprised in more than one rural parish. In those parishes in which the Lighting and Watching Act was administered by Inspectors and Committees, the lighting rates made during the year varied from 1½d. to 9d. in the pound. The total receipts of these Inspectors and Committees amounted to £2723, of which £2150 was from rates, and £348 from constituent authorities of Joint Committees. The expenditure came to £2706. Adding to these totals the sums received and paid under the Act during the year by Parish Councils and Parish Meetings, the total rates raised under the Act, in 917 rural parishes, during the year 1907-8, came to £76,857. The total receipts were £78,496; and the expenditure, £78,044—excluding expenditure out of loan, which was £270.

The next meeting of the Eastern Counties Gas Association is fixed for Friday week, the 23rd inst., at Cambridge. The technical matter will be the address of the President (Mr. J. W. Aughterlone, of Cambridge), and a lecture by Mr. J. B. Peace, M.A., on "Theory and Practice in Engineering." The following morning some of the Colleges will be visited.

GAS AT THE JAPAN-BRITISH EXHIBITION.

The Gas Companies' Joint Display.—An Addition to the Exhibit.



THE Gas Companies' Joint Exhibit Committee are to be congratulated upon a very effective display that has now been added to the already attractive exhibit which is to be seen at the Japan-British Exhibition at Shepherd's Bush. A series of photographs of the original display appeared in the "JOURNAL" for June 10 (pp. 619, 620); and these we are to-day able to supplement by a view of the recently added space, which almost adjoins the other stands. This extra space was taken, it may be explained, in order that a fuller illustration might be given to the public of the domestic uses of gas. The 36 feet by 15 feet available affords an excellent opportunity for drawing the attention of visitors to the exhibition to a quantity of the larger types of gas apparatus, which could not so well be shown under the conditions previously existing; and it is found that the new stand, being quite open on two sides, enables inquiries to be put and answered very readily. It is unnecessary to enumerate here the various appliances that have in this way been added to the joint exhibit, as they are shown in the photograph. It may be mentioned,

however, that they include cookers, hot-closets, carving-tables, a large quantity of laboratory apparatus, gas-fires, geysers, grillers, and cooking utensils. Wilson's new "Waldick" cooker, with a gas-fire in front, and water-heating arrangement at the side, is on view, as is also Main's gas-steaming closet; while there is a good display of different makes of cookers fitted with the new plate-rack. In fact, the show is altogether thoroughly representative; and every effort has been made not to give one make of apparatus undue preference over another. The stand is efficiently lighted by six three-light New Inverted Company's lamps. Inquiry of the Superintendent elicited the fact (which we were pleased to learn) that, since this new stand has been fitted up, a very great number of inquiries have been added to the large volume already received. In fact, up to the present date, the total number of inquiries received at the Japan Exhibition has nearly reached the aggregate of those obtained during the run of the Franco-British Exhibition. The Committee may therefore fairly claim that their efforts to make a good display have been thoroughly appreciated by the public.

GAS POWER IN FACTORIES.

At last week's congress of the Textile Institute, which was held in Bradford, Mr. T. R. WOLLASTON, of Manchester, read a paper on "Gas Power and the Uses of Producer Gas in Textile Mills."

The author said that spinning and weaving mills offered an ideal load for economy, in that, while running, they were generally at full load, or they approximated to the 100 per cent. load-factor. Still, they could never show the same low total cost per unit power as, for example, steel works, flour mills, and chemical works, which ran from Monday morning until Saturday noon without a stop. The three classes of plant which had to be compared were the ordinary steam reciprocating set, the steam-turbine set, and the producer gas-engine set. The first of these had, so far as could be foreseen, reached its ultimate state of development. Unless, and until, some vital discovery was made whereby the heat which escaped in condensing water and chimney gases could be utilized, there was nothing more to be looked forward to than, perhaps, the squeezing of an extra 10 per cent. of power per unit of fuel consumption, and that probably only at the cost of such added initial outlay as would in the end nullify the advantage gained. Broadly speaking, a steam-turbine plant should cost a little less than a steam reciprocating plant, and should give almost equal efficiency. The shortcomings of the turbine as compared with the reciprocating set were the difficulty and often costliness of obtaining and maintaining the high vacuum essential for even reasonable economy, and the fact that careless management and upkeep might lead to very disastrous blade strippings,

involving long and costly stoppages. In considering gas-power plants, it seemed advisable to draw a somewhat sharp dividing line between gas-engines under and over 500 H.P. The former were developed practically up to the state of reliability reached by the steam-engine. They were slightly more costly than steam-engines; but in conjunction with suction producer plants, they were often less costly than a complete steam combination. Gas-engines of over 500 H.P. were still looked upon with doubt by many, and probably justly, for builders in this country could not yet claim the wide experience which went to assure success. He was in touch with British-built gas-engines up to 1000 H.P., which were in every sense as sound and reliable as any steam-engine; and he had inspected engines of Continental manufacture up to 2500 H.P., which were similarly satisfactory. There had been much to learn, and the lesson had been the harder by reason of the prejudices set up by steam experience; but it might be said confidently that the large gas-engine problem was now solved.

Comparing gas-producer plant with boiler-house plant, he had no hesitation in stating that the pressure producer gas plant of to-day was a more satisfactory apparatus thermo-dynamically and practically than the corresponding boiler-house plant. It would work with a large range of fuels; converting a higher percentage of the possible heat units contained therein into the useful working medium. It was easier to manage, less likely to fall off in efficiency through laxity of attention, cost less during stand-by periods, was more rapidly brought to working condition after stoppage, and was usually lower in first cost. Moreover, its application dispensed with the need for any costly buildings, foundations, and chimney. Added to these was the possibility in large installations of the recovery of bye-products, which might, in favourable cases, show

such a large return that the fuel cost was absolutely wiped out, though results of this kind were not to be looked for in connection with the spinning and weaving industries under present conditions of the ten hours' working day with two intervals. Apart from the generation of power, producer gas had many applications well understood and appreciated by manufacturers in other trades, but as yet little understood in the textile industries. Its superior efficiency and economy had been proved in cloth-singeing operations and in yarn gassing. It might also be used with greater efficiency, and vastly increased economy, for heating calender bowls, and for boiling, evaporating, and concentrating processes. For drying-rooms, heating irons, and many other purposes, particularly when intermittently required or when fine temperature regulation was necessary, it was proved to be the most perfect and economical medium.

In the course of the discussion which followed the reading of the paper,

Mr. CROWLEY (Stafford) remarked that recent developments in Lancashire and Yorkshire, and also on the Continent, made it almost inevitable that electricity would be the connecting link of the future between prime mover and machine; and the steam-turbine was much more suited to the generation of electricity in the units required in the factory than the gas-engine.

Colonel H. A. FOSTER said that his firm were at present installing at their mills at Queensbury an electric drive at some distance from the main works. At first he was strongly in favour of gas; but after going into the matter very carefully, with the best expert advice obtainable, they had decided on an electric installation driven by a high-speed steam-engine working at 180 lbs. pressure, the steam from which would be afterwards available at low pressure for use in the works. A great drawback of producer plants was the polluting effluent from the gas washing. This was a matter that ought to give pause to those who recommended the general adoption of gas-engines.

Dr. ORMANDEY thought that the present wasteful way in which they were using up their national asset in the form of coal was simply ridiculous. A steam-engine had a thermal efficiency of only about 16 per cent. The thermal efficiency of a gas-engine was about 27 per cent., or two-thirds more. There was really no saving in working costs, because, though the gas-engine required less coal than the steam-engine, the coal cost four times as much. In capital charges there was a saving, because it was not necessary to build a chimney. With regard to Colonel Foster's point, the difficulty of the poisonous products from washing had been largely overcome as the result of some clever research work by Dr. Fowler, of the Manchester Corporation. Dr. Fowler had got hold of some bacteria which positively thrive on these phenol compounds. When turned loose on them, they simply chewed them up; and the result was an effluent from which all the poisonous material had been removed.

Mr. WILLIAM FROST (Macclesfield) expressed the opinion that for small manufacturers employing from 50 to 100 horse power, a suction-gas engine using anthracite coal was incomparably cheaper than steam.

Mr. WOLLASTON, in replying, admitted there were immense advantages in certain cases in electrical transmission; but he did not think it came within the scope of his subject. To Mr. Crowley, who said that steam would continue to be used exclusively in central electricity generating stations, he would say, "Wait and see." It was just possible that he knew a little more of what was happening in this direction than Mr. Crowley. It was his firm conviction that before long gas plants would be put down to take the average load, and the steam plants would be used for the peak loads only. The pollution difficulty could be solved in many cases by putting down a water-cooler in conjunction with some rough process of filtration, and using the same water over and over again. Moreover, quite a number of air-cooled plants were now being put down, which used very little water indeed.

FAILURES OF GAS AND ELECTRICAL MACHINERY.

Again we have received the annual report of Mr. Michael Longridge, M.A., M.Inst.C.E., the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited. As usual, it is most instructive, to engineers generally, and particularly to mechanical engineers. Dealing first with the inspection and insurance of steam, gas, and oil engines, it is gathered that the rate of increase of this branch of the Company's business, which for several years has been a little more than 6 per cent., was reduced in 1909 by one-half. The decrease must be attributed to the deplorable state of trade. Also, there has been a reduction in proportion of steam-engines to gas-engines insured. In 1908, the proportion was 27 steam-engines to 20 gas-engines. In 1909, it was 26 steam-engines to 20 gas-engines—the same proportion as in 1907.

The rate of breakdown during 1909 among steam-engines and turbines was 1 in 10·2 of the machines insured, and among gas and oil engines 1 in 10·4—slightly lower in both cases than in 1908, but slightly higher than in 1907. The proportions in which the various parts of the insured gas and oil engines broke down in 1909 is given in the last column of the following table; the other

columns giving the percentages for 1908, and the averages for the six previous years.

GAS AND OIL ENGINES.

Description of Parts which are Believed to have Given Way First.	Average Six Years to 1908.	During	
		1908.	1909.
	Per Cent.	Per Cent.	Per Cent.
Valves and valve gear	34·3	31·3	29·6
Cylinders and cylinder ends	16·1	19·4	15·4
Pistons	10·2	4·8	2·7
Connecting-rods and their bolts	10·7	10·8	9·4
Main-shafts	5·0	9·1	13·4
Governors and governor gear	4·9	4·8	5·4
Silencing-boxes and exhaust-pipes	3·9	2·4	1·3
Fly-wheels and driving drums	4·4	5·4	0·7
Clutches and couplings	2·9	0·0	0·0
Frames and pedestals	3·0	1·2	1·3
Bolts*	2·4	2·4	2·0
Total wrecks, cause not ascertained	0·8	0·0	0·0
Main driving ropes or belts	0·0	0·0	0·0
Miscellaneous	0·9	5·4	7·4
Gas-producer plants	0·5	3·0	11·4
	100·0	100·0	100·0

* These bolts do not include bolts in connecting-rods, valve-gear, and other moving parts, the bolts in these parts being included with the parts themselves.

The causes of these breakdowns may be classified as under:—

	Gas and Oil Engines. Per Cent.
Accidents and causes unascertained	34
Old defects or deterioration by wear and tear	19
Weakness, bad design, workmanship, or material	23
Négligence of owners or attendants	24
	100

It must be said that the large percentage of breakdowns from unknown causes is unsatisfactory, but difficult to alter, because so many of the gas-engines insured are small, and, on the occurrence of a breakdown, are either repaired or dismantled for repair before the inspector can examine them. The cases of weakness and bad design are also rather numerous. The weakest parts are undoubtedly the crank-shafts; as many as 13 per cent. of the breakdowns for the year being breakages of shafts. Has not the time come to build these parts instead of forging them in a single piece? That about one-fourth of the breakdowns resulted from neglect, no doubt arises from the practice of leaving small gas-engines either without skilled attendants or without attendance altogether.

Some of the breakdowns may be described; and selection is made from those referring to the breakages of crank-shafts. The first case is that of a single-cylinder horizontal gas-engine, 27 weeks old, with cylinder 24 inches diameter by 33-inch stroke, running at 146 revolutions per minute with producer gas. The crank-shaft, a mild-steel forging, was carried on three bearings; and the outer bearing, as well as the engine frame, was bolted to a massive block of concrete weighing more than 200 tons. After making about 33 million revolutions, the shaft broke one evening, without any warning, through the web of the crank next the fly-wheel, with consequential breakages of the piston, of the cap of one of the bearings, and of the engine framing, into five large pieces, besides damage to the side shaft, gas and water pipes, and other minor parts. So far as could be judged from the solidity of the foundation, and from the appearance of the shaft journals, the fracture had not resulted from inaccurate alignment of the bearings, nor from insufficient dimensions of the crank for the ordinary working pressure. In fact, there was nothing seen to which it could be attributed. It was therefore decided to analyze the material; the results of the analysis being:

Carbon, combined	0·320
Carbon, graphitic	Trace
Silicon	0·018
Sulphur	0·071
Phosphorus	0·078
Manganese	0·360

Tensile, impact, and fatigue tests were also made, with the following results:

Tensile Tests Made at the Manchester School of Technology on Standard Specimens of 2-inch Gauge Length, cut Parallel to the Crank-Arm and Perpendicular to the Axes of the Shaft and Pin.

Yield point, tons per square inch	16·8	16·12
Maximum stress, tons per square inch	28·4	27·92
Elongation, per cent.	21·0	25·0
Reduction of area, per cent.	35·6	42·2
Appearance of fracture	Silky	Silky

Impact Tests of Three Specimens, 2 inch by $\frac{3}{8}$ inch by $\frac{1}{16}$ inch, at Messrs. Willans and Robinson's Works.

Work absorbed, 3·2 ft.-lbs., 3·2 ft.-lbs., 2·5 ft.-lbs.
All fractures highly crystalline.

Fatigue tests, in Sankey's machine, of specimens, 4 in. long by $\frac{3}{8}$ in. diameter. Four, marked A, cut parallel to crank-arm; Two, marked B, cut parallel to axes of shaft and crank-pin.

	A.	A.	A.	A.	B.	B.
Number of bends	5	3½	4	2½	10½	14½
First effort, ft.-lbs.	28	28	28	28	27	31
Maximum effort, ft.-lbs.	42	42	43	43	45	47½
Mean effort, ft.-lbs.	38½	39	37½	37	37	40½
Work expended, ft.-lbs.	285	190	250	180	750	1250
Appearance of fracture		Crystalline				Silky

A decent 0.32 carbon steel should have a yield stress approaching 20 tons, and an elongation of about 23 per cent. in 8 inches, should absorb 15 or 16 ft.-lbs. under impact test, and about 2000 ft.-lbs. under fatigue test. The mechanical tests show that the steel from which the broken shaft was made was brittle; and the analysis why it was so. The flaw, if there was one, may be attributed to the high percentage of sulphur, and the early breakage to the phosphorus.

It is possible that failure may have been hastened by premature ignitions (though the owner of the engine denied that these had occurred), for the exhaust-valve had been left without examination from the time the engine started, on Aug. 22, 1908, until Feb. 22, 1909, a fortnight before the breakdown; and when taken out on the last-mentioned date it was found to be full of deposit internally, and burnt and corroded externally. The main cause of the failure, however, was the inferior quality of the shaft. The maximum load on the crank-pin was about 130,000 lbs.; and the weight of the fly-wheel about 21,000 lbs. Assuming the pressure on the bearing between the crank and fly-wheel to act at the middle of the bearing, the bending stress on the crank would be about 8900 lbs. per square inch.

Take another instance—a horizontal gas-engine, barely twelve months old, with cylinder 16 inches diameter by 21-inch stroke, running at 175 to 180 revolutions per minute with producer gas. The crank-shaft was a mild-steel forging. It was held in two bearings, and carried two fly-wheels 6 ft. 10 in. outside diameter, each weighing about 4000 lbs. One of the cranks failed in the web after the engine had made about 50 million revolutions, and about 18 million explosion strokes. The maximum load on the crank-pin was about 54,000 lbs., and the pressure on the bearing next to the fractured crank was about 27,400 lbs. Assuming this reaction to act through the middle of the bearing, the bending stress on the crank would be about 6500 lbs. per square inch. There would also be some slight additional stress from the torsion of the right-hand fly-wheel; but anyhow the stress on the slab was low.

Test-pieces, 2 in. by 3 in. by 1 in. 4 in. by 3 in. diameter, were cut from the broken crank for impact and fatigue tests, some (A) parallel to the crank-arm, others (B) parallel to the axes of the shaft and crank-pin, and were tested with the following results:

	A.		A.		B.		B.	
Impact tests—								
Work absorbed in breaking, ft.-lbs.	5'2	..	4'75	..	10'2	..	10'2	..
Fatigue tests—								
Number of bends	. . . . .	7 $\frac{3}{4}$	..	7 $\frac{3}{4}$	..	17 $\frac{3}{4}$	..	17 $\frac{3}{4}$
First effort	ft.-lbs.	30	..	31	..	30	..	32
Maximum effort	,,	44	..	49	..	53	..	50
Mean effort	,,	40'5	..	44'5	..	46'0	..	44'5
Work expended	,,	615	..	720	..	1710	..	1750

The steel was also analyzed, and found to contain:—

Carbon	0.209
Silicon	0.081
Manganese	0.603
Sulphur	0.020
Phosphorus	0.038

No static tensile test was made; but from the analysis, it may be assumed that such a test would have shown a proportional limit of about 14 tons, a yield point at about 17 tons per square inch, an elongation of about 27 per cent. in 8 inches, and a maximum resistance of about 30 tons per square inch.

Unfortunately, the percentage of nitrogen was not determined by the analyst; and it is possible it may have been sufficient to cause the brittleness to which the fracture must be attributed. Otherwise, there is no indication of any defect in the material. Nor was there any excessive stress set up by centrifugal forces resulting from the revolution of unbalanced weights in the fly-wheels; for the Company's inspector tested both wheels upon a mandrel, and found they were amply strong enough to stand in any position.

Another somewhat similar fracture had illustration two months later. In this instance, the engine had a cylinder 11 inches diameter by 18½-inch stroke, and ran at about 145 revolutions per minute, making, on an average, 32 explosions per minute. The crank-shaft had two bearings and two fly-wheels, each weighing about 1800 lbs. This shaft was put in new in January, 1907, and was fractured on June 29, 1909, through the crank-web nearer the driving pulley, after having worked for 5180 hours, during which it had made about 45 million revolutions, and suffered the stresses from about 10 million explosions, giving a pressure of about 350 lbs. per square inch on the piston. The stress on the crank-web would be about 12,800 lbs. per square inch.

After the breakdown, instructions were given for the preparation of test-pieces for impact and fatigue tests. These were to have been cut, as in the other case, parallel to the crank-arm and parallel to the axis of the shaft; but by some mistake all the specimens for the impact tests were cut parallel to the axis of the shaft—A with the broad sides (3-inch wide) and B with the narrow sides (1½-inch wide) facing the edge of the crank. Fortunately, however, the Company obtained three more specimens (C) cut, as B ought to have been cut, parallel to the crank-arm. The fatigue test-pieces D were cut with their axes parallel to the crank-arm; but the piece E (which should have had its axis parallel to the axis of the shaft) was cut with its longest dimen-

sion perpendicular to this axis and to the crank-arm. The results of the tests were these:—

	A		A		A		B		B		C		C		C	
Impacts tests—																
Work absorbed in breaking, ft.-lbs.	9.5	10.1	8.2	9.4	10.5	10.6	5.0	5.4	6.8							
Means „	9.7						5.7									
							D				D				E	
Fatigue tests—																
Number of bends					7½		..		7½		..		6½			
First effort ft.-lbs.. . . .					29		..		28		..		38			
Maximum effort „					55		..		53		..		50			
Mean effort „					45.6		..		49.6		..		48.4			
Work expended „					785		..		700		..		715			

Neither static tensile test nor analysis was made, nor was the cause of the fracture suggested by anything in the construction or working of the engine.

The impact and fatigue tests in this and the previous examples are suggestive. They all show the low capacity for withstanding impact and fatigue of the pieces cut with their longest dimensions perpendicular to the axis of the shaft, and especially of those cut with their longest dimensions parallel to the crank-arms. They suggest that crank-arms proportioned on the assumption that the material in them is as strong as in the bodies of the shafts forged with them are in reality much weaker than the shafts, because the material in them has not the same capacity for resisting the stresses which come upon it as has the material in the shaft to resist the stresses which come upon it. In other words, if a unit stress of 8000 lbs. to 9000 lbs. be permissible upon necks and crank-pins of forged crank shafts, the unit stresses on the crank-arms should not exceed 4000 lbs. to 4500 lbs. per square inch. If this be true, then these two last-mentioned breakdowns may be ascribed to weakness; and as the dimensions of the crank-arms were not unusually small in relation to the cylinder dimensions, it follows that most crank-arms are weak, and that they ought to be strengthened or forged separately, and shrunk or forced on to the shafts and crank-pins.

A further case is a horizontal gas-engine, some seven years old, working with gas from a town main. The cylinder was 11½ inches diameter by 24-inch stroke; the speed, 220 revolutions per minute; the number of explosions per minute varying from 50 to 90, but generally between 70 and 80; and the average of explosions recorded at the inspector's visits, 71 per minute.

The crank-shaft had three bearings, 5½ inches diameter by 10½ inches in length; and a crank-pin 6½ inches diameter. The weight of the wheel was about 5000 lbs. The engine was set on wedges on a concrete seat; the space between the top of the seat and the under-side of the bed-plate being grouted with fine concrete. In November, 1907, the grouting had become softened with oil; and the middle bearing of the shaft was found to be too low. In December, the bearings were adjusted. In November, 1908, the middle bearing again ceased to support the shaft, and the outer bearing ran warm. The old grouting under the bed-plate was then picked out, and replaced by good folding wedges and fresh grouting. The shaft was lifted, and the bearings all properly levelled. In November, 1909, the shaft broke at the junction of the crank-pin with the crank next the fly-wheel. The stress upon the pin, supposing all the bearings to be in line, would be about 7200 lbs. per square inch—a stress unusually low in gas-engine practice. The result was that, notwithstanding the failure of the foundation in 1907, the shaft made 250 million revolutions, and probably bore about 80 million explosion stresses before it broke. Had the engine been properly seated, no doubt the life of the shaft would have been longer; but for a gas-engine shaft it was not bad.

As a final example, reference may be made to a horizontal gas-engine, six years old, with cylinder 20 inches diameter by 30-inch stroke, connected by flexible coupling to the shaft of a dynamo running at 180 revolutions per minute. In 1906 the shaft broke, and was replaced by a new one. Soon after starting, one morning in October, 1909, the bearing next the fly-wheel began to heat; and the attendant was compelled to stop the engine. When the cap was lifted, a crack was found running into the crank-web along the neck, and then circumferentially round it—the total length being about 9 inches. The engine was supplied with suction gas, giving a maximum pressure of about 340 lbs. per square inch upon the piston, and a load of about 94,000 lbs. upon the crank-pin when the crank was on the inner centre, a load of 87,600 lbs. when the tangential pressure on the crank-pin was a maximum, and a maximum tangential load of 45,000 lbs. The maximum stress calculated for these loads would be somewhere about 18,000 lbs. per square inch. The life of the shaft was about 91 million revolutions. The number of explosions per minute could not be ascertained; but assuming it to be 80 per cent. of the possible mean, it would be 18 millions.

Fatigue tests of pieces A, cut parallel to the crank-arm, and B, perpendicular to the crank-arm and to the axis of the shaft, gave:

	A1.		A2.		B1.		B2.	
Number of bends	14.5	..	14.5	..	16.5	..	19	..
First effort, ft.-lbs.	29	..	30	..	27	..	?	..
Maximum effort, ft.-lbs.	52	..	52	..	57	..	?	..
Mean effort, ft.-lbs.	46.5	..	46	..	46.5	..	?	..
Work expended in breaking, ft.-lbs.	1380	..	1320	..	1550	..	1755	..

The composition of the material was found to be :

Carbon	0'300
Silicon	0'074
Manganese	0'780
Sulphur	0'035
Phosphorus	0'740
Nitrogen	0'006

Turning to the section of the report alluding to the inspection and insurance of electrical machinery, it is found that in this branch of the Company's business also the rate of increase has been affected by the state of trade. It is lower than in 1908; but the rate of increase in the number of breakdowns has fortunately been lower still. Indeed, the breakdowns of dynamos were absolutely fewer than the previous year. The cost of repairing the damage done, except in the case of starting switches and controllers, was also less; so that, on the whole, the benefit of inspection to the insurer as well as the profit to the Company has been greater. The rates of breakdown among the various classes of machines were: Dynamos, continuous current, 1 in 17'2; alternating current, 1 in 17'5. Motors, continuous current, 1 in 8'2; alternating current, 1 in 9'5. Dynamos and motors, continuous current, 1 in 9; alternating current, 1 in 9'7. Starters and controllers, 1 in 25.

The causes of the year's breakdowns were probably these :

Cause of Damage.	Dynamos.			Motors.			Starting Switches and Controllers.		
	Average for Seven Years previous to 1908.			Average for Seven Years previous to 1908.			Average for Three Years previous to 1908.		
	1908.	1908.	1909.	1908.	1908.	1909.	1908.	1908.	1909.
Accidental	11'6	6	5	8'4	4	2	15'6	8	5
Dirt and neglect	18'2	23	20	20'8	30	26	11'0	17	19
Age and deterioration . .	24'1	25	16	23'1	20	14	26'0	25	17
Bad work or design . . .	20'4	20	23	16'1	11	14	7'7	9	14
Overloading	2'5	0	1	5'0	1	1	5'7	2	2
Unascertained	23'2	26	35	26'6	34	43	34'0	39	43
	100'0	100	100	100'0	100	100	100'0	100	100

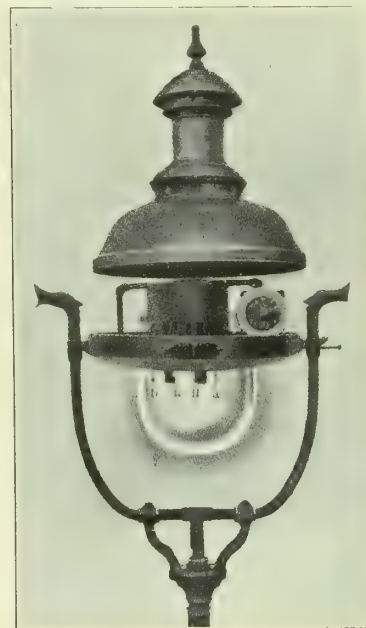
Some examples of breakdowns are quoted; and before closing this section of the report, Mr. Longridge considered it well—in view of the number of men who have been killed or have received severe shocks recently by touching high-tension machinery—to remind all who have to clean or inspect such machinery that, when well insulated, and endowed with large electrostatic capacity, it will conserve a charge for an appreciable, and sometimes for a considerable, time after the current has been cut off. No one should, therefore, attempt to handle any part until he has satisfied himself that it has been completely disconnected from the source of supply, and that a sufficient time—say ten minutes—has elapsed after the disconnection to allow the electrical charge to leak away. The stators of large high-tension alternators may possibly remain charged for still longer periods; and therefore, even after the lapse of whatever time may be considered sufficient for discharge, the part, before being handled, should be touched lightly and quickly with the finger. Indeed, this preliminary touch is always wise. Long cables, armoured or buried underground or immersed in water, may, under certain conditions, hold charges for hours, and should never be handled by those who do not understand the conditions under which they become condensers, and the proper methods of discharging them.

The Leicester Appointment.

At a meeting of the Leicester Gas Committee, held on Monday of last week, under the presidency of Alderman T. Smith, it was decided to recommend the Town Council to confirm the appointment of Mr. Hubert Pooley, of Stafford, to the position of Engineer and Manager of the Leicester gas undertaking, in succession to the late Mr. Alfred Colson. The salary will be £800 a year, rising by annual increments of £100 to £1000, on giving satisfaction to the Committee. The appointment was made from a list of five selected candidates. Mr. Pooley has been the Stafford Corporation Gas and Electrical Engineer and Manager since 1900. During his term of work there, very important alterations have been made to the works, designed by Mr. Pooley, under whose supervision the undertaking generally has been most successful. He is a son of the late Mr. Henry Pooley, J.P., for many years senior partner in the firm of Henry Pooley and Sons, the weighing machine makers. He is a cousin of Mr. J. A. Picton, one of the Members of Parliament for Leicester from 1884 to 1892. He was trained in the office of his father's firm. Afterwards he was a student at the University College, Liverpool, studying chemistry and engineering. On the completion of his studies, he was articled to Mr. T. O. Paterson, the Birkenhead Corporation Gas Engineer, whom he assisted in carrying through some extensive alterations. In 1893, he was appointed Engineer and Manager to the Dunfermline Gas-Works, which were taken over by the Corporation in 1896. While there, he was elected President of the North British Association of Gas Managers. He went from Dunfermline to Stafford. Mr. Pooley was President of the Midland Association of Gas Managers in 1907.

"BAMAG" DISTANCE PRESSURE-LIGHTERS.

WITH electric illumination, it is possible to light all lamps from a central station. This arrangement offers the advantage that the lights can be turned on or off in the street lamps without any special attendance, independent of existing lighting schedules, without any preparation whatsoever, and can always be accomplished to suit real and actual requirements. This advantage had to be transferred to gas, in order to enable it to permanently maintain its acquired position as a popular illuminant in competition with its rival, electricity. To light and extinguish street gas-lamps from a central station has been the object and aim of several arrangements for some years past, such as distance lighters operated by compressed air, by electricity, by clock-work, and by gas pressure. Distance lighters for street lamps,



"Bamag" Distance Lighter for Inverted Street Lighting.
[Head of Lamp Raised.]

actuated by air pressure or by electricity, have not met with very much success, as the expenses connected therewith were too high, while gas-pressure distance lighters have become a favoured medium.

The first experiments, about nine years ago, in utilizing gas pressure for operating distance lighters by a pressure wave (a temporary increase of pressure over the normal pressure), have shown that such a pressure wave can be transferred through the

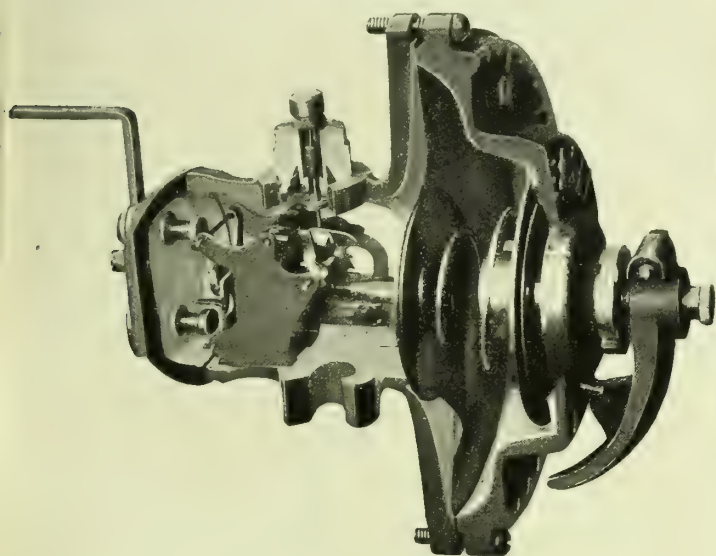


Head of Lamp Closed, and "Bamag" Lighter Hidden.

whole system of mains with astonishing velocity, even to the remotest outskirts, and to any distance. Therefore, a wave of a certain height is sufficient to operate all the street lamps of a town simultaneously, provided that, at the time of the wave being given, the mains are not over-loaded, or that inadequately sized

mains do not stem the progress of the pressure wave. Experiments to produce distance lighters operated by a pressure wave led to the making of two distinct kinds—one with a diaphragm, and another with a float or cup, on which a wave can exert its force. The first prolonged trials (the Distance Lighting Company claim) proved at once the superiority of the diaphragm.

The first distance lighter on the diaphragm principle which has come into extensive use is the "Bamag." The numerous, and many years old, installations of this apparatus have conclusively proved that gas and its impurities have no deleterious influence on the diaphragm. They have proved, too, that it is the correct thing to dispose all movable parts within the strong shell of the apparatus, which protects them from any wilful damage. At first it was feared that accumulation of gas impurities and corrosion would affect the parts disposed in the gas space. But this has not been the case, as the absence of oxygen excludes corrosion. The movable parts disposed outside the gas space will be much more readily clogged, corroded, and damaged, on account of the



Section of the "Bamag" Apparatus.

ever-changing moisture and temperature of the atmosphere, dust, and other deleterious influences, than will be the case with the internally-disposed movable parts of the "Bamag." Consequently, we learn that an unlimited guarantee can be given as to the performance and life of the "Bamag" apparatus.

The diaphragm is the most important part of the apparatus. It only moves within the limits of its greatest force development; and an air-cushion, provided also within the shell of the apparatus, regulates the movement of the diaphragm. Sudden, unexpected pressures from within, as well as from without, have no effect on it. The employment of a valve to control the gas-way in the "Bamag" lighter is sufficient for the intended purpose, while its mobility is independent of temperatures and all other influences. Besides, a valve requires the least possible power for movement, which enables the "Bamag" apparatus to work with only a small pressure wave.

It is of the utmost importance that a distance lighter should allow of speedy fixing, and also of equally speedy change, if alterations in working pressures are made. To achieve this, the "Bamag" apparatus is provided with a pointer, movable in front of a dial, which permits of easy and instantaneous adjustment to any desirable gas pressure.

The pointer at the same time serves to take pressures in the lamps; for, by moving the pointer in a certain direction, the gas is ignited. The point of ignition shows the actual pressure in the lamp service-pipe at the moment the pressure is taken; and it can be read off directly below the pointer. By fixing the pointer on a correspondingly higher point, correct adjustment of the "Bamag" is complete. This shows clearly how readily and quickly a "Bamag" lighter can be adjusted, even under the most difficult pressure conditions.

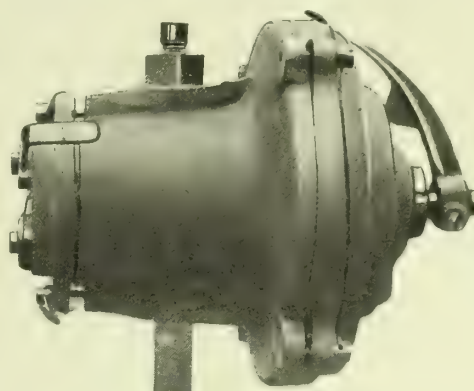
This pressure lighter, besides being operated by a

pressure wave, can also be operated by hand, inside the lamp by means of a lever, or else from the outside by a lever with rod. The apparatus is constructed to suit all kinds of lamps, with upright or inverted burners, and for high-pressure gas lighting. The simple construction of the working parts indeed allows of manifold applications; so that the apparatus can work with two, three, four, and more pressure waves in 24 hours. This makes

it possible, for instance, to light all lamps or burners at dusk, extinguish part of the lamps (say) at 11 p.m., another part at midnight, and the remainder at dawn. Or part of the lamps can be relit during the night as required—say, after the electric lights are extinguished—or for a few hours in the morning when men are going to their day's work.

The gas industry has opened a new field for itself by adopting distance lighting plant. The plant supplies gas by pressure from the gas-works to a distant district, small town, or village, which

is provided (say) with lamps fitted with "Bamag" distance lighters. In conjunction with such an installation, gas pressure lighting reaches a point of additional interest; for, by the special construction of the supplementary plant used, the actuating of the "Bamag" distance lighters in the most remote districts can be



Side View of the Apparatus.

made quite independent of the other districts of the central gas-works, and the waves can moreover be given at any desired time, and in any desired manner or rotation.

The great advantage of the "Bamag" distance lighters, coupled with the possibility of using them under all conditions, and under the most difficult pressure occurrences, have greatly favoured their adoption; so that at the present time, we understand, more than 63,000 are in operation in Germany alone. Should unfavourable conditions—insufficiently large mains, &c.—not admit of the use of distance lighters without certain alterations, it may be taken for granted, and with absolute certainty, that the mains kept under normal pressure at the governor, do not satisfy all the requirements of consumers. It is a friendly warning to the managements of gas undertakings that they should subject their mains to inspection and improvement, if waves of sufficient height cannot be satisfactorily transmitted from the gas-works. In such cases, it is in the interests of the gas-works to increase their mains with a double object—to satisfy their customers, and to give as much gas as possible under suitable pressure. Finally, gas pressure distance lighting forms on its own accord a continual supervision, indicating, whether in the mains, and at which points, alterations or improvements are required.

The great range of the apparatus in meeting variation in pressure and requirements, and the certainty in complying with the designed purpose in operation under numerous different conditions, have been demonstrated to us by Mr. Maurice Schwab, at the office of the Distance Lighting Company, No. 69, Farringdon Road, where anyone interested can also have a like interesting experience.

The foregoing general reference to the "Bamag" gas-pressure distance lighters may be supplemented by extracts from reports on the subject that have recently appeared in the "Journal für Gasbeleuchtung," and contributed by Herr F. Göhrum, of Stuttgart, and Herr H. Dobert.

FROM THE REPORT BY HERR GÖHRUM.

As the lighting requirements of our streets increased, proposals came forward to decrease the cost of expenses. Lighting and extinguishing play a prominent part in this, so that a reduction of cost in these, by the use of seemingly suitable appliances, appeared to be the first consideration. The appliances coming into question, can be divided into three groups:

- (1) Apparatus with clockwork which operates the opening and closing of the lamp-cocks. Each lamp possesses one apparatus, independent of all the other lamps.
- (2) Apparatus operated by electric current. Such apparatus is operated according to the arrangement of the electric wire system, simultaneously in the whole district, or in groups only. It allows actuation of the street lighting, corresponding to the commencement or the end of the lighting requirements—the commencement of dusk and the beginning of dawn.
- (3) Apparatus which actuates the lamp-cocks at the time of lighting or extinguishing, by means of different gas pressures in the mains. Such apparatus operates simultaneously all through the district; allows the actuating of the lamps at the beginning of dusk and of dawn.

An appliance which meets all demands, must comply with the following conditions: (1) It must be absolutely reliable. (2) It must allow the possibility of lighting and extinguishing as and when required. (3) It must in no way influence the lighting in private houses. (4) It must not cause unproportionally great outlays. None of the foregoing three systems answers completely these demands; but it may be stated that the clockwork apparatus



Back View of the Apparatus.

is a quite useful medium, and in many cases will be the only system which can be adopted. After it was recognized that the existing lighting appliances did not come up to the ideal of central lighting, we reverted to the system of pressure waves, which, if my memory does not fail, was first used by Professor Klinkerfuss, of Göttingen. This system has been recently worked out and improved in divers forms. It is intended to communicate the advantages of technical and economical nature which have been obtained in Stuttgart during the past half year with about 4200 distance lighters. It may be shortly stated that the installation of so great a number of lamps with "Bamag" lighters was decided upon after a small number of the same apparatus had been tried experimentally for two years, at a great many divers points of our mains, and after the suitability of the apparatus had been verified both in horizontal and vertical positions. It may be further stated that of the 4200 "Bamag" lighters only few, if any, miss per day; and here it may be remarked that a number of service-pipes have frequently water lodged in them, which may account for the failures.

The technical advantages of the distance lighters are: (1) The possibility of lighting or extinguishing the whole of the lamps in the space of one minute, and that, too, at any desired moment; so that the street lighting can be made to fit the requirements as close as possible. (2) The possibility of lighting the lamps should darkness set in exceptionally early, without waiting for the arrival of the lamplighters, which varies according to a fixed lighting schedule. Through abnormal, unforeseen weather conditions, the street traffic increases; so that absence of illumination is felt doubly disagreeable. (3) The possibility in case of floods (which occur here frequently), in low-lying districts, to operate the lamps without any trouble. (4) In the fact that an absolutely reliable attendance to public lighting is no longer dependent on the certainty or uncertainty of the lamplighters. (5) In the quiet and easy lighting or extinguishing of the lamps, as the pushing, pulling, or knocking with the torch on the lamp-cocks is avoided; and consequently the vibration of the whole lamp does not exist, and the ignition of the gas takes place without any explosion. The mantles and chimneys of the burners are not ill-used, and they last longer. There is, in our own case, a reduction in the number of mantles from Dec. 1 until March 31, as compared with the same period of the preceding year when the lamps were operated by hand, from 9900 to 5500; and in the same period breakages of the chimneys were reduced from 4100 to less than 600. This shows clearly how maintenance has been simplified by the introduction of distance lighting. (6) In the fact that a smaller number of men, but more qualified, are required for attendance and maintenance of street lighting. This removes all unpleasantness appertaining to the employment of a large staff recruited from all ranks, and as a rule not over-intelligent. (7) An additional fact may here be mentioned, which, it may be said, is indirectly useful. With the introduction of distance lighters in the whole of the lamps, the entire mains are, as regards pressure conditions, under lasting observation; so that, if necessary, improvements in these conditions can be carried out before the consumer suffers through insufficient supply.

The foregoing enumerated technical advantages produce very economical results; and the economical advantages of distance lighting can be tabulated in figures:

- (1) Saving in gas from Dec. 1 to March 31, compared with the consumption in the same period of the previous year, in consequence of lighting and extinguishing to meet actual requirements, 14,000 c.m. (495,000 cubic feet).
- (2) The number of mantles used in the four months was 5508, as against 9912 in the same time the year before, which equals a saving of 4404 mantles. It may be mentioned that the mantles employed from Dec. 1, 1909, to March 31, 1910, were considerably less durable.
- (3) The number of chimneys used in the four months was 578, against 4128 during the same period the previous year, corresponding to a saving of 3550 chimneys.
- (4) Expenditure in wages for maintenance and attendance on the lamps in the four months was £212, as against £1064 10s. for the same period of the preceding year, and that is for the whole street lighting of the town of Stuttgart. This shows a saving of £852 10s., which sum would have been increased by £105 if, at the time, the whole of the lamps had been fitted with distance lighters. This will be realized in the course of this summer, when all the district governors will have been reconstructed in such a way as to allow the pressure wave to pass through into every district.

Expressed in money, we have the following result for the period, as against the corresponding months of the preceding year:—

Saving in gas, 14,000 c.m. (497,730 cubic feet) at 10 pf. (2s. 9½d. per 1000 cubic feet)	£70 10
Saving in mantles, 4400 at 20 pf. (2' 4d.)	44 0
Saving in chimneys, 3500 at 12 pf. (1' 4½d.)	21 0
Saving in wages	850 0
Total saving in four months	£985 10
From this must be deducted gas burned in the bye-passes, 26,400 c.m. at 10 pf.	132 0
Leaving a net saving of	£853 10

We may therefore calculate with certainty on an annual decrease of cost for street lighting of £1250, in consequence of the

installation of 4200 "Bamag" lighters. By the introduction of distance lighting, not only a saving in the cost of street lighting is achieved, but an installation of public lighting is obtained which does not lag behind the electric light.

[Since the above was written, Cannstadt (a suburb of Stuttgart) has been supplied with an additional 1500 "Bamags."]

FROM THE REPORT BY HERR H. DOBERT.

After five years' use of distance lighting apparatus, and the lighting and extinguishing of the whole of the lamps of my town having been done by these appliances for more than two years, I am in a position to reply to the question whether the advantages expected from the installation are actually gained.

By the use of distance pressure lighters, the lighting and extinguishing of all the lamps is performed by one man only, at the gas-works, by means of pressure given by the governor, at the moment when dusk sets in in the evening, and with the break of dawn in the morning. The giving of pressure waves is shown in all gas-works pressure recorder diagrams; and this record will present an absolutely correct picture of the actual number of hours all lamps have been alight. In a paper read by me in 1908, I showed (by graphic illustration) how irregular darkness sets in in the evening, according to prevailing weather. Very seldom the time remains the same for several succeeding days—differences from five to fifteen minutes occur nearly daily, and sometimes they reach fully thirty minutes. The deviation from the normal lighting time schedule is still greater, as the time when lighting becomes desirable can be judged in all weathers. During the winter months, with few exceptions, we could light up about half an hour later than is prescribed in the lamp time table, but in the light summer months lighting took place on many days three-quarters to one hour later. As these differences also exist in the mornings when darkness fades, with a little attention the burning hours per annum can be materially reduced in the evening and all-night lanterns. When tending lamps by lamplighters, no notice can be taken of bright weather, as lighting and extinguishing have to be performed according to the schedule.

The average consumption of gas per lamp per hour, taken at 4 cubic feet, means a consumption of 2000 cubic feet in 500 lamps per hour. Therefore every minute which can be saved of the time of burning in bright weather means a saving of 35·3 cubic feet in 500 lamps. According to my statistics, the actual burning hours for evening lamps have been reduced by 135 through the distance lighting apparatus. This means for the 500 burners a saving in gas for 135 hours of 8000 cubic metres. For all-night lamps also, a reduction of burning hours occurs; but the lamps being less in number, the saving probably is 2000 cubic metres. The saving in gas for 500 lamps in one year is, therefore, 10,000 cubic metres, or per lamp per annum, 20 cubic metres.

To this has to be added the saving effected by the simultaneous extinguishing of the evening lamps as well as the all-night lamps. It is not possible to estimate this by calculation. Immediately after the installation of the distance lighters, leakage was reduced by 2 per cent., which admits of the conclusion that, by the regular extinguishing of evening lamps at the same hour, a greater saving in gas is effected than was fixed by calculation for the lighting of the evening lamps. Taking one-half of the gas saving accrued by the reduction of leakage to the credit of the distance lighters, it means, for the conditions prevailing in my town, a saving of 17 cubic metres per lamp per annum. It would not be estimating too high to take the annual saving of gas for each lamp as being 35 cubic metres.

In order to ascertain the saving in wages, I calculate the average number of lamps tended by one man to be 60 to 65. Thus 500 lamps require eight lamplighters. Under the assumption that the men also clean the lamps, their average earning per year will be £30. An inspector for maintenance of lamps, mantles, and burners is required whether the lighting is done by hand or automatically. For cleaning 500 lamps, two cleaners will be wanted. They can clean 20 to 22 lamps thoroughly per day; so that every lamp receives proper attention once a fortnight.

Dispensed (with automatic lighters for 500 lamps) with eight lamp lighters, having an average yearly wage of M. 600	M. 4800
Required two lamp cleaners with an average annual wage of M. 1200.	2400
	<hr/>
Saving in wages in favour of distance lighters . .	M. 2400
Or per lamp per annum	480

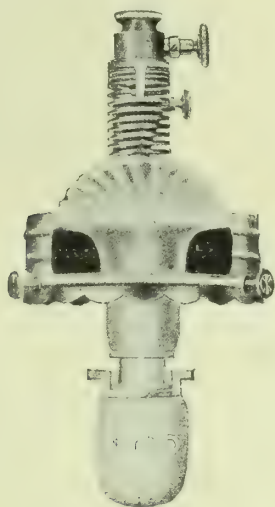
With proper care of the distance lighters, the economical advantages, in reference to saving in gas and wages, stand thus :

Gas, saving per lamp per annum 35 c.m. at 11 pf.	M. 3'85
Wages, " " " "	4'80
Single light, per lamp, per annum, total saving	M. 8'65
Double " " " "	12'25

Should at any time a burner with lighted bye-pass refuse to light, it is a positive sign that the fault lies in the main—either a stoppage or a leak which has weakened the pressure wave. The distance lighters assist greatly in tracing defects in mains. They enable one to verify the pressure conditions in the mains, as by moving the pointer on the face of the dial, the existing pressure can be ascertained at a glance. It is consequently quite a simple matter to find and remove any fault in the main, when unduly low pressure is observed in any district, caused by inadequate connections or throttled pipes.

"NICO-VIBRA" BURNER & "NICO-RADIO" LAMP.

THE New Inverted Incandescent Gas-Lamp Company, Limited, of Farringdon Avenue, have always, as the records of the "JOURNAL" show, had a keen eye for novelties in connection with inverted gas-burner lighting. Pioneers in inverted gas lighting in this country, their acuteness in this respect is quite in accordance with the fitness of things, and with what one would expect from a Company that showed such perseverance as this one did in the early days of a revolutionary system of lighting. Honour to whom honour is due. We say, and we say it without fear of contradiction, that, had it not been for the tenacity of the Company to their belief in the possibilities of the inverted burner in the days when the burners came to us in their crude state, and for their painstaking work in discovering the necessary refinements conducing to perfection, the inverted burner would not have occupied the position in popularity and in the economy of lighting that it does to-day. The spade-work was theirs. As we look to-day on the latest burner that the Company have introduced to our notice under the name of the "Nico-Vibra," giving a steady and intense light with an economical consumption of gas, thoughts revert to the first public exhibition by them of inverted burners at the Crystal Palace in 1901, with their wobbling, noisy flames, and a tantalizing propensity to light-back. Then people said—the expert gas man among them—that the burner was a contravention of the natural order of the combustion of gas, and would never succeed. What of the prophecy now? The inverted burner to-day stands at the very apex of the economy and efficiency of incandescent lighting.



The New "Nico-Vibra" Inverted Burner.

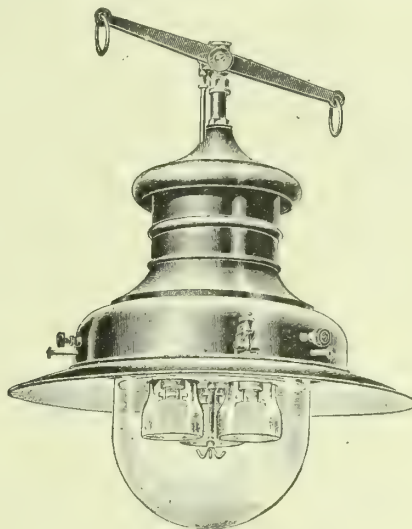
In their work of improvement, and in introducing improvement, the Company have not—either in the domestic or outdoor forms of lamp—adopted any conservative attitude, or turned from their doors, without thorough examination, any new ideas emanating from outside sources; and in this regard, they are not, even with the efficiencies of their own "Nico" type of burner, departing from established policy. The newest burner—the "Nico-Vibra"—that they have added to the range already possessed is proof. It is the invention of Signor Amedeo Giorgi, Gas Engineer, of Florence; and the patent rights have been acquired by the Company. It is the most novel inverted burner that we have yet seen; and as its name implies, in its structure is an anti-vibrating arrangement, forming an inseparable part. It looks curious. Presented to the eye we have, in place of the ordinary bunsen tube, a strong spiral spring. Fitted at the top of this is the gas nipple and regulator. This feeds into an altogether separate part in the form of a funnel; and this funnel works up and down as required in a short bottom length of tube, with a bell-mouth. We need not here refer to the gas regulator and nipple; the combination is of the well-known "Nico" type. The funnel plays an important part in the supply of air for the mixture. It produces as it were a dual supply of air at different stages of the flow down what, falling a better name, must be termed the bunsen. At the top of the funnel, is the primary air supply; and at the bottom a secondary air supply. Owing to the cone shape of the funnel, the turning down or up (by means of the projecting piece working in the spiral spring) effects the proportioning—by the reduction or enlargement of the annular space—of the air supply to a nicety for any grade of gas that is being supplied; so that it is adjustable to suit practically any condition of gas supply. To say the least, it has a magnificent range of both air and gas adjustment. The proof of the advantage in the construction, and in the admission of a primary and secondary air supply, is found in the production of a noiseless and high-temperature flame under varying conditions. The spiral spring (which is made of hardened steel wire, and so must have a longevity of a no mean order) not only acts as an excellent vibrator, but it also serves as a radiator for the heat generated by the burner; and consequently through it, and the construction of the crown of the burner, the fitting to which the burner is attached is kept comparatively cool. This was tested after a

burner had been in use some time, by toying with the gas adjustment without any inconvenience in the way of burning the fingers. Thus regulation can be effected at any time the burner is in use. But just a few words as to the lower part of the burner. It is made of a white china cone, with a deflecting head attached in one piece, and an outlet is provided in one direction only by an opening (as illustrated) in the globe supporting band. The protective power of the burner is obvious.

The burner (which is finished in polished brass, steel bronze, or red bronze) is at present made in the standard large and medium sizes; and so it takes the standard sizes of globes and mantles. Reference has been made to the anti-vibratory action of the spring. Its flexibility is noteworthy; and subjecting it to vibration tests, it was observed that, though the burner was almost swinging, the flame and the incandescence of the mantle were not interfered with. From this it will be seen there is for the burner, in addition to domestic and shop lighting, the large field presented by factories, mills, railway stations, and other places where work and traffic produce considerable tremours. It is notorious, too, that the inverted mantle possesses longer life than the vertical form; and the "Nico-Vibra" will extend the life, and thus add to economy. The burner is altogether good looking; and it has the well-finished appearance that speaks of good workmanship and strength.

Regarding the consumption and the efficiency of the burner, the one is low, the other is high. Photometrical tests show that the standard large size burner gives an illuminating power of 100 candles with a consumption of only $3\frac{1}{2}$ cubic feet of gas an hour; while the medium sized burner, with a consumption of $2\frac{1}{4}$ cubic feet per hour, gives a duty of 65 candles—being equivalent in both cases to an efficiency of about 29 candles per cubic foot of gas consumed. We still progress in low-pressure lighting.

The Company are also putting on the market this season a highly efficient outside gas-lamp under the name of the "Nico-Radio," which title again is expressive of characteristics. The lamp is made either with an enamelled steel, or a strong copper, casing. It is of the self-intensifying form, fitted with inner glass chimneys. The burners are of a special type, with external gas and air regulation. Each burner consumes about 4 cubic feet of gas an hour, giving an illuminating power of 125 candles; and



The "Nico-Radio" Lamp.

this duty can be multiplied by the number of burners with which the lamp is fitted. The lamp is furnished with a flash bye-pass; and this, being below the mantles, is not affected by the heat or by carbonization. The construction of the lamp renders it perfectly wind and rain proof; and from all points of view, it is an excellent lamp for maintenance purposes. When used for shop window lighting, a parabolic reflector, instead of a flat one, can be supplied, if desired.

Some of the firm's customers have a particular liking for the "Nico" inverted mantles; and there has been request for the same mantles in the upright form. The Company, nothing loth to extend business in any legitimate direction, have complied with the desire, and are now making a speciality of strong loom-woven types of upright mantles.

This reference to the New Inverted Company's latest special productions may be concluded with a brief allusion to their new catalogue. We venture to say that this is the most comprehensive and extensively illustrated catalogue they have ever issued. It is expressive of the magnitude of the inverted lamp and burner business to-day. Illustrated are an excellent range of "Nico" gas-burners, an abundant design of fittings from the plain to the highly ornate in all the finishes complying with the current demand, numerous accessories, and glassware of all styles. Concerning the fittings, the patterns are the Company's own, and are made at their works at Birmingham. Some of them are most artistic; and being manufactured under the Company's direct supervision, good workmanship is the result. The catalogue is worth something more than a cursory inspection; for it truly typifies the extent of the art and business of inverted gas lighting.

DAVIS GAS-STOVE COMPANY'S NOVELTIES.

A Barless Gas-Fire.

A VISIT to the City Show-Rooms, in Queen Victoria Street, of the Davis Gas-Stove Company, for the purpose of inspecting any novelties that the firm may be introducing for the coming heating season, will result in the inquirer coming away fully satisfied that the Luton works are likely, as usual, to play no small part in furthering the advancement of heating-stoves from the scientific and practical side. Various nice patterns are in the show-rooms; but before referring specifically to these, allusion must be made to a new method of construction which has already been applied to quite a large series of fires. Interest is naturally aroused by the

statement that a gas-fire can now be procured without any bars whatever in front to keep the fuel in place. The advent of the pillar fuel has already carried us far along this road; but something more was needed before the final step could be taken. This "something more" the Davis Company have provided, and so made the barless gas-fire an accomplished fact.

The barless fire has been rendered possible by the evolution of a suitable fuel; and the production of such a fuel was the task to which the Davis organization set themselves some months ago. Now that success has crowned their efforts, the outcome of the investigation appears simple. But, if they would, the Company might be able to tell of many disappointments before results which they considered consistent with their reputation were at length secured. The fuel, which is to be known as "Reinforced Pyro," consists of pillars of very high radiating efficiency rein-



Fig. 1.—Placing Fuel in the Barless Fire.



Fig. 2.—A Bad Fracture.

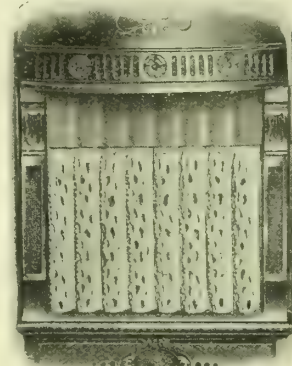


Fig. 3.—The Same Fuel Replaced.

EXPLANATORY OF THE BARLESS GAS-FIRE.

forced by means of specially prepared nickel-steel wires. These wires are inserted at the back of the fuel; and their composition enables them to withstand intense heat. The fuel is held in position by means of a flange on the top sliding brick; while at the bottom there is also a sliding brick. This bottom brick is made of comparatively soft and porous material, in order to give the greatest radiating power possible; while the top section is much harder—its duty being, as already mentioned, to hold the "Reinforced Pyros" in place. A special fuel and a special brick are thus the essentials of the barless fire. To place the "Reinforced Pyros" in position, the top section of the sliding brick is lifted by the thumb and fingers of one hand, as shown in fig. 1; and no part of the fire has to be removed. Of course, accidents will happen, and careless people are always to be found. But if the "Reinforced Pyros" are actually fractured in several places, they are still kept intact in the barless fire by means of the nickel-steel wires. An extremely bad case of fracture has been photographed; and the two illustrations (figs. 2 and 3) may be left to speak for themselves. As has already been mentioned, the barless principle finds an embodiment in many different patterns of the firm's stoves which are being introduced for the coming winter season; and some of these are shown in the accompanying photographs. Every one of the barless series of fires is fitted with right and left hand gas connection; and an entirely new duplex burner is an important feature. Another point which may be mentioned is the introduction of a new form of gas and air adjuster. Regulated by the fingers alone, no tools of any sort are necessary; and the operation is easily performed while the fire is burning. It is perhaps superfluous to say that the reputation of the firm in the matter of maintenance has been fully upheld, if not enhanced, by the specialities which figure in

the 1910-11 programme—all wearing parts being strictly interchangeable.

Perhaps here a moment may be spent on the subject of porcelain enamelling—a department of which, the Company express the opinion, only the fringe has so far been touched, and for the development of which they have laid down, in specially constructed buildings at Luton, plant capable of meeting almost any demands which are likely to be made upon it. It is anticipated that, in the hands of the expert chemist in charge, controlling a staff of skilled workmen who have made this particular branch the work of their lives, the results may prove a revelation to any who may have hitherto regarded the porcelain enamelled stove in art colours as being more or less of a luxury.

On the subject of the "Steamless" radiator—with which the name of the Davis Gas-Stove Company has become identified—there is also something to be said. Certain changes have been made with the idea of bringing this apparatus still nearer the perfection aimed at; and among these, is a base entirely independent of the columns. To this base are fitted the burners, the gas-connections, the governor, and the regulating jet. The last two go to form the Davis new patent controller, which combines the functions of governing as well as regulating the gas. It will readily be seen that the base and all pertaining to it may be easily connected to the gas supply, and the columns placed in position afterwards—thus immensely simplifying the handling of the "Steamless" radiator; and, as in the case of the gas-fires, special provision is made for right and left hand gas connections. But these advances have not contented the Company, who have introduced for the present season an entirely new departure in the shape of the "Luminous Steamless" radiator, which is manufactured in two heights and four widths. It is made on the "Steamless"



Fig. 4.—Fire No. 2035.

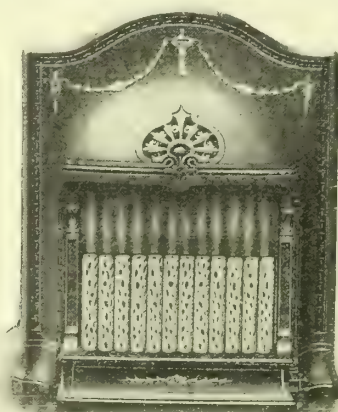


Fig. 5.—Fire No. 2027.

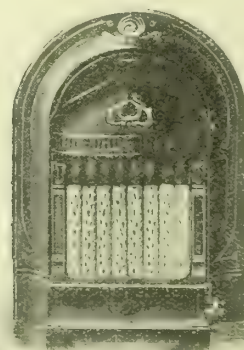


Fig. 6.—Fire No. 2017.

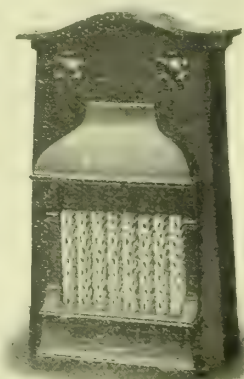


Fig. 7.—Fire No. 2019.

SOME PATTERNS OF THE BARLESS GAS-FIRE.

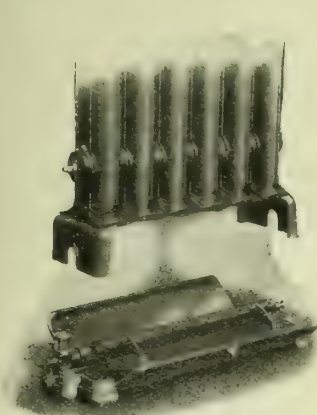


Fig. 8.—"Steamless" Radiator, showing Independent Base.



Fig. 9.—"Luminous Steamless" Radiator, showing withdrawal of Inner Tube.

principle, but in addition possesses many unique advantages of its own. A flame of the luminous type is used, and each burner is under separate control; while here, again, provision is made for right and left hand connections. A table top is fitted to the radiator, by removing which the whole of the interior becomes easily accessible. As shown in the photograph, the inner tubes (which are of the same high-class quality steel as those used in the standard "Steamless") may be readily withdrawn without disconnecting or dismantling the radiator in any way.

To return to the subject of fires, mention may be made of two very interesting specialities introduced by the Company. These are self-setting grate-fires, and are known respectively as the "Ritz" and the "Boudoir." Dealing first of all with the "Ritz," it may be remarked that this is provided with a special duplex burner, consisting of front and top section; and this burner is controlled by a single tap. In the front, the fuel is fitted vertically; while on top, it is laid in horizontal rows. In the former case, "Reinforced Pyros" are used; and in the latter, the Davis Company's standard "Pyro" fuel, which achieved considerable popularity last season. If desired, of course, coloured lump fuel may be added, to give the general appearance of an ordinary coal-fire. The "Boudoir" is certainly a most pleasing and very artistic fire; and it may be confidently predicted that this, as well as the "Ritz," will find its way into many drawing-rooms and sitting-rooms. The general principles are the same as those embodied in the "Ritz;" but instead of the horizontal "Pyro" fuel, imitation wood logs are fitted. These logs are excellently dyed; and when in use, the approximation of the effect gained to the old-fashioned wood-log fires cannot fail to be remarked. In addition, the fire is claimed to be a very economical one. We are given to understand that the Davis Gas-Stove Company have bestowed a considerable amount of attention upon the design of their gas-fire canopies; and we are assured that there is no possibility of any of the products being bye-passed into the apartment where the fire might be fixed.

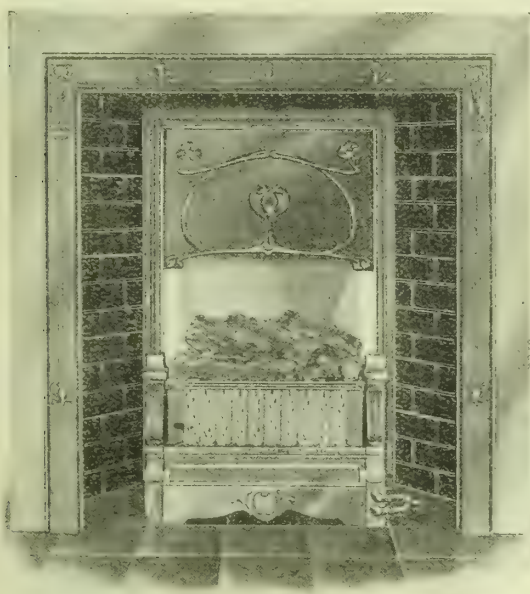


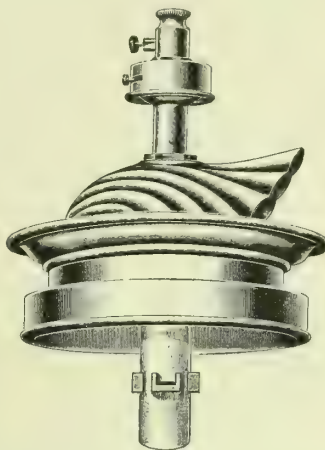
Fig. 10.—The "Boudoir" Log Grate Fire.

In congratulating the firm on the numerous novelties they are bringing out—thus showing their determination to do their full share in keeping the gas-heating business thoroughly up to date—mention may be made of the fact that, in the case of fires fitted with the open front bar, which were a feature of the Davis Company's 1909 programme, the "Reinforced Pyro" fuel is now used, in order that there may be no possible danger of the fuel fracturing and falling out.

NEW BLAND BURNERS.

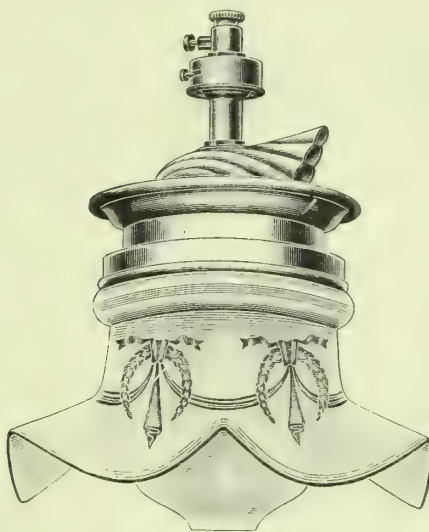
THE Bland Light Syndicate, Limited, are inviting attention to the new forms of their burners. While not departing in any way from the principles that have made their burners gain such a large measure of popular approbation, they have practically reconstructed them, as a result of devoting much time, thought, and experiment to improvements in details and materials, and in obviating that objectionable feature of the discoloration of the metal of inverted burners and the fittings above. The proof of the veracity of claim is found in experience; and a burner that has been in use for some time shows that small defects have been cured by the changes made, and that the metal of the burner is in no sense dirty.

Let us start in the description at the top of the new type of Bland burner. With regard to the regulator-nipples, these are made absolutely gas proof; being tested for this purpose up to a pressure of 12 inches, which is high enough to cover any possible excesses of ordinary pressure conditions. Any burner that will



New Type of Bland Burner, showing New Dust Protector and Bunsen Tube.

not stand this test without gas escaping at the nipple regulator is rejected until it can pass the severe ordeal. Another test applied is to gas issuing from the nipple. A light is applied. If the flame is of jagged form and not even, the nipple is discarded. In connection with the air admission, a new patent arrangement, called a dust cap, has been introduced this year. It is found that burners, or the nipple-points, after being in use for some time, get choked up with the dust and dirt that enter the mixing chamber. A protector has now been provided (the extended cylindrical portion of the burner seen in the illustration near to the top of the burner) by which the air supply finds admission underneath. Within this, the air-admission chamber has downwardly inclined sides, with slotted holes, and regulation is secured by means of a shutter of the same configuration, which shutter is operated from outside the protector by a lever action, and is then fixed in position by a set-screw. There has been trouble with cheap and flimsy forms of burner through the burner body parting



New Burner, "A" Type.

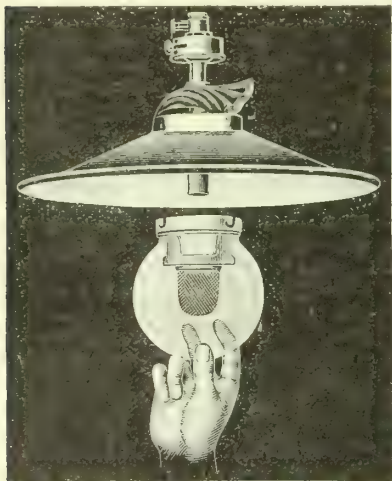
company with the gas-nipple, owing to the economy in the provision of threads for attachment. A specially large number of threads are provided in the case of this burner, and, independent of this, there is also a screw-nut for making assurance doubly sure against accident at this point. Before leaving this part of the burner, it may be mentioned that the gas and air adjustments are arranged to be above the closed side of the protecting shell; so that they are not affected by the uprising heat, and efficient regulation can be effected at any time. Coming to the protecting shell, which has always been a feature of Bland burners, this is now treated by a process called sheradizing—well known in America, but with it there is not such acquaintance here. This process makes the metal impervious to the humid conditions of the atmosphere—in other words, metal so treated will not rust or corrode, nor will it be affected by deposit from the products of combustion. Connected with the shell has been another improvement. In the old form of burner, there was an opening between the shell and the gallery, which allowed cool air to rise, and be drawn direct into the lamp. The partial vacuum thus created permitted the products of combustion to escape

quite easily. This was an advantage in the old type of burner; but it is a disadvantage in the new type with the dust-cap protector and under air-inlet, because it is found that a certain small proportion of the waste products climbs up the dome of the shell, and enter the burner with the primary air supply, which in the old burner was taken in downwards into the burner, and not upwards as in the new form. Protection against the disadvantage described has been obtained by inserting between the shell and the gallery, a plate with a curved inner edge, so that the products of combustion strike against this, and find an exit at the one proper opening provided by the shell. Another good point is that it completely ensures the fittings against any discoloration; and no matter how long the burner is in use, the fittings are kept perfectly cool above—the only heat being that conducted by the metal itself.

The next new feature is an important improvement. The old steel bunsen is discarded; one reason for this being that the metal corroded, and often fell in small flakes into the mantle—thus destroying it. Now the bunsen and nozzle are made in one piece, and of a patent electrically hardened steatite. In fact, it is so indurated that one can hardly get a tool to touch it; so that there is no fear of its breaking. A better lighting result is secured through the use of this bunsen tube because of the freedom from obstruction to the flow of gas on the inner surfaces. The diameter of the new bunsen is larger at the top than at the bottom; and, at the point of combustion, the nozzle has a lip. So that everything possible is done to ensure that there shall be nothing but the check of designed regulation to the feeding of the mixture to the flame. Then, in order that the mantle shall hang perfectly straight on the nozzle, the new bunsen is screwed to the burner, and trued-up upon a lathe. These are all contributions to perfection; and the Bland Syndicate claim that, by what they have done, they have secured increased flame temperature, and consequently efficiency. Further, on the point of security. The brass fitting underneath the shell, to which the upper part of the burner is attached, is now made with a reverse screw, so that the action of unscrewing the nozzle shall not result in unscrewing or loosening the upper part of the burner. Then true and close connection between the steatite part and the metal fitment above is assured by having the screw-threads exceptionally coarse. With this burner, one gets a good flame, and an excellent volume of it in the mantle. Every detail seems to have been carefully thought-out; and anything believed to be for the good of the burner and its economical use has been carried into effect.

A few words on special types of the new burner. There is the "A" universal form, with which all standard globes and mantles can be used; or one of the Syndicate's carriers can be applied to take the Bland mantle. A better lighting result, too, is secured by using their inner intensifying pear-shaped globe, which, by

the way, is made, as are all the globes supplied by the Syndicate, of the justly-famed "monopel" glass, which it is said does not crack with heat. The globes are also strengthened by having the ends melted. Then there is the "B" type, or intermediate sized, burner. This can be fitted with a nozzle to take an ordinary size mantle, or a medium size one. In this burner, the globes are supported by a carrier, which is attached to the gallery by a bayonet joint. The "Billiard (D11)" burner, the special purpose of which is denoted by its title, is so constructed that it requires no hole for air supply at the bottom of the globe. The mantle and globe are



The Factory and Workshop Burner.

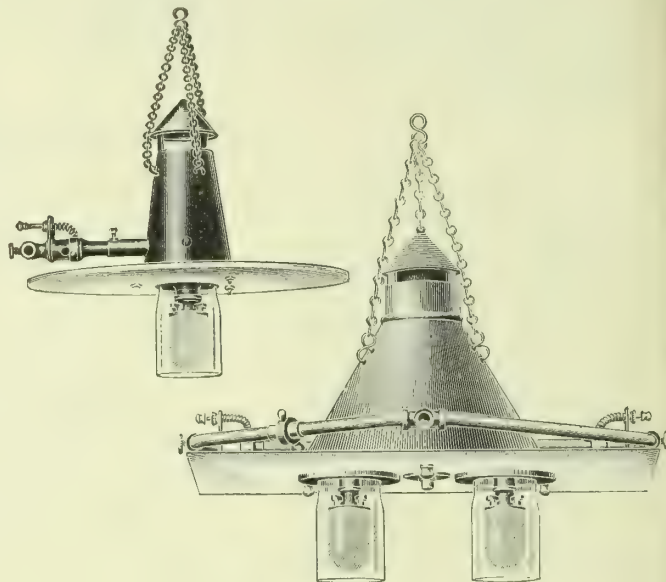
[Illustrating the method of attaching the globe and mantle to the burner.]

carried by the same fitting; and the air is drawn into the globe at the top, between the gallery and the carrier. A self-intensifying lamp is also seen; and a good looking combination it is. This one takes the Graetzin mantle and inner cylinder. The gallery is specially constructed so that it draws in air through it, which then travels down between the inner glass and outer globe before reaching the mantle. One advantage other than the intensity of the light is that it can be used as an ordinary burner, to take an ordinary mantle and globe, by merely changing the nozzle. The new improvements are found in all the foregoing burners, and for the most part are reproduced in the bijou type, which is a public favourite.

Then there are the factory burners of which the firm make a speciality. These are particularly suitable for mills and warehouses where there is a lot of dust about. The lamp can also be fitted with the Syndicate's anti-vibrator nipple, with which there is no possibility of leakage.

LAMP CONVERSIONS AND NEW TYPES OF LAMPS.

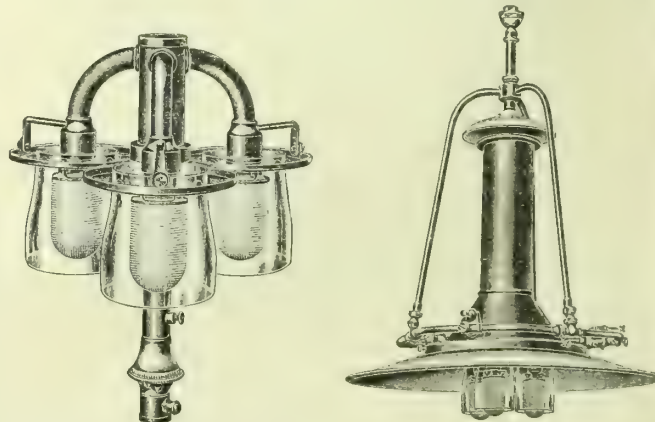
A STRIKING feature at the business premises of Messrs. A. E. Podmore and Co., of Charles Street, Hatton Garden, at the present time, is the large range of "conversion sets" that the firm have devised for promptly transforming lamps of all shapes and sizes in which the vertical incandescent burner has held sway to the inverted system. Here we have conversion—providing the lantern itself is worth converting—made easy. The firm have been at this work for some years, so that it is not new with them;



Samples of Conversion Fittings.

but all the practical experience that has been gathered in the past has been brought to bear upon the larger extent of work that has come in these days. From north, south, east, and west, lighting authorities are inquiring what can be done, and in the cheapest possible way, in the matter of conversion to the inverted system. But the firm are cautious in advising that the conditions of existing lanterns must be good for the purpose; otherwise it is better to go straight for a complete new lantern, constructed specially for the inverted burner. Of such lanterns they have many types, containing several up-to-date improvements.

But a conspicuous feature for the moment is the conversion of vertical burnered lamps to the inverted form; and for this work the firm have made special provision. Here we have before us conversion sets for square lanterns, cylindrical ones, hexagonal ones, and other shapes; and for one, two, three, four, five, and six burners. Practical requirement and efficiency have had foremost consideration in their design. There is nothing about them that suggests any patchwork conversion. A converted lamp looks the real thing—just as though it had always so existed. We pick up one of the sets for converting an existing lantern to the inverted form. There is a strongly made white-enamelled reflector, above which is a cone-shaped chimney for conveying away the products of combustion, and keeping them quite clear of the incoming fresh air for the supply of the burner. The burner (which is fixed above the reflector, and passes through the cone-shaped chimney) is of the angle type, and is fitted with a screw gas-regulator and a convenient air-regulator operated by a spring and locked in position by a nut, so that vibration cannot disturb



Another Form of Cluster Conversion Fitting.

Lamp for Halls and School Rooms.

the adjustment. This fitting is supported in the lantern by means of a chain carried by a cross bar through the top of the ventilator. Provision is made for the use of inner cylinders or a globe, or otherwise—just as the user's fancy dictates. The gas supply is

conveyed to the burner from the top of the stand-pipe service, by means of either metallic tubing or brass or copper piping. The arrangement is susceptible of several variations—for example, the top of the cone-shaped chimney in one style is furnished with a perforated conical copper piece, in order that any wind getting into the top of the lantern may have a free cross passage, and so prevent down-draughts. This arrangement, however, is not suitable for all lamps. Where a lantern has a dwarfed head, a shorter chimney is necessary, with a cap mounted a little way above the chimney in place of the perforated top. Again the regulators for the air and gas can either be arranged inside or outside the lantern just as desired. But for protection purposes, most people like them conveniently placed inside the lantern. Further, the reflectors are made either to fit the lantern or to leave a space round the sides. They are also manufactured in concave, convex, flat, or any other ordinary styles. Really, the variations are so many, that we cannot note them all; and there are, indeed, no practical conditions that cannot be met by the conversion designs which, by-the-by, the firm make on their own premises. The conversion sets can be easily adapted to any form of existing controller in lamps, and the bye-pass fitted to light either above or below the mantles.

The description will apply to cluster lighting up to six or more lights. Each burner has its own aperture through the reflector; and there is one large diameter cone chimney common to all the burners. These large conversion sets can also be held up by a chain, or supported in the lantern from the reflector.

With regard to the lighting power of the converted lamps, the firm claim that, with their burner, they are able to use a long or a short mantle, in view of the range of gas and air adjustment. Preferably a mantle is used 54 mm. in depth. We have seen the results of some photometrical tests of a converted cluster lamp. The gas consumption, with bye-pass, was 8.4 cubic feet of 14-candle gas per hour, at a pressure of from 2 to 2½ inches. Tested at an angle of 60°, the illuminating power was 270 candles, which is equal to 31.8 candles per cubic foot of gas consumed. A good result!

Turning now to examples of the firm's new designs in lamps. There is one that is very suitable for mission and public halls, school and lecture rooms, and such like places. A large demand for high-power sources of light using inverted burners, but without glass (in view of breakage), has sprung up for buildings of this kind. The lamp is made up of the firm's standard parts; and an excellent looking fitting it makes. The one illustrated is of the

three-burner type; and it may be taken as an example of several forms. There is, in this instance, a 20-inch enamelled steel reflector; and above this is an intensive chimney. Three arms support the structure; and these arms provide the gas-ways—being connected by unions to the pipes conveying the gas to the burner. This union connection is merely an instance of how the firm try to put in their work as much practical value as possible. By the aid of the unions the whole structure of the lamp can be readily dismantled. The burners (any number desired can be used) are of cast-brass; and have an imperishable appearance. These are separately provided with gas and air adjustments, and are designed with a view to rough usage, while providing high efficiency. Of course, the limits of use of the lamp are not really defined by the places already mentioned.

They can be employed for factories and workshops where a strong light is required on a low-pressure supply. To prevent draughts affecting the mantles, a glass cylinder can be used round them; but it is entirely a matter of choice.

Coming next to the "New Model" lamp (1910-11), it is externally of the well-known form with an enclosed globe at the bottom, and made for any number of burners within reason. Apart from the efficiency, structurally the new main feature of the lamp is that, *in situ*, just by the removal of three screws, the bottom—including the plate surrounding the mantles, the cone sliding into the chimney, and the globe carrier—can be removed in one piece; thus leaving exposed all the vital working parts of the lamp. The importance of this in maintenance work goes without saying; and, furthermore, in the interests of economy in maintenance, all the parts are interchangeable. The firm do not appear to be particularly enamoured of inner glass cylinders surrounding the mantles inside the globe of such a lamp. They do not disparage their use, but consider that the disadvantages counterbalance the advantages. They furnish an additional seat for breakage; and they become discoloured, if not frequently cleaned—thus serving, in some measure, to obscure the lighting power. Customers can, however, follow their own special views as to whether they adopt the inner cylinder. The lamps are made with or without them; but if without, a simple, inexpensive

fitting can at any time be applied for carrying the cylinders. The burners are of the same type and efficiency as those previously described; and standard mantles and glassware can be used with the lamps. The casings are strongly made of copper, and can be had with all metal parts enamelled. They are of a type particularly suitable for hiring-out or hire-purchase, and equally suitable for street lighting as for shops—using a harp or swan-neck at the top of the street-lamp columns. They have a splendid range of light-giving power.

The firm's dust-proof intensive lamp still holds its position in favour; and lately one use to which it has been largely applied is for the lighting of school-rooms, where daily there is a lot of dust brought into the place by children, and constantly being stirred up by their movement. The light-distributing power of the lamp is excellent. Another speciality is the lamp (made in several styles) for hot climates, where the myriads of winged insects have a bad effect on the working of any lamps improperly designed for preventing the entry of the little intruders. We will not describe the lamp in detail. Suffice it to say, it is quite impossible for insects to enter the lamp so as to injure mantles, and choke up the burners. Ingenuity has also produced the design of the structural parts so that the lamps can be readily taken apart.

ENGINE-CYLINDER TEMPERATURE CHANGES.

The following is an abstract of a paper, on the "Cyclical Changes of Temperature in a Gas-Engine Cylinder near the Walls," that was presented to Section G at the Sheffield meeting of the British Association, by Professor E. G. COKER, M.A., D.Sc.

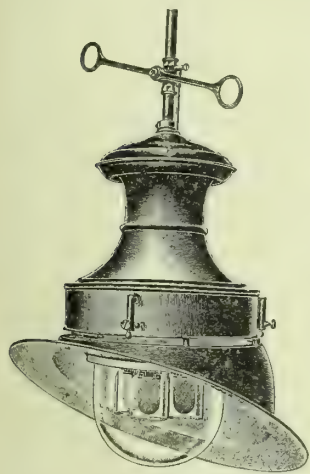
Experiments described in "Engineering" for October, 1908, show that the temperature at the inner surface of a small gas-engine is about 240° C., and the cyclical variation is usually less than 10° C. The steady conditions of low temperature at the wall-surface are maintained by the jacket-water, although the explosion of the gaseous mixture produces very great changes of temperature close to the walls. This variation has not hitherto been measured for a complete cycle, owing to difficulties that occur in effectively measuring the highest temperature of the explosion.

In order to obtain the cyclical variation near the walls, a couple was made of an alloy of 10 per cent. iridium and platinum, with a pure platinum wire; and this was secured in a metal plug so that it projected ¼ inch into the cylinder. On light loads and weak mixtures, the cycle remained unbroken; but near full-load, the platinum wire melted. Couples made from 10 per cent. alloys of iridium and rhodium with platinum were afterwards used, having an electromotive force E above 500° C. given by $E = -174 + 7.6075 T - 0.00167 T^2$, where T is the temperature Centigrade. The junctions were rolled down to five or six ten-thousandths of an inch in thickness, and inserted at a depth of ½ inch from the cylinder-wall. These couples were able to withstand the highest temperatures near the walls; and they were not melted except during abnormal explosions. Measurements of the cyclical variations showed a variation of E.M.F. lying between 1.56 and 7.83 millivolts, with an average cold junction temperature of 30° C. The temperature variation corresponding to these values ranges between 250° and 1700° C.

In estimating the highest temperature reached, the upper limit of temperature is indicated by the partial melting of one of the wires when the engine ran above its full normal load; and the lower limit is indicated by the melting of platinum wire. The melting-point of platinum is $1710 \pm 5^\circ \text{C.}$; and, in the absence of definite values of the melting-points of the alloys used, it is assumed that both are below the melting-point of iridium, for which Violle's value is 1950° C. The probable causes of error in measurements are discussed; and the conclusion is reached that the temperature at the place of measurement has a maximum value between 1850° and 1900° C.

The Manchester and District Junior Association have been invited to visit Messrs. J. & J. Braddock's meter-works at Oldham on Saturday next; and one of the staff will contribute a short paper on "Retort-House Governors." A general meeting of the members will be subsequently held, at which the Council will announce the arrangements they have made in the matter of the proposed University Scheme, dealt with by the President (Mr. F. Thorp) at the close of last winter's session.

Coal Storage under Water.—Submerged storage of coal has been adopted by the Twin City Rapid Transit Company, of Minneapolis, as a means of storing for summer use about 12,000 tons of screenings which can be purchased cheaply in the winter season. A concrete tank about 104 ft. by 213 ft. is subdivided into four separate and isolated bins by means of cross walls; the depth being about 14 feet for the side walls and 11 feet for the cross walls. The structure is built entirely of reinforced concrete. At the intersection of the cross walls is a hopper feeding a crushing plant, from which the coal falls through a shaft to a belt conveyor in a tunnel passing under the bins, and running to the boiler-house. Coal is dumped into the bins from railway cars, and is taken for use by a grab bucket worked by a locomotive crane. Each bin has an inlet and drain opening connecting with a pipe system laid in the conveyor tunnel.

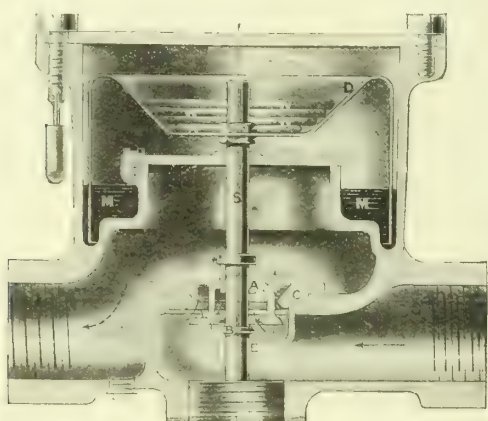


"New Model" Lamp, 1910-11.

(Fitted with parabolic reflector for shop lighting. It can be used without cylinder glasses.)

THE FOSTER HIGH-PRESSURE GAS-GOVERNOR.

IN consequence of the growing practice of supplying gas at higher pressures than heretofore, and the increasing employment of high-pressure gas for all purposes, the Foster Arc Lamp and Engineering Company, Limited, of Morden Road, Wimbledon, have designed what they claim to be a highly efficient and reliable gas-governor, for use on pressures up to, and including, 27 inches. So sensitive is the Foster patent governor to the slightest variation in pressure, that it will operate with the small consumption taken by an ordinary duplex bye-pass. Wherever the main supply at any time is above the normal pressure of 2 inches, the firm strongly advise the use of the Foster governor, as a large percentage of the gas which is unavoidably wasted through incomplete combustion is saved, when this small apparatus is fixed. It is pointed out that in laundries, where large quantities of gas are consumed, a Foster governor is invaluable, not only on account of the reduced gas bill which ensues, but also because a constant temperature is always obtained from gas-heated apparatus—such as irons, &c. This is a point which all laundry managers will appreciate. Another instance in which the governor may be said to fulfil a long-felt want is in printing works using linotype machines, as the type metal is, by its aid, always kept at a pre-determined temperature, which means clean and uniform type.



The Foster Governor.

A.—Main gas-valve, sliding on spindle S, and closing on C. B.—Main valve, forming part of S, and closing on A. C.—Main valve-seating. D.—Inverted cup, floating on M. E.—Three-arm guide for end of S. M.—Mercury. W.—Adjusting weights.

The action of the governor can be readily seen by referring to the sectional illustration. Gas enters in the direction shown by the arrow, and passes between the valves A and B and the seating C into the inner chamber, and so to the house-service. Should the pressure be in excess of that required, the cup D is lifted, which causes A to close on C, and so restricts the flow of gas. Should this be insufficient to reduce the pressure to normal, the cup will still further be lifted until B bears upon A. This cuts off the supply until the pressure is reduced in the gas-chamber, when the cup falls, and so opens the valves in reverse order. This cycle of operations takes place whenever there is a variation of pressure.

THE WHOLESALE FITTINGS COMPANY.

A GOOD example of the growth of a gas-fittings business is furnished by the Wholesale Fittings Company, who, from the very smallest beginnings, have now acquired premises which are conclusive evidence of the large trade carried on in gas-lighting accessories of all kinds, and whose price list has now grown from one page when first issued something like fourteen years ago to more than one hundred and fifty times that size at present. The motto of the firm has always been "Small Profits and Quick Returns;" and its success is seen in the fact that the old premises in Commercial Street, E., have been transformed into a warehouse, and two large buildings have been acquired on the opposite side of the road in order to meet the ever-growing demands for floor-space. These two new buildings, which consist of three floors and a basement, contain excellent offices, show-room, sales department, and packing-rooms; and the remainder of the space is filled with stocks of all descriptions. Not an inch of room appears to be wasted; and business is being carried on at high pressure, even though the season has so far hardly begun. After the bewilderment of hundreds of filled packing-cases and bins, the extensive show-room is quite a haven of rest; and it was here, of course, that we were introduced to the Company's newest goods. Gas-fittings of all sorts and sizes are to be seen there in abundance; while the range of French hard-glass ware is of the widest possible description. There are, too, numbers of beaded shades of different styles and colours, which form an attractive covering for inverted burners.

As to lamps, the first type which calls for notice here is the "Ezol-Famos," which is strongly made, for two or three lights,

and finished in white enamel. Each burner has its own separate gas-passage outside the body of the lamp; and the gas and air regulators, being similarly situated, are easily get-at-able, without any fear of burning the fingers. Yet another feature is the enamelled reflector plate through which the burners pass, which is removable by simply taking out two or three screws. By this means, it is possible to unscrew the burners and replace them, when necessary, without having to take the lamp down—an advantage which needs no emphasizing. In fact, the whole thing can be taken to pieces while the casing of the lamp remains in the position in which it has been fixed. The "Ezol" lamp, noticed on a previous occasion, which is made for one, two, or three lights, is also now fitted with this removable reflector plate. A handsome indoor gas-lamp, which can be had finished in copper-bronze and white enamel, is the three-light "Yotto" (illustrated). This is intended for use without chimneys, and with either clear or frosted globe; the globe-carrier being provided with a number of holes, by means of which the necessary draught of air is secured. One of the advantages urged for the "Yotto" is its cheapness—indeed, moderate prices are one of the principal features claimed for the firm's goods, though at the same time quality is not allowed to be sacrificed to this end. The "Ezol" adapter for converting street-lamps to the inverted system, which was referred to twelve months ago, is, we learn, being largely adopted. One form has been arranged for three burners; and by a simple movement of a revolving bar on its axis, one, two, or all of the burners (according to the extent of the turn given) can be lighted up or extinguished. This arrangement is very useful in places where, though some light is required to be kept on, the maximum power of the lamp is only needed during certain hours. A single-light adapter of simple form also meets with a ready demand.



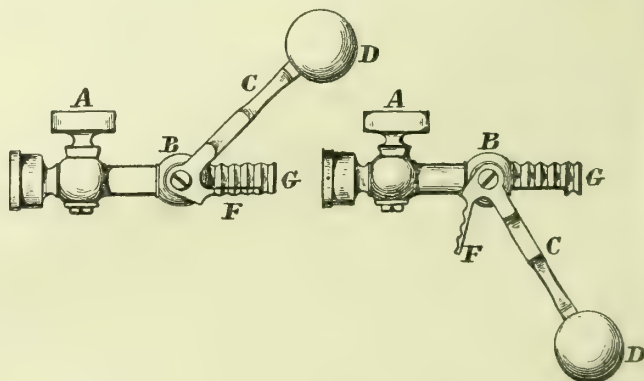
The "Yotto" Light.

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A SAFETY TAP FOR FLEXIBLE CONNECTIONS.

A PAPER was read at the last meeting of the Association of Gas and Water Engineers of Austria-Hungary, at Innsbruck, by Herr V. O. KELLER, the General Manager of the Central Gas and Electricity Company of Budapest, describing "A Safety Tap for Flexible Connections," of which the chief points are as follows.

There have been many cases of accidents (frequently involving loss of life) due to flexible tubing sliding off the tubulure of a wall tap which has been left open, and so allowing the gas to escape freely into the room. Suggestions for avoiding such accidents have been made from time to time—among others by Herr Peischer, of Innsbruck. Directions have also been issued to consumers, requesting them always to turn off the wall tap as well as the tap at the burner, when the latter is put out of use. But if, through forgetfulness or laziness on the part of them or their servants, this request is not obeyed, the danger of an escape of gas, through the flexible tube slipping off the nozzle of the wall bracket, remains. Herr Peischer has pointed out that at least half the cases of gas poisoning which occur in private houses are due to flexible connections slipping off the tubulure of the wall tap through their own weight, and so allowing gas to escape. Recently two servants in Vienna lost their lives from this cause; and there was a similar fatal case at Innsbruck in 1906. In order to prevent the possibility of the occurrence of such accidents, Herr Keller has designed and patented the safety device shown in the annexed illustration.



In addition to the ordinary upright wall tap A, there is on the tubulure a horizontally-set tap B, to the plug of which is attached the forked-arm C, which terminates in a ball-weight D. The lower prong of the fork forms an extension F, which constitutes a

segment of the tubulure G. When the rubber tube is to be put on the tubulure, the fork is lifted until the segment fits in place on the tubulure; and the tube is then pushed over the two. The fork is held in the raised position by the tubing; and the cock B then remains open, so that when the tap A is turned on gas passes freely to the burner. If, however, the flexible tube slides off the tubulure, the fork C at once descends through the weight D, and, turning the cock B through 90°, completely closes it. Thus the flow of gas through the open tap A is cut off by the closed cock B. The apparatus behaves perfectly, as it depends for its action only on the weight of the ball D, and obviously under normal conditions it cannot get out of order.

Its use should entirely preclude the occurrence of accidents due to flexible connections sliding off the tubulures of wall taps which have been left open. The first illustration shows the device with the arm raised ready for putting the flexible tube on to the tubulure; while the second one shows it after the arm has fallen and closed the cock B.

MEASURING AIR OR GAS SUPPLY TO ENGINES.

One of the papers submitted to Section G at the meeting of the British Association was by Professor W. E. DALBY, M.A., M.Inst.C.E., on the "Direct Measurement of the Rate of Air or Gas Supply to a Gas-Engine, by Means of an Orifice and U-Tube." The official abstract is as follows.

An orifice in conjunction with an anemometer was used to measure the air supply at the Ashton trials of the Committee of the Institution of Civil Engineers; and more recently Professor Ashcroft contributed a paper to the Institution of Civil Engineers describing a method of using an orifice in conjunction with a specially designed indicator, to measure the difference of pressure on the two sides of the orifice. In the Ashton trials, the air supply is inferred from the anemometer readings; and in Professor Ashcroft's method, the air supply is inferred from the difference of pressure in conjunction with the orifice, which was made about the same size as the suction-pipe of the engine, in consequence of which the difference of pressure was very small. In each case, calibration was effected by driving the engine from the crank-shaft end, and then from indicator diagrams deducing the weight of air passing through the orifice. This deduction cannot be made accurately unless the temperature can be accurately measured at one point on the indicator diagram. In neither case could this temperature be measured.

The gas-engine used by the author is fitted with apparatus by means of which the temperature corresponding to the pressure and volume at an assigned crank-angle can be accurately measured with a platinum thermometer. Thus, all the data are observed from which the weight of air drawn through the orifice per cycle can be computed. Indicator diagrams were taken with an optical indicator giving accurate results. Every indicator-card was calibrated for pressure *in situ*. The peculiarity of the method is that a relatively small orifice is used—so small, in fact, that the difference of pressure on the two sides of it is equivalent to about 1 foot of water under normal conditions of running. This difference of pressure can then be measured by a U-tube; and small variations of head are easily observed. Numerous experiments established the fact that the coefficients of the orifices tried were practically constant, and equal to 0.6.

The gas supply can be measured through an orifice in the same way. Hence, the mixture of air and gas passing into the cylinder can be obtained from two readings, with suitable corrections for density, at any time during the run. The orifices, in combination with their U-tubes, become rate-measurers; the one giving the rate at which air is supplied to the engine, and the other the rate at which gas is supplied.

Mid-Rhenish Association of Gas and Water Engineers.

The programme of the 47th annual meeting of this District Association, fixed for the 3rd to the 5th inst., at Gmünd, in Swabia, included the following items: On Saturday, the 3rd inst., an inspection of the town water-works in the afternoon and the inaugural reception of members and guests in the evening. On the 4th inst., in the morning, the reading of papers on "Experiences in the Regulating of Inclined Retort-Settings," by Herr Heinrich, of Pforzheim; "Dry-Sealed Purifiers," by Herr Fischer, of Esslingen; "The Gmünd Corporation Gas and Water-Works," by the Manager, Herr Geyer; "The Control of the Working of Gas-Works through the Instructional and Experimental Works of the German Association," by Dr. Karl Bunte, of Carlsruhe; "The New Stuttgart Gas-Works," by the Manager, Herr Göhrum; "Coal and its Valuation for Gas Making," by Dr. F. Mayer, of Mannheim; "Bauduin's Distance Indicator of Gas-Pressure and Water Level," by Herr F. Lux, of Ludwigshafen-on-the-Rhine; "Results of the Gasification of Saar Coals which have been long in Store," by Herr Heinrich, of Pforzheim; and "Simplification of the Clerical Work on Gas and Water-Works by the use of the Addressograph," by Herr H. Welty, of Bäle. Various technical questions were also set down for general discussion. The banquet was fixed for the evening of this day. For Monday, the 5th inst., there was an inspection of the local gas-works, and an excursion. Those attending the meeting were invited by Herr Göhrum, the Manager of the Stuttgart Gas-Works, to visit the works.

THE PROVIDENT USE OF COAL.

By Professor H. E. ARMSTRONG, F.R.S.

[A Paper Read before Section B. of the British Association, Sept. 6, 1910.]

During my four months' stay on the American Continent last year, the topic which came most prominently under my notice as of consequence was that of the conservation of natural resources. Mr. Roosevelt's most abiding claim to the gratitude of the world will, I think, some day be admitted to be that he has made this the subject of burning controversy in his country. To what extent are we alive to the fact that we have natural resources to conserve? is the question ever asked here in Sheffield in connection with coal, for example.

I assume that it will be admitted, by all who are capable of judging, that we are improvident in our use of coal. It is only here and there that engineers and manufacturers are being forced to economize on account of the constant advance in the cost of fuel. In far too many cases it is being consumed most wastefully, without any attention being paid to economy. I do not propose to deal with the use of coal for industrial purposes generally. I shall confine my remarks to its consumption for domestic purposes and in the gas industry; and I shall be very brief, as my one object is to call public attention to a very simple issue.

In burning coal as we do in open grates, we not only burn it in the most wasteful manner possible, but in such a way that we are a nuisance to ourselves and to our neighbours. The evil consequences are too apparent to need description. How are we to avoid these? Probably they are unavoidable so long as we burn bituminous coal. In burning bituminous coal, however, we not only create a nuisance, but we also waste much that is valuable. Can we save this, and avoid creating a nuisance? The answer is, I believe, that we can, and that in effecting the saving we shall also be taking the steps that will enable us to avoid creating the nuisance that now attends the use of bituminous coal as a domestic fuel.

During the early stages of combustion, a variety of volatile inflammable substances are given off, which burn with a smoky flame. By first coking the coal at a low temperature, we may remove and recover these, and obtain a fuel which both takes fire and burns as readily as coal, and on the average gives a better and a hotter fire. By burning such soft coke in our towns, we might get rid of the smoke nuisance—if not entirely, to a very large extent. In making such soft coke, we should separate from the coal substances of considerable value for a variety of purposes that are now entirely wasted. I am even prepared to go so far as to urge that such a policy be made compulsory at no distant date in our towns. The subject has been in my thoughts during the past thirty years. In the early eighties, I was led to pay much attention to the bye-products in the manufacture of gas from oil, as practised by the various railway companies in making gas for compression, to be used as an illuminant in railway carriages—an industry that is now somewhat in abeyance. I also studied the tars from Jameson coke-ovens, where coal was coked so that the volatile products were given off at a very low temperature compared with that prevailing in a gas-retort.

In a note communicated to the Iron and Steel Institute in 1885,* I ventured to insist that we knew practically nothing of what happens when coal is distilled, or of the conditions most favourable to the production of the most valuable constituents of coal-tar, and that until we possessed accurate knowledge on such points, the coking of coal and the manufacture of gas from coal could not be conducted scientifically. I urged that experiments should be made. Nothing was done until the Coalite Company took the matter in hand quite recently. Coalite is nothing but soft coke formed by heating the coal until all the volatile products which burn with a smoky flame are given off. I have availed myself of the opportunity which its manufacture affords to examine the products of the distillation of coal at temperatures perhaps not exceeding 800°C. The investigation is only in the early stage; but I have already learned quite enough to convince me that the tar obtained is—as, indeed, was to be expected—very different from ordinary gas-works tar, which is clearly a mixture of the end products of numerous and complex changes undergone by the primary products of decomposition of the coal substance at high temperatures in contact with intensely heated carbon.

Coalite tar consists of the primary products of decomposition and of products of their interaction at relatively low temperatures. It contains a not inconsiderable proportion of saturated hydrocarbons—in fact, of petroleum—together with unsaturated hydrocarbons of the olefine and acetylene series, and a relatively small proportion of benzene and its homologues, but no benzonoid hydrocarbons of higher series. All these hydrocarbons are most valuable solvent materials, and might be used in the internal combustion engine. Phenols are present in far larger proportion than in ordinary coal-tar—particularly the higher homologues of phenol. But little ammonia is produced during distillation; and basic substances appear to be less abundant than in gas-tar.

To account for the presence of paraffin and unsaturated non-benzonoid hydrocarbons, it must be supposed that coal contains

* See "JOURNAL," Vol. XLV., p. 960.

a very considerable quantity of "fatty matter" of some kind, as such matters are known to yield petroleum hydrocarbons on distillation. I am inclined to think that the benzines are in the main synthetic products formed by processes akin to those by which such hydrocarbons are produced in the manufacture of oil gas. The proportions in which the various homologues of benzene are present appear to be somewhat different from those in which they occur in ordinary coal-tar. The phenols are presumably directly derived from hydroxy-benzonoid compounds in the coal; and it will be a matter of considerable interest to establish their nature. The greater proportion of benzines in ordinary coal-tar is probably due to the conversion of the phenols in large part into benzines by the action of heated carbon. The gas given off during the coking process is very rich.

In the first place, I would advocate that this gas be substituted for the rubbish now produced by carbonizing coal at very high temperatures, so as to obtain the maximum possible yield of gas. It is absurd—no other expression is suitable—that the production of gas from coal in this manner should constitute a primary industry, especially as the coke which is produced is not suitable for ordinary domestic use. It is time the public realized that the article now supplied is beneath contempt, and that a better article is at hand, and can easily be supplied.

Great improvements are in sight in the application of gas to heating purposes; and it is to be expected that the use of gas will be largely extended in the near future. But if this is to come about, it is essential that the quality be improved. Since the sulphur clauses in the Gas Acts were repealed, there has been a steady deterioration in the quality of gas; and the damage done to furniture in consequence is now most serious. If the gas industry desires to retain its position within doors in competition with electricity, some action must be taken to supply a product free from the objections to which our present supply is subject. While low temperature coal-tar will yield a far larger supply of phenol compounds suitable for use as disinfectants, it cannot well serve as a source of benzene and toluene, as these latter are mixed with so large a proportion of petroleum hydrocarbons that it will not be possible to separate them economically.

Distinct uses must be found for the hydrocarbons in the higher distillates. It will be possible, I believe, to make any class of solvent hydrocarbons that is desired from them without difficulty. They should be valuable for cleaning purposes—far more so than ordinary petroleum spirit or petrol—as rubber solvent, and a substitute for turpentine, the demand for which is now in excess of the supply. Much of the oil is also suitable for use in the internal combustion engine. It has been shown recently that the sterilization of soil by means of toluene and similar substances has a most remarkable effect in increasing its fertility. Should it prove practicable to sterilize the soil as a part of the ordinary farm practice, it is more than probable that a suitable agent will be found in the lower distillates from coalite tar.

My object in this brief communication is to direct attention to a provident use of coal, which I believe deserves most serious consideration by the public at large. I see no reason why the coal now used in the raw state by a community should not be first coked at a low temperature. The gas given off would be available as an illuminant, and for heating purposes. The residual coke would be burned with far greater efficiency than the original coal, and without producing smoke. If washed coal were used, the sulphur would be largely eliminated, and a still further improvement effected. A variety of bye-products would also be obtained, the sale of which should afford some (if not considerable) profit.

Science is of little public value if it cannot be brought to bear on such a problem; but it rests with the public to take action. Some interest must be shown in the matter, if the lethargy which now prevails and the vested interests which bar progress are to be overcome.

Discussion.

The PRESIDENT (Mr. J. E. Stead, F.R.S.) quite agreed with the author that it was barbarous to use coal in an ordinary fire; and this was one direction in which science could be applied with great advantage in a practical way. With regard to the production of gas, Professor Armstrong had made some remarks at Middlesbrough on one occasion, with the result that a gentleman present had gone back to his steel works and made great improvements in his producer plant; and the economy in coal consumption at this works ever since had been very considerable.

Professor ARTHUR SMITHELLS (Leeds University) said this was a subject upon which it was exceedingly easy to be indiscreet. Professor Armstrong would probably find, as he had found before, that he would come into conflict with a good deal of opposite opinion. They would all sympathize with the desire which animated the paper; for the economical consumption of coal was of national importance. But whether the question was to be solved on the lines indicated, was quite another matter. He felt confident that many people would not agree with the author. The idea of using fuel carbonized at a low temperature was by no means a new one; and he believed it had been recognized for some time that the bye-products obtainable by carbonizing coal at a low temperature had certain constituents in greater proportion than in tars accumulated by the ordinary process of coal carbonization, which added to the value of the bye-products. The whole question, however, was an economic one. The point that remained to be proved was whether or not coalite, and fuels of the same character, could be produced under conditions which

would enable them to compete economically with coal and its products, as put upon the market under existing conditions. If so, he believed the public would use them. Among consumers of domestic fuel, there was no doubt a very widespread desire to contribute towards the abatement of the smoke nuisance. But, even so, the public would have to be shown that these new fuels had the same advantages in giving the cheerful fire—to which they had been so long accustomed—and at the same time were not more expensive than coal. This had not been proved; and until it was proved, it would be hopeless to commend it to the public, or to expect the public to take the lead in the reform which Professor Armstrong and so many other people had at heart. Personally, he was very much interested in the question, inasmuch as the Leeds University were closely associated with the coal industry, and also with the coal-gas industry; and they were endeavouring to contribute, in their way, to the solution of the problem, by seeing what was possible to be done by the use of coal gas as a heating agent. This was another direction in which something might undoubtedly be accomplished, to mitigate the smoke nuisance and conserve the supplies of fuel in this country. They were only at the outset of their work; and it was not necessary for him at present to say more than that they hoped to assist in the solution of what was undoubtedly a most important national problem. They must, however, all realize that it was useless to rely upon the theoretical efficiency, or upon the intrinsic merits, of the particular fuel which was being commended to the public. Regard must also be had to the pecuniary advantages.

Mr. A. W. OKE remarked that, as a director of several gas companies, he had naturally watched with great care for any complaints as to the quality of gas. The author had referred to the deterioration of gas, and also to the effect of the sulphur compounds since the repeal of the sulphur clauses. His experience had been that there was no increase in the number of complaints; and he was surprised to hear Professor Armstrong take such a gloomy view of the question. While indebted to the author for his paper, he (Mr. Oke) contended that gas managers were doing very much now to preserve the use of coal, by getting a great deal more gas out of it, and by producing it at a price which enabled its use to be greatly extended for cooking and heating, and thereby lessening the evil that Professor Armstrong was so anxious to see remedied.

Professor G. T. BEILBY said he was very grateful to the author for having brought forward the question of low temperature distillation of coal, because he believed that in this direction considerable help would be obtained towards the end they had in view. The whole question at the present time, however, was in an experimental stage; and he, for one, had been waiting with great patience, and with very vivid interest, on the results which would attend the labours of the British Coalite Company in their efforts to supply the public with a cheap and smokeless fuel. The progress of this concern seemed to be rather slow. The undertaking was heralded, perhaps, by too much advertising and sound of trumpets; and some of them had almost come to the conclusion that there had been an anti-climax in the matter. However, he was given to understand recently that installations for the production of coalite, so-called, were gradually extending throughout the country, and that there would soon be many object-lessons in the production of this fuel. Economically, he would draw attention to the large figures in which they had to think if they wished to deal with this question in a masterly way. The present consumption of coal in the country for purely domestic purposes was of the order of 40 million tons, while the gas companies distilled about 14 million tons for the production of gas. In order to supply the public with this 40 million tons of solid fuel, it was evident that not only must the gas industry be completely revolutionized—if not wiped out—in its present form, but some other very large uses would have to be found for the gas and other liquid products to which Professor Armstrong had referred, the value of which might be anything from 50 to 100 per cent. more than the original value of the coal.

Professor C. H. OLDHAM, as an economist, asked Professor Armstrong how he hoped this reform would be carried out commercially. He had been told that some German firm of chemists had asked permission to erect coke-ovens in South Wales in order to turn any amount of coal into coke, which they would supply for nothing, provided they were allowed the bye-products. This offer was not accepted; but the local colliery owners were now putting up their own coke-ovens, and were beginning to employ chemists as an auxiliary branch to the coal business. He did not know the details sufficiently; but it seemed to him that, if the ideal which Professor Armstrong saw in the future was to be realized practically in commerce (and they all hoped it would), it was only to be done by a development of the colliery business in this direction—viz., by the addition of the chemical side. If this came about, there was a prospect of the coalowners giving away the coke and living on the bye-products.

Mr. ARCHBUTT (Derby) said that people were being continually urged to burn gas instead of coal, on the ground that, by so doing, fogs would disappear. Personally, however, he thought the use of more gas would add to fogs, owing to the large quantity of sulphur in the gas, which tended to form fog. One speaker mentioned the fact that he did not get complaints from consumers.

Mr. OKE: Not more than before the repeal of the sulphur clauses. Of course, we get complaints.

Mr. ARCHBUTT said that he did not think people knew what an

evil this sulphur was. It was responsible for all the brasswork and silverware in a house becoming tarnished. He could not help thinking it was a very great mistake to allow the sulphur clauses to be repealed.

Mr. BOOTH, speaking with regard to the low-temperature distillation of coal, said he was acquainted with a venture in which this was being undertaken in an almost complete vacuum. An air-pump was used in connection with the retorts, which kept a vacuum of about 25 to 27 inches. The product was a household fuel something in the nature of coalite; and the bye-products were of a similar character.

Professor ARMSTRONG, in reply, referred first to the effect of sulphur in the gas. He said he was on the South Metropolitan supply; and all the brasswork in his rooms was quickly covered with verdigris, when the slightest moisture was about. It was not safe to allow a picture to hang by the same wire for more than a year. He did not want electricity in his house; but he had been simply driven to it since the late Sir George Livesey got the sulphur clauses repealed. People were not aware of what was going on; and the makers of the gas themselves did not know what they were perpetrating. He was very glad this point had been raised, because no protest could be too emphatic against the present gas supply *quâ* sulphur. Further, the illuminating quality was being run down, and an attempt was being made to put a calorific value on gas, and to reduce the cost still more. He ventured to contend that this was in the wrong direction altogether. It meant the use of a very large radiant, whereas they really wanted to copy electric light and go back to the small radiant. The question raised many important issues; and this was the reason why he brought it forward. The bye-products which could be recovered by low-temperature distillation were far more valuable than present coal-tar products for all purposes other than those of colour making. For these, they needed the present coal. But coke-ovens would supply sufficient of that; for coke was going to be made at no distant time in such a way that the volatile products would be recovered. Then there would be more than enough coal-tar from this source.

A vote of thanks was accorded the author.

HIGH v. LOW PRESSURE GAS DISTRIBUTION.

By H. W. FRUND.

[A Paper Prepared for the Southern Gas Association, U.S.A.]

Not so many years ago, in the electric fraternity, there were two factions—the low-pressure dogmatic advocates and the high-pressure boosters. Able minds were on both sides of the question; and invested interests in low-pressure work (including the Edison system of distribution) for a considerable time were in the lead. Not until about 1895 was it conclusively shown that high-pressure electric transmission had come to stay; and the advocates of the Edison system then began to change tact. Space is too brief to go into the revolutionary advancements made in the electric field to high pressure, and which are not to be wondered at considering the infancy of the electric industry. Not so with the technical and mechanical progress in the gas industry. In an old established industry like ours, it could hardly be expected that advancements would be made on giant strides as in the electrical field. However, high-pressure gas lighting under recent developments constitutes probably one of the most interesting and important steps in the progress of our industry, and has come to stay. As in former years in the electrical field, the low-pressure advocates fought strenuously against any change, so to-day with the low-pressure gas adherents, some of whom think the time has not so far come when high-pressure supply to low-pressure distribution should be seriously discussed.

High-pressure gas distribution is pointing the way in which gas is destined to cope with electricity for its share of the illuminating business. Detroit, Boston, Chicago, St. Louis, Milwaukee, Trenton, and other large cities are experimenting with high-pressure lighting with encouraging results. In Europe greater progress is being made than in the States; and, therefore, it is well that this question be brought before the Association—the end in view being a discussion of experiences had among the few operating high-pressure gas distribution, and also to and for the benefit of those either wavering on the question or contemplating putting in high-pressure plants. It is not intended in this paper to set forth at all minutely the experience had with high pressure, as it would be too long. The object is rather to base a line for discussion of experiences had among the members of the Association.

The proposition in question is made up of a coal and water gas plant with low-pressure distribution through large atmospheric pressure mains, and high pressure through small steel mains. The low-pressure system was first installed to serve customers residing in the city wherein the gas plant was located. The high-pressure system was afterwards installed to supply gas to an adjoining town of 3500 population, three miles distant from the gas-works. Such good results were obtained with the high-pressure distribution that a portion of the city having the large low-pressure mains is now being supplied by high-pressure gas—independent however, and not tapped into the low-pressure mains, as no boosting of pressure or supply in low-pressure mains is necessary or required.

The plant consists of two compressing engines (one held in

reserve), one compression tank with the necessary governors, regulators, &c.; the compressors taking gas from a large holder through a gas-main line 400 feet distant. At the gasholder, the initial pressure is 35-10ths. The gas is first compressed into a small tank at 45 lbs. pressure; then released and discharged into 2-inch mains, where the pressure is automatically maintained, day and night, without a storage tank, at 5.5 lbs. pressure. Individual regulators are installed on each service, where the pressure is again reduced to 35-10ths.

From the point where the gas-main leaves the works to the first right-angle turn in a public highway, distant 350 feet, the high-pressure gas-main is 7 feet lower than the compressor, and is the only point on the entire line of all the mains where there is a drip, from which we occasionally (more particularly during the four winter months) drain a discoloured water deposit. From this drip, the main inclines till, at a point 800 feet distant, the mains are 20 feet higher than the main at the drip.

The pressure upon the gas, no doubt not being sufficient to carry the water over the hill, undoubtedly is one of the reasons no trouble is experienced with complaints in the districts supplied by high pressure. Since the installation of the plant, no liquid or naphthalene troubles or other complaints have been experienced; while more or less naphthalene complaints come in from the low-pressure mains distributing gas from the same holder providing for the high-pressure mains. On every occasion that presents itself, high-pressure mains and services are examined; and all are without exception found perfectly dry. The only trouble thus far experienced is in some of the services choking-up at the corporation cock with a rust formation caused by a too small ($\frac{1}{8}$ -inch) opening. Since cocks with $\frac{1}{4}$ -inch openings have been adopted, this trouble has entirely disappeared. Occasionally, we get a little distillate in the compression tank, which is then drawn off. Drips along the entire high-pressure line have been opened many times, and never has there been found anything in a drip on the main, in or between either of the two towns, except one near the works at the foot of a hill.

The temperature at the compressors when working at full capacity during the summer months is 115°; and during the four winter months, it is an average of 65°. Thus far the investigation of the effects of compression and transmission on the candle power and heat units of the manufactured coal gas has not been fully ascertained. Suffice to say, with the plant in question, the quality of gas does not appear to suffer in candle power by comparison with the same gas distributed in the large low-pressure mains. This may be possibly accounted for—as there is no rapid condensation to reduce the initial power of the gas, even in the colder months—through plant being located in the South where the frost seldom more than enters the crust of the earth; and, therefore, the mains, though laid shallow, are not affected.

It is now being generally admitted, from investigation of the effects of coal gas compression, that it does not affect the fixed gases to any great extent where the work is carried on above the critical pressure; but where vapours are dealt with which can be condensed, attention must be paid to this point. However, whatever are the barriers in the way of high pressure, the benefits derived overbalance them many fold. Where proper distribution of gas in low-pressure mains is bad, and conditions become acute, high-pressure work comes to the relief. Large deliveries can be obtained through quite small pipes by this system. Naphthalene, water, and other stoppages are practically unknown; and the service to consumers is always satisfactory, as there is excess of pressure on the inlet side of the governor, which insures an unvarying pressure on the house pipe, so that if more volume of gas is needed it is obtained without reducing the pressure.

Again, high-pressure transmission can be used to supply several small towns which are already piped with mains for low pressure. And particularly, if the town is improperly piped and the service is unsatisfactory, a small high-pressure loop may be employed to surround the town and feed through small district governors into the dead-ends of the low-pressure system. Or in some cases, a high-pressure spine may be run through the middle of the town, feeding into the low-pressure system on each side through small district governors.

There is also a possibility of high-pressure gas playing a part in this country in public street lighting. The Committee on Street Lighting for the City of London, which visited the Continent to investigate the public lighting conditions, visited eight cities, and have recommended high-pressure incandescent gas lamps with inverted burners. In the future, incandescent gas lighting only will be used in Berlin. Some of the plants on some streets will have inverted high-pressure gas-lamps of 4000-candle power; other streets 2000-candle power; and, again, other streets of less importance 1000-candle power.

There should be no hesitancy at this time, and with experience had, to break-away from the old and established practices and instal a high-pressure system—particularly for new gas-works in a city ever so large, or town ever so small, in population.

The Sir John Cass Technical Institute.—The new session of this Institute, which is especially devoted to technical training in experimental science and in the artistic crafts, will commence on Monday, the 26th inst. The syllabus includes a series of courses on "Liquid, Gaseous, and Solid Fuel," which comprise lectures and laboratory work on "Fuel Analysis" and on "Technical Gas Analysis."

ELECTROLYSIS OF PIPES.

[From "Engineering Record," New York.]

The extreme probability of electrolytic injury to buried gas and water pipes is familiar to all engineers; and the actual results of such electrolytic corrosion have become unpleasantly familiar. Yet, in spite of the importance of the subject, and the serious nature of the damage which has been done in some cases, there has been as yet no definite agreement as to the proper remedial measures to be undertaken. The source of the injury is, in almost every instance, the currents which come from the use of the ground as the return by electric traction systems. Very few cases of injury have ever been definitely ascribed to accidental leaks upon lighting systems, even where a grounded neutral wire might give opportunity for such leaks. Obviously, casual leaks due to faulty construction are much less likely to turn a material amount of stray current into the ground than is the deliberate use of ground return on a large scale.

Theoretically, the return current of a railway system is through the bonded rails; but where these run parallel to pipe-lines, more particularly in moist earth, the actual amount of current passing from the rail through the pipes often rises to a very considerable amount. And here is just where the trouble begins. The widely varying underground conditions are sufficient reason for the extraordinary variations in results in different localities. In some cities electrolytic troubles are almost unknown; in others they are very severe. And just so in some lines of pipe, apparently exposed, no serious corrosion has occurred during years of service; while in others, in appearance no worse situated, perforation has taken place in a few weeks.

A recent report on electrolysis of the American Gas Institute deals at length with the subject; and the conclusions reached are highly important. Of remedial measures for both gas and water pipes, several have proved to be measurably successful. Thorough bonding (which is important to the traction systems themselves) helps very materially; and the addition of liberal return feeders, carried overhead to a properly bonded system, will generally reduce stray currents to comparative insignificant amounts. Of course, a complete overhead return eliminates all electrolytic difficulties. But this involves such considerable difficulty in construction and maintenance that it has generally been abandoned as impracticable; and the loss of the very large conductivity of the rails would be a serious one. Thorough bonding and return feeders arranged to relieve sections of track from which stray currents would be especially feared, seem in many cities to give excellent results. In some cases, the addition of negative boosters, to help along as it were the return current, has removed most of the stray currents.

The main trouble in applying this remedy is that only a very thorough investigation of the underground conditions enables one to tell definitely where to apply the return. And even so, there is considerable chance that some danger spots will escape protection; for the course of ground currents is somewhat erratic. Danger to pipes consists mainly in intense local action, rather than in a mild general corrosion. The typical pitted character of electrolytic injuries is sufficient evidence of the remarkable localization of the damage, which is unquestionably helped along at times by local differences in the conductivity of the ground. Aside from the complete overhead return and the partial overhead return, to which reference has been made, the chief remedies are protection of the pipe by insulating coating, so that the current cannot get in and consequently cannot do damage by its exit, and insulation of the pipe joints, so that the current does not find the pipe a continuous conductor for any considerable distance.

As far as complete coating of gas or water pipes by surface insulation goes, there seems to be very general agreement, strongly backed up by the Committee report in question, that the procedure is ineffective. Paints or other supposedly insulated coverings are not, in other words, very reliable as regards electrolysis, although they may to a certain extent protect the pipes from any chemical action. If the current once gets into the pipe through a flaw in the covering, and finds an exit through another flaw, at this latter point there is apt to be strongly localized damage, so that perforation might be actually more rapid than if the pipe were not protected at all. The other recourse is to lay the pipe with insulating joints, so that the flow of current is practically checked. The Committee report shows that this remedy is upon the whole successful, particularly if a considerable proportion of the joints are insulating joints—such as are obtained by laying gas-mains with cement. If joints were thoroughly insulated, the danger from electrolysis would be for the most part removed.

Sometimes a drastic remedy has been applied to the pipe-systems, consisting in laying them with conducting joints, and then tying-in the piping system to the ground-return so that the current would leave the pipes *via* a copper conductor instead of the earth. The Committee report strongly condemns this method, because while if the pipe were actually a continuous conductor it would be thus freed from danger, any imperfectly conducting joints might become the seat of serious trouble, and adjacent and less perfectly conducting pipe systems would tend to give up their current to the better conductor, and hence would be exposed to electrolytic injuries. In other words, it looks very much as if the alternatives were either to insulate the piping systems thoroughly at the joints, or make them so completely conducting that they

could safely become part of the grounding return. The former procedure is in most cases very much the safer and easier to carry out; it being much easier to check the current flow along the pipes than to make it complete enough to avoid risks. In the former case, too, there is less danger of localized action; and it is this which produces practically the most serious damage.

To sum up the general conclusions of the report in their relation to the existing situation, it is apparent that the first requirement in getting rid of electrical trouble is to make the tracks which are the legitimate return as good conductors as possible, and to help them out at all danger points by overhead returns; and then to make the pipe-lines as bad conductors as possible. In some few cases local protection of the pipes by an insulating covering may help; but anything more than what would be indicated as a palliative, for general corrosion would seem to be unnecessary. The one comforting thing in the situation is that the damage done by electrolysis is for all practical purposes confined to underground metallic structures of considerable dimensions. Foundations and superstructures, buildings, bridges, viaducts, and the like, are practically immune. Any current leakage sufficient to cause electrolytic trouble in such structures would quite certainly be sufficiently manifest locally to attract attention; and the remedy is then easy.

It is difficult to form a clear idea of the extent to which electrolytic damage really goes. When localized, it can commonly be recognized at once; but general injury is almost indistinguishable from that by chemical action of the soil and its contents. It is very likely that such minor damage is comparatively common, although of so trivial a character as to be practically negligible.

BRIDGE LIGHTING BY INCANDESCENT GAS.

A recent number of "Progressive Age" contained an account of a successful piece of incandescent gas lighting carried out by the Welsbach Company of Gloucester (N.J.) on the Sharpsburg and Lawrenceville Bridge—a large steel structure spanning the Allegheny River between Pittsburg (Pa.) and Sharpsburg, and carrying three electric lines and a great amount of pedestrian traffic. The following particulars of the work were furnished by Mr. W. B. Patterson, a salesman in the Pittsburg Department of the Company.

This was the first bridge in the district to be lighted by gas; and great difficulty was experienced in securing the order. The officials of the Bridge Company at first refused absolutely to have anything to do with the proposition, because they did not believe it feasible. But after many interviews with the toll-takers and the Bridge Superintendent, the higher officials began to show interest, and finally gave their permission to make a demonstration, providing they did not incur any obligation, and that all materials were removed in case the trial was not satisfactory. Two Welsbach gas "arc" lamps were accordingly placed on the bridge, at certain points designated for trial.

The plans and specifications for the piping of the bridge required that the main feed-pipe should be of 2½-inch iron pipe extending over the full length of the bridge (no reductions at either end being allowed); an expansion section, permitting of not less than 12 inches contraction or expansion, to be placed in the centre of bridge where the two sections of the structure were joined and rested on the centre pier, and where expansion and contraction to the extent of 7 inches are shown by marks on the bed-plates.

The lighting of the bridge was finally accomplished with ten Welsbach "arc" lamps, hung in the centre of the bridge between the tracks, 20 feet high, and approximately 190 feet apart. The lamps are lighted and extinguished simply by opening or closing the main valve on the bye-pass which is placed convenient to the occupant of the toll-house. This house is situated one-fourth the distance of the length of the bridge, or 480 ft. 4 in. from the end lamp on the Sharpsburg side, and 1440 ft. 8 in. from the one on the Pittsburg side.

Noting the great distance from the end lamp on the Pittsburg side to the toll-house, it might not seem possible that all the lamps could be lighted instantly when the main valve was opened in the toll-house; but this is the case. This fact much pleased the owners of the bridge, as well as a considerable number of gas men in the district, who thought such a device could not be made to work satisfactorily on a pipe-line extending a distance over 1921 feet, and supplying ten "arc" lamps.

This installation of the Company's lighting system displaced seven electric arc lamps; reducing the cost, and giving a much better and more steady light, and, moreover, one that does not go out. The objections to the electric lighting system formerly used on the bridge (which, however, were not spoken about until after the Company had completed their installation) were: First, the electric light occasionally went out, leaving the bridge in total darkness for as long as five minutes at a time; secondly, the light from the electric arcs was not sufficient; and, thirdly, it was too expensive.

The installation was completed about four years ago, and has been in operation ever since, giving entire satisfaction. During the whole period it has been on the Company's maintenance service; and they expect to retain it for an indefinite length of

time. Mr. Patterson says the word "satisfaction" in this particular case means more than the ordinary use of it, when one takes into consideration the fact that these lamps are suspended from the structural steelwork, 100 feet or more from the surface of the river, practically in the open. The heavy storms that pass up the valley the greater part of the year make this the severest test possible.

The following is the comparative cost of the lighting per month :

Seven electric arcs, for current and maintenance	\$56
Ten Welsbach "arc" lamps, for gas	\$20
For inspection and maintenance	12

Making a total of \$32

Or a saving to the Bridge Company of \$24

This figure includes gas for lighting and heating the toll-house. The cost of the installation was \$572. It can readily be seen that the saving of \$24 per month to the Bridge Company would enable them to pay off the first cost in two years, and in addition to this receive what they acknowledge to be much better service.

Since the Welsbach system was installed on the bridge, the Bridge Company have purchased lamps and other equipment for their bridge at Charlestown (W.Va.), which is stated by Mr. Patterson to be equally satisfactory. The Welsbach Company have also equipped the Pennsylvania Railroad bridge, for which they have an inspection and maintenance contract, including the lighting and extinguishing of the lamps. Electric lighting was objected to, because of the danger of the steel bridge being charged with electricity.

PAINTS FOR IRON AND STEEL WORK.

The members of the New York Section of the Society of Chemical Industry had before them early in the present year the results of some investigations carried out by the United States Paint Manufacturers' Association on the subject of the durability of paints. Towards the close of 1907, the Association erected at Atlantic City (N.J.) a long wooden fence on which were placed 560 panels of wood of three grades—white pine, yellow pine, and cypress. Upon the panels were painted a series of 47 paints, made from both single and mixed pigments, most of them being applied in three colours—white, yellow, and grey. The fence was under the direction of the Scientific Section of the Association, while the Master Painters' Association of Philadelphia had control of the actual painting work. The Sub-Committee on Protective Coatings of the American Society for Testing Materials agreed to inspect the fence, and their representative was present throughout the work. A year after placing the painted panels upon the fence, an inspection was made by the various Committees interested in the test. At the same time a similar fence was erected at Pittsburg, in the grounds of the Carnegie Technical Schools. It was under the same direction, and the master painters of Pittsburg did the work. The Carnegie Technical Schools' Fence Committee supervised the operations, and assisted in preparing the report after the painted fence had been exposed for a year. Several fences were also erected at Fargo, in the grounds of the North Dakota Agricultural College, and placed under the supervision of Dr. E. F. Ladd, the State Food Commissioner. The principal features of the reports on the tests are given in the current number of the "Journal of the Society of Chemical Industry," from which we extract the following particulars, in regard to paints used for iron and steel work.

Searches into the nature of these paints enabled certain rules to be formulated as to the value of pigments for coating iron and steel. The tests were made upon 50 pigments largely used in the production of paints, in order to determine which possessed stimulative, which inert, and which inhibitive characteristics when in contact with steel in the presence of water. The results were given in a report on "The Preservation of Iron and Steel," by Dr. Allerton Cushman, issued by the United States Department of Agriculture. It was too early to make a report upon the value of the various pigments at the close of 1909, but the following are a few observations thereon: The white leads (corroded and sublimed) and zinc oxide pigments appear to have well protected the steel and iron. The pure white leads showed a tendency to early and heavy chalking; but the steel beneath seemed in good condition. The zinc oxide showed a tendency towards checking and cracking, possibly because insufficient oil was used in its grinding. Zinc oxide mixed with silica or white lead gave efficient protection. The red iron oxides applied to the steel plates seemed to have done very well, with the exception of Venetian red, on which there seemed to be a slight exudation of the calcium sulphate contained in it.

The plates painted with red lead were in excellent condition, as were also those painted with zinc chromate and zinc and barium chromate. In the case of the plates painted with zinc chromate, several abrasions made at the time of erecting the fence disclosed the clean steel plate, which had suffered practically no corrosion. This was presumably due to the fact that zinc chromate, being slightly soluble, had kept the abraded places in a passive state. The plates, which were primed with various inhibitive pigments and topped with the same second coat, showed that red lead or zinc chromate are the safest pigments to use for this purpose.

The plates which were coated with red lead, and second-coated

with bitumen and coal-tar paints, disclosed a marked cracking of the top coats, through which the red lead used as a prime coat could be distinctly seen. Unequal expansion of the two coats was partly responsible for this fault, as well as the action of light upon coal-tar paints.

The appearance of the plates painted with Prussian blue was perfect. The paint was in most excellent condition, and possessed a very high gloss; thus demonstrating the value of ferro-cyanides as excluders of moisture and retarders of oxidation. The plates painted with calcium sulphate (gypsum) showed the most marked corrosion; brown oxide of iron working itself completely under the coating. Calcium carbonate and barium sulphate when used alone were in very bad condition; early chalking and destruction of the film having taken place.

The samples of steel which were exposed unpainted after having been pickled, showed varied degrees of corrosion; those containing manganese and other impurities, either in small quantity or regularly distributed, being corroded evenly and without any marked pitting. However, on the plates which were exposed unpainted, but having the mill-scale, there was more rapid corrosion and also more pitting than on those not having the mill-scale. In fact, certain of the plates having the scale corroded in some spots in an extremely rapid way, leaving whole areas with the mill-scale unacted upon. The scale in this case would act as a surface upon which the hydrogen evolved during the electrolytic action which accompanies corrosion could be catalyzed to form water—thus allowing the corrosion to proceed very rapidly.

Wherever an abrasion appeared upon the paint coatings of the various panels, different results were noted. In the case of panels painted with certain stimulative materials, abrasions showed that progressive corrosion had proceeded, and pitting was evident; while with the panels painted with high-power inhibitive materials, the steel was in very good condition.

One of the most striking results of the tests is the effect on the life of a paint of the addition of a very small percentage of colour (lampblack, chrome yellow, iron oxide, &c.). The North Dakota tests showed marked improvement in the wearing of white leads, tinted yellow or grey, over that of untinted leads. The results of the tests at Atlantic City and Pittsburg confirmed this in the case of whites composed of lead and zinc. The only whites approaching the wearing value of the tinted whites were certain mixtures of lead and zinc, generally with a small percentage of inert pigment added. Thus the wearing value of a paint appears to be dependent upon its containing more than one pigment.

An addition of siliceous pigments appears to be valuable in increasing the wearing properties of paints. It is well known that corroded white lead acts upon linseed oil; but such paints may be made comparatively inactive towards the oil by grinding with them an inert pigment. This explains to some extent the action of ochre, silica, barytes, lampblack, and chrome yellow.

The ability of certain pigments to absorb, and of other pigments to prevent, the passage of ultra-violet rays, no doubt has some bearing upon their action in a paint. The reflection of light by white paints might tend to preserve any delicate colours underneath them; while black paints have the contrary effect. Black pigments—such as lampblack and carbon black—are very slow driers, and tend with linseed oil to form films which are for some period excellent excluders, remaining quite elastic and durable. The chemical and heat rays of the sun, absorbed according to the selective action of the pigment, undoubtedly have some effect upon the drying and longevity of the oil.

Delicate pigments, such as Para red and others, need care in the selection of foundations. Canadian and British painters often add red lead to the white lead used in the priming of wood, as a better base than white lead alone. Some experiments made in the United States indicate that a combination of lead and zinc, with a small percentage of mineral pigment, gives the best results.

Removing Hydrogen Sulphide and Carbon Dioxide from Illuminating Gas.—A German patent has been taken out by Herr H. Hirzel for a process for effecting the above-named object. According to an abstract of the specification which appears in the current number of the "Journal of the Society of Chemical Industry," the patentee points out that in the removal of hydrogen sulphide and carbon dioxide from illuminating gas by washing it with ammoniacal liquor, in order to avoid loss of ammonia, only the liquor which is produced from the gas by condensation (so-called weak liquor), and which contains most of the hydrogen sulphide and carbon dioxide removed from the gas, is treated in a column apparatus for the expulsion of these impurities. In order further to reduce the loss of ammonia, the upper part of the apparatus, where the liquor is introduced and cooled, is made deeper than usual. The higher hydrostatic pressure thus produced leads to a better exchange of heat, and also increases the boiling-point of the liquor in the lower part of the column—thus facilitating the expulsion of the hydrogen sulphide and carbon dioxide. The same cooling water is used for cooling the freshly introduced gas liquor in the upper part of the column, and then for preheating the liquor in the middle portion before it passes to the lower heating compartment of the column; and thus economy of fuel is effected. An automatic temperature regulator is fixed on the inlet-pipe for the heating steam, so that the temperature of the liquor in the heating compartment can be kept constant some degrees below the boiling-point. The heating-tubes in the lowest compartment of the column are made separate and interchangeable, so that they can be easily replaced by others.

REGISTER OF PATENTS.

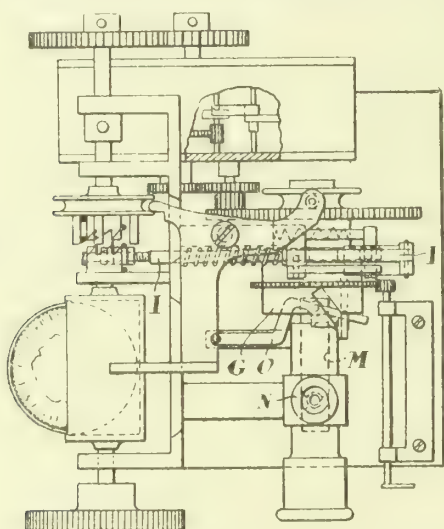
Prepayment Gas-Supply Apparatus.

HANSFORD, J., of New Barnet, and WRIGHT, J. F., of Aston, Birmingham.

No. 10,934; May 8, 1909.

This invention relates to prepayment apparatus (for the supply of gas, electricity, or the like) of the type in which, after the insertion of a coin of the proper denomination in the coin-carrier, the rotation of the coin-carrier spindle effects the coupling therewith of clock mechanism and the continued rotation of it winds the spring of the clock.

In the construction applied to controlling the supply of gas, the coin during rotation in a carrier on the actuating spindle displaces a spring-urged lever by which the winding clutch is brought into operation, and simultaneously a clutch connecting the timing disc with the clock is disengaged, while a crank on the boss of the winding clutch displaces a spring-urged frame or rod, so as to turn the timing disc through a definite angle by means of a pawl mounted on the rod which co-operates with a ratchet on the timing disc. The valve spindle is simultaneously displaced to turn on the supply by the engagement of a pin on the spindle, or its equivalent, with a cam or tappet on the timing disc.



Hansford and Wright's Prepayment Gas-Supply Apparatus.

The gas supply arrangement differs but slightly from the electrical apparatus. The gas-supply cock (as shown) consists of an axially movable piston valve M having a transverse passage, which, by the movement of the valve, is brought into and out of register with a corresponding opening or openings in the gas supply or delivery pipe N. The valve is shifted from one position to the other through the medium of a lever O pivotally connected with the valve. In the initial position of the apparatus—i.e., when the valve is closed—the end of the lever is within and at the bottom of the slot shown; but when, after the insertion of the coin and on rotating the coin drum, the timing drum G is rotated on retraction of the rod I, the first part of the movement of the timing drum shifts the end of the lever out of the slot, thereby opening the valve, which remains open during further rotation of the drum—the end of the lever resting on the edge of the drum. When the drum is returned towards the initial position by the clockwork, as the quantity of gas paid for is nearly consumed, the end of the lever is engaged by the other edge of the slot, the edge of the drum G being extended at this point (as shown), to ensure engagement between the lever and the inclined surface of the disc or drum. The rear face of the projecting part of the rim of the timing disc G serves as a stop to prevent the disc being rotated more than a complete turn.

Any clockwork mechanism may be used to drive the switch or timing disc; but it is preferred that the mechanism should comprise an escapement which will enable the mechanism to start as soon as the torque is applied to the escapement wheel spindle—for example, as soon as tension is put on the driving spring, whatever the position of the escapement. With this object, the escapement wheel is preferably (as described in patent No. 10,935 of 1909) in the form of an equilateral triangular disc, and one arm of the anchor is crooked or set obliquely (much in the usual manner) to engage the angles of the escapement disc, so as to retard the latter until freed by the action of the balance-spring or its equivalent; while the other arm has its operative surface so formed that, as soon as pressure is applied to it by the escapement disc, the anchor is displaced thereby against the action of the balance-spring—that is to say, the operative surface of this arm of the anchor is such as to present a slight incline to the path of the corner or angle of the escapement disc for all positions of contact between them.

Charging and Discharging Gas-Retorts, Coking Ovens, &c.

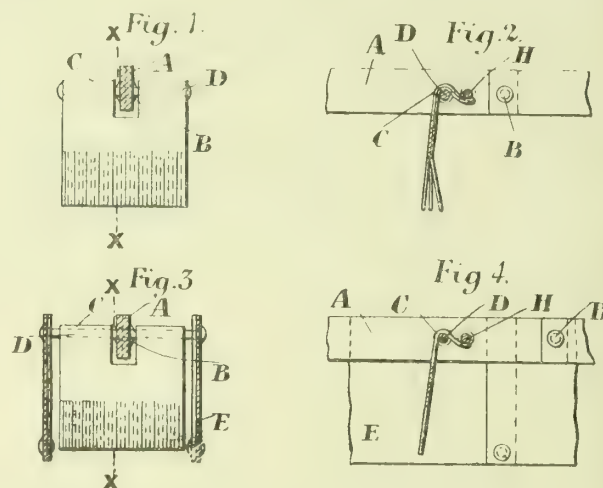
MASTERS, E., of Palace Chambers, Westminster, and HANSFORD, J., of New Barnet.

No. 13,428; June 8, 1909.

This invention relates to apparatus for charging and discharging gas-retorts of the character described in patent No. 9057 of 1909, and consists essentially in improvements in the construction of the charging

element, the principal feature of which is the substitution of brushes for the push-plates then described.

These brushes may be carried by a jointed bar which, in operation, is advanced centrally along the retort with the brushes depending sufficiently to sweep the floor of the retort. The brushes are mounted at intervals on the jointed bar, so as to be free to swing forwards; but they are prevented from swinging backwards beyond the vertical position by means of stops on the bar which encounter the brush mountings or suitable projections thereon. The charging member may have side plates jointed in correspondence with the central bar, and forming the sides of the brackets or boxes into which the coal is charged from a hopper or shoot; or the side plates may be dispensed with, in which case the counterweighted apron plate and charging platform co-operating with the charging member, and which are carried by the charger-frame in front of the mouth of the retort (as described in the earlier patent), are provided with side plates so as to complete the receptacle for the coal as it is delivered on to the charger from the hopper or shoot.



Masters and Hansford's Charging Member for Gas-Retorts.

Fig. 1 is a side elevation of a charging bar and brush without side plates. Fig. 2 is a section on the line X in fig. 1. Figs. 3 and 4 are corresponding views of a charging member provided with jointed or hinged side plates.

A is a bar comprising a series of links hinged together at B. The brushes comprise a plate provided with a foliation of wires or tongues, and either pivoted or hooked at C on to arms D integral or attached to the bar A, as shown. But where side plates E are used, the brushes are preferably hooked to distance-pieces connecting together the two rows of side plates. The side plates, where used, comprise a series of short lengths of plate hinged together in the usual way.

For controlling the swinging movement of the brushes, which normally are suspended in a vertical position, back-stops H are adapted to engage a surface of a brush in the desired limiting rearward positions.

The charging and discharging operations are performed in the usual way—that is, coal is shot between the brushes, and as these are caused to travel forward they push the coal in front of them and sweep it into and along the floor of the retort; while as the bar carrying the brushes is withdrawn, the brushes swing up and pass over the surface of the coal deposited in the retort.

Dip-Pipes.

PARKER, C. H., of Wednesfield.

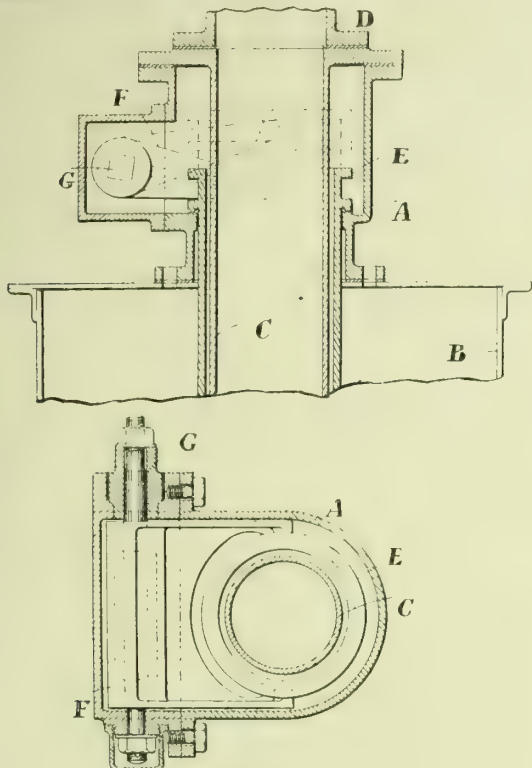
No. 18,455; Aug. 10, 1909.

This invention relates to dip-pipes for hydraulic mains, of the type wherein the tubular valve part surrounding the dip-pipe may be lifted clear of the level of the liquid in the main or lowered so as to make a liquid seal when it is necessary to cut off particular sets or "bunches" of retorts, as when charging and discharging them. The invention has for its object to permit of access to the tubular valve part for the purpose of cleaning, by the provision of a supplementary casing separate from the casing carrying the dip-pipe and valve, and capable of being readily detached from it. The supplementary casing carries the valve lever and spindle of the valve lever; and thus, on the removal of the part referred to, the spindle of the valve lever and the valve lever itself are completely removed, so as to permit of access to the valve without the necessity of removing the dip-pipe, ascension-pipe, or the casing on which the dip-pipe is mounted, and within which the top of the valve is carried.

The fitting A (p. 727) is secured to the top of the hydraulic main B with a flange at its upper part to receive the flange of the dip-pipe C; the latter being also provided for the reception and connection to it of the flange of the ascension-pipe D. The fitting A is provided with a seat for the enlarged top part of the tubular valve E when the latter is allowed to assume its lowermost position; and at the side of the fitting is an aperture of a width corresponding to the width of the top of the valve, and through which may pass a bifurcated lever F, whose arms extend one upon each side of the top of the valve, and are provided with projections for entry within, or engagement with, an annular channel or recess provided upon the valve.

The bifurcated valve lever F is mounted upon a spindle G transversely disposed to the axis of the valve; and its extremities are mounted within a supplementary casing adapted to cover the aperture through which the lever F passes. Flanges or lugs are provided around the aperture in the casing of the dip-pipe and valve for the reception of bolts or screws, which are screwed into flanges or lugs on the supplementary casing carrying the spindle and the valve lever, so

that the supplementary casing is capable of being readily mounted in position and as readily disconnected for the examination and cleaning of the valve.



Parker's Adjustable Hydraulic Main Dip-Pipes.

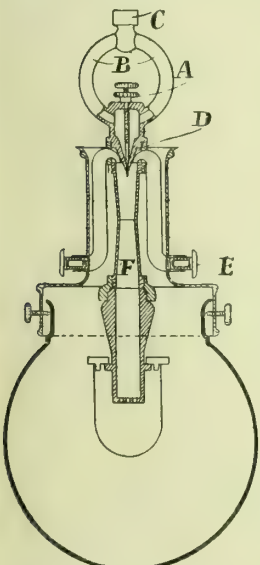
In order to render the casing gas-tight, the fitting mounted upon the spindle G, and provided for the reception of an operating lever, is formed with a valve-like surface adapted to bear upon a corresponding valve seat formed in the supplementary casing, and the nut is screwed down upon a washer; while at the further end of the spindle there is provided a small cap mounted to cover the spindle nut, or alternately a stuffing-box through which the spindle passes.

Inverted Incandescent Gas-Burners.

RAYBURN, E. C., of Edinburgh.

No. 16,699; July 17, 1909.

The gas is supplied through a nipple A, in which is a central vertical direct-acting needle regulated by being screwed up or down. The gas is supplied by two branch-pipes forming a circular suspension link by which the burner is carried. The gas is heated by the products of combustion impinging against the branch-pipes; and for the purpose of more effectually heating the gas, these branch-pipes may be made to dip into, or lie close to, the top of the funnel forming the top of the gallery B. The gas from the nipple is delivered centrally and vertically downwards into a closed tube C of fairly large diameter; and passing into the tube are one or more air inlet-tubes D, tapered at the ends which lead into the closed tube, or gradually flattening to an ellipse. In any case, the tubes are of greater cross-area where the air comes in than where it passes in to mix with the gas. Where the tubes enter the gas-chamber C, they are bent more or less downwards, so that the air is delivered in streams downwards and towards a common centre. Attached to each air inlet-tube, and at a point where the heat is comparatively great, is an air-heating chamber E provided with an air regulating valve. The air inlet-tubes pass out through the gallery B. In the head of the burner, directly underneath the delivery ends of the



Rayburn's Inverted Incandescent Burner.

air tubes, is a bunsen tube F, tapered as shown, somewhat like the well-known "vena contracta" form of outlet-pipe. The chamber or nozzle immediately beneath the bunsen tube is provided with a perforated diaphragm which "adds materially to the efficiency of the lamp." To the lower end of the nozzle are the usual projections for carrying the mantle.

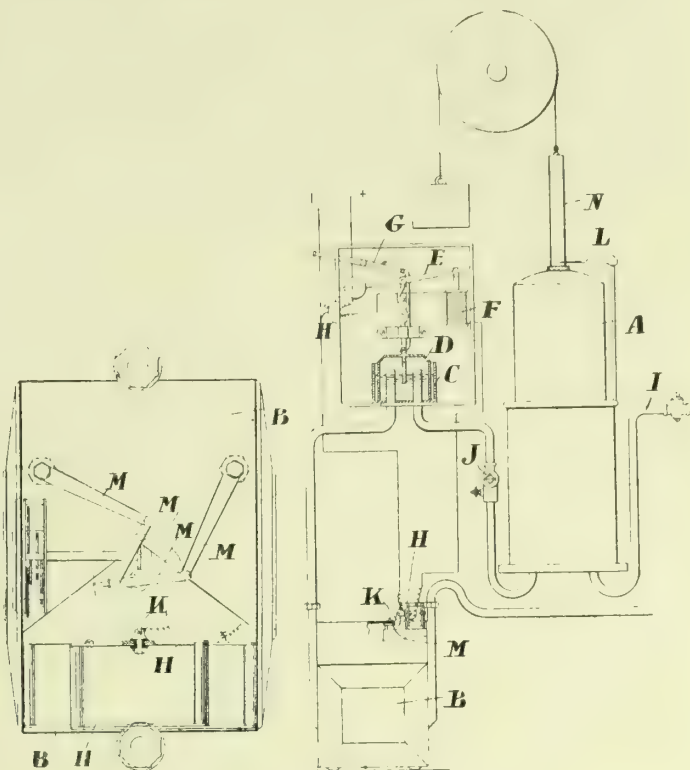
Testing the Capacity of Gas-Meter Diaphragms.

GLOVER, T., of Queen Victoria Street, E.C.

No. 19,031; Aug. 18, 1909.

This apparatus is for testing the capacity of the diaphragms, bellows, or other measuring appliances of a gas-meter by causing either of the actuating arms or the tangent, or a stop or pin on the index-spindle, to

establish an electric circuit on each revolution or complete movement to immediately shut off the supply of gas to the meter.



Glover's Gas-Meter Capacity Tester.

The first illustration is a part sectional elevation of the complete installation; the second being a plan of a dry meter with the top removed.

Between the ordinary gas-bell A employed for testing purposes and the meter B is a mercury cup C, into which is led the gas-pipe from the bell, and from which is led the pipe to the meter. In the cup is a sealing bell D having a division plate which acts between the two gas-pipes; and on the sealing bell is a hook or hooked rod which engages with a hook on a rocking beam E, one end of which is connected to the core of a solenoid F. The lever G engaging with the hooked rod on the sealing bell is for lifting it out of the mercury cup. A spring-controlled folding frame, preferably of X shape, is positioned preferably within the top of the meter, as at H, and by its construction may fit many sized meters.

Now suppose it is wished to test a meter to find out the capacity of the bellows, the meter is connected up, and the gas-testing holder is filled from the pipe I, and the supply cut off. The frame H is placed in position—the meter with the depending pivot piece of the axle in the path of the actuating arm, tangent, or stop on the index spindle. This is then set; the bell D is lifted in the mercury cup to free the gas-pipes; the tap J is turned on; and gas passes from the gas-testing bell, and commences to fill the bellows in the meter. The electric current is then switched on; and as soon as the actuating arm makes contact with the depending pivot piece K, the electric circuit from the battery is completed and the core of the solenoid is operated to release the sealing bell D, which immediately drops and shuts off the gas. The meter mechanism is then stopped. The testing holder L is then set for the commencement of a reading; the depending pivot piece K is lifted from the path of the actuating arm M, or the stop on the index spindle, and the sealing bell is lifted by means of the lever G—gas passing through the meter. As soon as the actuating arm is moved away from its original position, the depending pivot piece K is dropped into the path of the actuating arm M, and the current is switched on. When the revolution is complete, the actuating arm comes against the depending pivot piece K, and electrical contact is again established, and the sealing bell shuts off the gas as before, stopping the meter, and the reading is taken by which the correctness or otherwise of the meter can be read on a scale N attached to the top of the holder.

Discharging and Charging Gas-Retorts.

DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 19,305; Aug. 21, 1909.

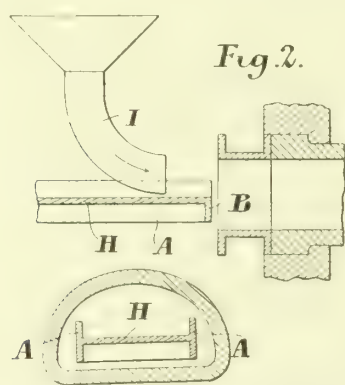
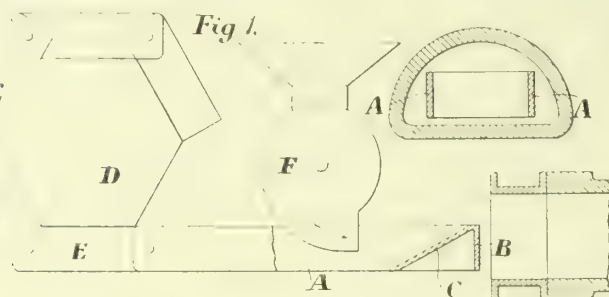
This invention relates to a machine adapted to discharge and charge a retort in the one cycle of entering and leaving it. The discharging device is constructed so that, while it is being withdrawn from the retort, the projector operates to fill the retort.

The machine comprises plates of suitable dimensions for entering the retort, and provided with a head to serve as a ram for discharging the coke. The projector may be of any known form involving rotary mechanism, or simply a vertical tube curved at the bottom, down which the coal falls—being projected into the retort owing to its own momentum.

Fig. 1 (p. 728) is a longitudinal section through the end of the retort and discharging device combined with a projector, with a cross section showing the discharging device within the retort. Fig. 2 is a part longitudinal section showing a modification.

In fig. 1, the discharging ram consists of two side plates A, joined together at their forward end B, and having between them at this end an inclined plate, which may be a web C, adapted to cause the projected coal to ride over the end. This ram is driven into the retort by

a polygonal drum D, which drives links E connected with the ram. The ram and projector F, which has rotary blades projecting coal from a hopper, may be carried by the same framework; and when they have been brought into proper position relative to the retort to be discharged and charged, the ram is first pushed into the retort to discharge the coke. A stop having then been arranged at or near the end of the retort from which the coke has been discharged, the ram is withdrawn a little way, and the projector is started in operation while the withdrawal of the ram is continued. The coal issuing from the projector runs along the bottom of the retort between the plates A, and shoots up the incline O over the end of the ram, and the retort is duly charged. This projector may occupy permanently its charging position relatively to the whole apparatus, since the end of the ram never has to pass the projector.



Duckham's Retort Charging-Discharging Device.

In fig. 2, the ram is slightly varied, in that there is a horizontal plate H between the side plates A and the end plate B, but only half the height of the side plates. In this case, the coal runs along the plate H instead of along the bottom of the retort, and no incline is required. The shoot I is assumed to be the lower end of a tube attached to a hopper; the coal descending the tube and acquiring sufficient momentum to carry it into the retort.

Gas-Fires.

AIRD, K., of Falkirk.

No. 23,482; Oct. 14, 1909.

This invention relates to gas-fires of the kind adapted to be fitted to existing grates, interiors, or fire places, "so as to be self-contained and give the appearance of an incandescent coal-fire." It consists of a gas-fire so arranged that the whole area of the fire-grate is "available for holding fuel, and is not lessened by the fitted-in structure occupying part of the fuel space."

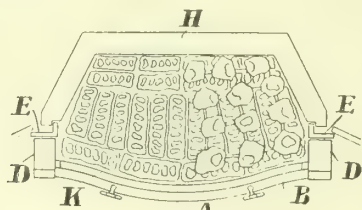
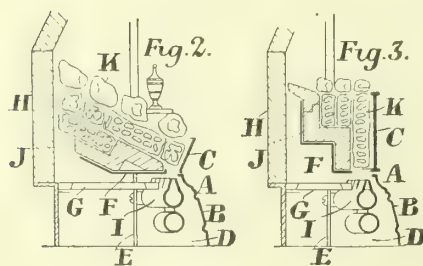


Fig. 1.



Aird's Gas-Fire.

Fig. 1 is a plan, and fig. 2 is a vertical cross section of such a gas-fire. Fig. 3 is a vertical cross section showing a modification.

In figs. 1 and 2, the fire comprises a casting A resting on the hearth, and having an ornamental or other front B, with front grating C above; the grating being formed integral with the casting, or else detachably

secured to it. The rear edges of the sides D are fitted against the forward edge E of an existing grate whose front bars have been removed; while a supporting base F, formed integral with the casting and grating (or detachably secured to it), is extended horizontally over the usual grate-bars G and upwards towards the back brick H of the fire place. In the hollow front part of the casting, a bunsen burner I for supplying gas is fitted; and over the rearwardly extending base F is fitted a fire-brick block J, having a sloping or stepped surface, on which are laid or built-up the hollow or like bodies K constituting the "fuel," the forward edges of which are supported by the front grating of the casting, which bars are kept unusually low.

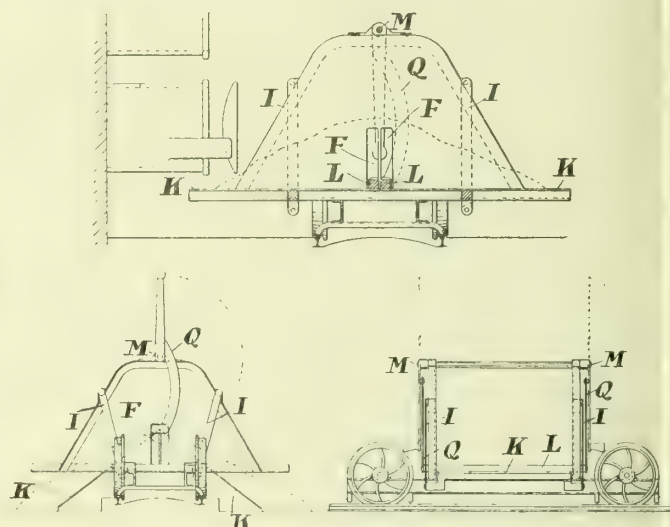
The construction shown in fig. 3 is substantially the same, except that a high front grating C is employed, and the rearwardly extending base F is stepped; the fire-brick block J being made to correspond.

Coke Trucks, Barrows, or Conveyors.

ROBERT DEMPSTER AND SONS, and TOOGOOD, H. J., of Elland.

No. 25,302; Nov. 3, 1909.

This invention, relating to coke trucks, barrows, or conveyors, is especially adapted to carrying away coke discharged from the bottom retorts of a setting of horizontal or inclined retorts, where vertical space is limited. It comprises flat bottomed or other trays or plates, pivoted at their centres of gravity (in determining which points due regard may be had to the weight of the coke borne), and linked to a toggle-jointed lever or system of levers in such manner as to be capable of tilting or rising in the centre of the truck so as to discharge their contents at opposite sides.



Dempster and Toogood's Coke-Trucks.

The truck as shown comprises two channel irons, on which are mounted four flanged wheels, and two horizontal angle irons supporting side frames. The space enclosed by these bars may be partially filled-in solid, leaving two guide-slots F at each side of the truck. Pivoted to the frames are swinging bars I, to the lower ends of which are connected cranked crossbars on which are secured flat plates or trays K, each constituting one-half of the flat bottom of the truck. Crossbars L, with cylindrical ends, are secured to the inner or adjacent ends of the two trays K and on their upper surface—working freely through the slots F. At the top of the frame is pivoted at M a handle linked to a curved lever Q, the lower end of which terminates in a double boss or bearing, in which work freely the round ends of the bars L. The handle is preferably in duplicate, so that the truck may be discharged from either end.

Coke having been discharged from the retort on to the trays K, and the truck having been traversed along the rails to the required tipping place, the handle is raised, causing the lever Q to draw the crossbars L to the tops of the slots F, when the trays K assume a sloping position, as shown, and discharge the coke, which, if not entirely discharged at once, slips or trails-off as the truck runs along. Upon the downward stroke of their handle, the plates K resume their normal position, and the lever Q is preferably taken past the centre line to lock in the loading position, ready to receive the next load of coke.

By reason of the cranked bars being pivoted to the bars I, they are free to turn outwardly when the inner ends of the trays are raised, whereby the required steepness of inclination of the trays for discharging can be readily obtained, in the minimum of available height; and, "owing to the balanced nature of the suspensory mechanism, the tilting is performed with the minimum effort on the part of the workman."

Lubricating Gas-Exhausters.

MASON, J., of Oakham, and MASTERS, R., of Dudley.

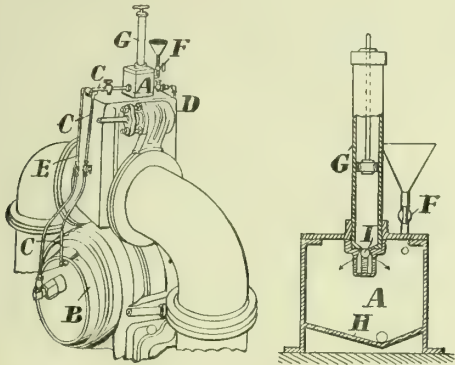
No. 28,111; Dec. 2, 1909.

This invention relates to means for oiling gas-exhausters, whereby from one common oil-receiver all parts will be oiled at one operation, "which can be performed quickly, without any danger of any of the oil being spilled."

A general view is given of a portion of a gas-exhauster showing the improvements applied to it, and a sectional side elevation through the lubricating apparatus.

On the top of the exhauster is a small enclosed oil-container A, preferably of somewhat larger capacity than is required to hold the oil for one oiling of the two end rings (in the covers B) and the central shaft. From the lower part of the enclosed oil-container there are two pipes C D

with controlling taps leading and connected to the oil inlets in the two end exhauster covers; and there is a branch pipe E with tap leading and connected to the oil inlet to the central shaft. The oil-chamber A has a filling hole, closed by a screwed plug-cock or the like F. In communication with the top part of the enclosed oil-container, there is a pump G adapted to force air into the oil-chamber on to the top of the oil in it.



Mason and Masters' Gas-Exhauster Lubricator.

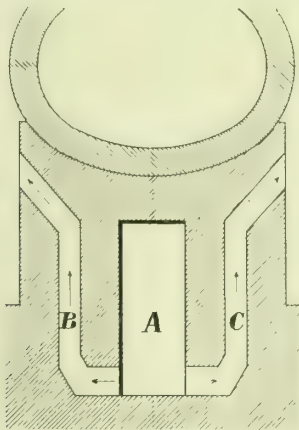
The taps on the pipes leading from the oil-container to the oil inlets in the end cylinder covers and in the shaft are first closed, and a sufficient quantity of oil for one oiling of the parts is poured into the oil-container, which is closed at F. Air is forced by the pump into the oil-container on the top of the oil, and compressed to a suitable pressure. The taps are then all opened simultaneously, and the pressure of the air in A forces the oil along the pipes to the end rings in the covers and to the centre shaft simultaneously; the pressure of the air being such as to ensure the oil being forced into all parts to be lubricated. The lower portion of the container is preferably formed with an inclined or wedge-shaped bottom H, for the purpose of leading any small quantity of oil to the pipes, while the valve in the pump may be of the ball type—the ball I being pressed downwards by the air pressure from the pump G against the resistance of a coiled spring, the air being forced through holes in the lower part of the pump into the container.

Gas-Fired Retort-Furnaces.

BENNINGHOFF, O., and KLÖNNE, A., of Dortmund, Germany.

No. 826; Jan. 12, 1910.

This invention relates to a gas-fired retort-furnace of the kind wherein the available space is only sufficient to admit of a single gas passage for the heating of both sides of the furnace. In furnaces of this type, the patentees remark, it is difficult to adjust the chimney draught with such accuracy as to cause the heating gases to be equally divided between the two sides of the furnace—the side which has the greater draught naturally attracting more heating gas, and also more air for combustion. In order to prevent this air from being drawn back from the one side of the furnace through the gas-outlet flue into the gas-passage (thus causing back-firing therein, "which would injuriously affect the bottoms of the retorts") the gas-outlets are, in accordance with this invention, constructed as shown.



Benninghoff and Klönne's Gas-Fired Retort Furnaces.

A is the gas-supply passage or channel, from which the outlet flues B and C branch off on opposite sides. The flues for the combustible gas are on both sides arranged horizontally at the base of the gas-supply passage. Before, however, these flues reach the interior of the furnace, their direction is changed, so that they pass first vertically upwards in the side wall of the furnace to the level of the top of the passage A, and then obliquely outwards into the combustion chamber above this level. Should the draught not be uniformly distributed, it may happen that the heating gas is drawn more to one side than to the other in the flues B and C. With this arrangement, it is impossible for back-firing to occur in the pipe A, and injury to the furnace due thereto is thus prevented. But the columns of gas ascending in the flues B and C first vertically upwards through practically the entire height of the passage A, and then obliquely upwards and outwards, prevent the entry of air into the passage A, and thus obviate the risk of back-firing therein, and of consequent injury of the bottom of the retort.

To attain this result it is, however, said to be necessary—in order to

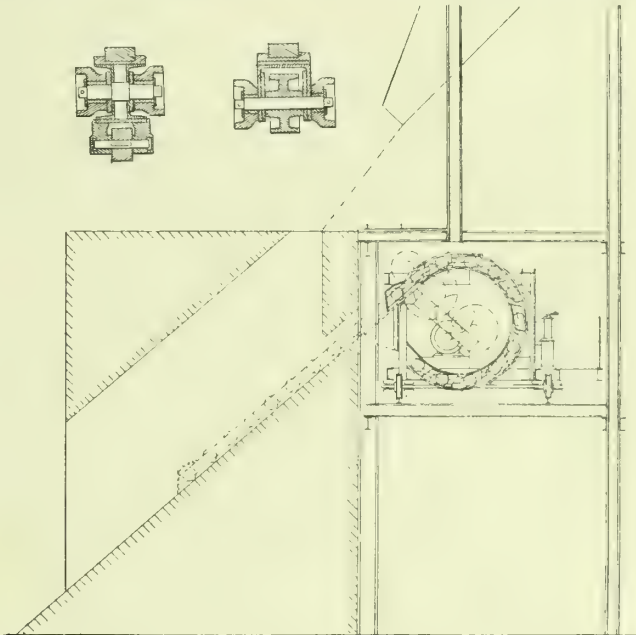
provide ascending gas columns of sufficient height—that the gas should flow in the manner shown on each side from the bottom of the passage A, first outwards and then vertically upwards on each side throughout a height equal to that of this passage; and the arrangement here described and shown thus differs essentially from previously proposed arrangements, wherein the gas-flues branch off obliquely upwards from about the middle of the height of the main gas passage, or from the top or from one side only of this passage, or from the bottom of the flue A on one side, and at about the middle of its height on the other.

Discharging Machine with Jointed Ram for Horizontal and Inclined Coke Ovens or Retorts.

MULLER, W., of Saar, Germany.

No. 1286; Jan. 18, 1910.

In order that the necessary space for coke-discharging machines with rigid discharging rams (which must be as long as the oven or retort to be worked) may be reduced, and that the foundation masonry or brickwork for the track on which the machine is to move may be less expensive, machines of various forms of construction have already been suggested, the patentee points out. For example, in one well-known form of construction, the discharging ram consists of several sections which telescope with one another; and when introduced into the oven they are drawn out by a chain-gear so as to form a long rod. For the purpose of economizing in the masonry or brickwork, the whole device is placed on a high frame, which runs below on the level on rails. The disadvantage of this form of construction, he points out, is that for extending the different parts of the discharging rod the sensitive chain-gear must be employed, and, further, the discharging ram and the machine frame are exceedingly heavy in construction. Moreover, forms of construction are known in which the discharging ram consists of a large number of small links or elements, which in operation slide along the bottom of the oven or retort, and are wound on a drum or the like, when the ram is drawn back. But a disadvantage in these rams is the sliding of the jointed ram along the bed of the oven, "whereby the latter is often damaged, the rams are quickly worn away, and a relatively considerable expenditure of force is necessary in discharging."



Muller's Jointed Ram for Discharging Ovens or Retorts.

The present invention is intended to enable the jointed ram to be operated in such a manner that these disadvantages are avoided. For this purpose, the links of the rams are provided with guiding and supporting rollers, which may be constructed in various forms, and two examples of which are illustrated. By the roller-guide arrangement for the links or sections, direct contact between the latter and the bed of the oven is avoided, and the links are easily guided in the guide-groove (or curved guide) when they are turned over. In this way, any premature wearing away of the links is prevented, and the consumption of power is very slight. The roller arrangements illustrated are intended to ensure a separate guiding of the ram in the oven and in the curved guides—the side-rollers acting as guide-rollers in the guide-curve of the machine; while the lower rollers act as supporting rollers for the links in the oven or retort. In the main drawing, an example of the invention for discharging machines employed in inclined ovens or retorts is shown in connection with the roller-guided links of the discharging ram which are turned over downwards in a fixed guide-curve when the rod is drawn back.

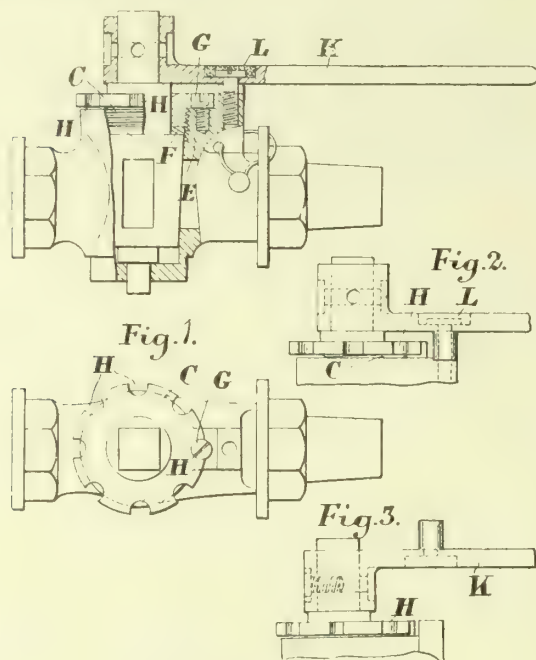
Controlling the Supply of Gas from Main to Meter.

CLARK, H. N., of Lewisham, S.E.

No. 5840; March 8, 1910.

This invention (relating to cocks designed especially for controlling the supply of gas from the main to the meter) has for its object an arrangement whereby more efficient means of locking the cock when the supply is cut off are obtained, and means are provided whereby leakage of the cock is prevented, and loss of the key or misuse thereof is obviated when the cock is in use. With a cock constructed in

accordance with the invention, the use of a cock on the consumer's side of the meter is dispensed with.



Clark's Gas-Meter Cut-Off.

Fig. 1 is a part sectional elevation and plan of the cock; fig. 2, a part elevational view showing the handle or key locked to the body; and fig. 3, a similar view showing the handle or key in the operative position.

The taper plug has its lower end fitting in a closed conical recess, and is provided with an extension which passes through the bottom of the recess. The cap C screws into the stuffing-box E formed in the body of the cock, and is locked in position after the washer F has been compressed on the top of the plug to the requisite degree by means of the screw G, which screws into the body of the cock, while its head takes into one or other of the notches H on the screw-cap. To prevent the gas-supply pipe from being disconnected from the meter, the screw union is locked to the body of the cock in any recognized manner—for instance, by a wire passed through a hole in the body of the cock and through the flange of the union; the ends of wire being sealed off.

The key or handle K has its boss fitting the stem of the plug, with lugs or projections formed on the key. The vertical extension formed on the body of the cock is adapted, when the handle is to be locked, to fit between the lugs, and when in this position, it is locked to the body of the cock by a screw passed through the recess in the key, and screwed into a hole of the vertical extension shown. The space above the screw-head is filled with any suitable seal L, thus rendering it impossible to operate the plug without tampering with the seal; and, further, as the holes for the screws are in alignment, it is impossible (when the cock is locked) to tamper with the screw cap C, unless the handle or key is removed.

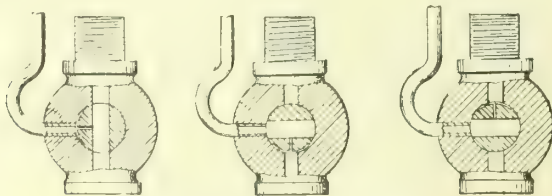
When the cock is required for use, the seal L is broken, the screw removed, and the handle reversed, as in fig. 3; the handle being then secured to the stem by means of a screw passed through one or other of the holes in the boss of the key, and screwed into the stem. In the same manner also, the handle or key may be secured to the stem when in the locked position.

Bye-Pass Gas-Regulator.

THOMAS, B., of Birmingham.

No. 5055; July 31, 1909.

In this invention, the plug of the valve, in addition to being provided with the usual straight cross passage, has a small aperture formed at right angles to it, in the one side of the plug only; the aperture being of a size to permit the passage of sufficient gas for the supply of the bye-pass or pilot light. A second port is formed in the valve body, and is provided with a tube, the purpose of which is to conduct the gas for the pilot light to a convenient point for the ignition of the main burner. A groove or recess is formed in the seat and plug (or in the plug only, as illustrated) for the purpose of conveying the gas to the pilot aperture after it is turned from alignment with the inlet passage of the valve.



Thomas's Bye-Pass Gas-Regulator.

It will be seen that when in the bye-pass position, as is shown in the second figure, the valve requires exactly one-quarter turn to turn the main burner full on—the bye-pass remaining alight; while a further quarter revolution completely closes the valve to the supply. Stops are provided in similar positions to the ordinary plain valve, thereby enabling the valve to be constructed from the usual type of body.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

High-Pressure Gas Lighting.

SIR,—To prevent possible misapprehension on the subject, may we ask you to allow us a few lines in the "JOURNAL" as to the early attempts made to produce mixtures of air and gas in mains before its entrance into service-pipes of consumers.

We do not claim that we were the first to apply this principle to incandescent lighting; the system of diluting gas with air is as "old as the hills." We have employed mixers in connection with our oil-gas apparatus for many years; and a number of these mixers are still in regular use throughout the country.

As long ago as March 24, 1884, an article appeared in the "Mechanical World" describing the application of this mixing or diluting apparatus, as applied by our Mr. James Keith. This conclusively proves that the principle of mixing air with gas before use is not novel.

From this, your readers will appreciate that there cannot possibly be any patenting of the "principle" of producing the mixture, but only in the different forms of apparatus by which the mixing is secured.

Farrington Avenue, E.C., JAMES KEITH AND BLACKMAN CO., LTD.,
Sept. 10, 1910. A. COLLINSON, Manager.

Colonial Gas Development.

SIR,—Nothing is more noticeable at the present moment in the gas industry than the sudden springing-up of a demand for the latest and most efficient means of manufacture and distribution among the smaller townships and outlying districts of our Colonies. In Australia and New Zealand, this is particularly remarkable. It would seem as though there had been a thorough awakening to the fact that the best and most modern of appliances for all such purposes were not only advisable to keep pace with the times, but that they constituted in grim earnest the essentials which were absolutely necessary to the well-being and the welfare of each particular community. At the same time, existing works of ancient construction are equally imbued with this spirit of progress; and we are at the moment pressed with demands for the most up-to-date appliances for minimizing the cost of production, from widely divergent Colonial possessions. The following is an illustration of our argument:—

INVERCARGILL (N.Z.) BOROUGH COUNCIL.

GAS DEPARTMENT.

Comparative Analysis of Profit and Loss Account for Four Years Ending March 31, 1910.

	Per 1000 Cubic Feet of Gas Sold.			
	1907.	1908.	1909.	1910.
Coal	35'78d.	33'76d.	33'82d.	27'41d.
Less residuals—Coke, tar, &c.	17'95d.	17'36d.	16'11d.	16'07d.
Net coal	17'83d.	16'40d.	17'71d.	11'34d.
Manufacturing and distribution charges, including wages, purification, management, wear and tear, printing, &c.	27'28d.	29'30d.	33'54d.	27'21d.
Net coal and working expenses	45'11d.	45'70d.	51'25d.	38'55d.
Capital charges, interest, &c.	22'10d.	18'19d.	16'01d.	16'29d.
Gross cost	67'21d.	63'89d.	67'26d.	54'84d.
Less gas, meter, and stove, and other net receipts	79'38d.	79'24d.	77'78d.	74'52d.
Net profit	12'17d.	15'35d.	10'52d.	19'68d.
Gross profit earned on loan capital	7'8 p.c.	7'7 p.c.	6'9 p.c.	11'2 p.c.

E. RABBIDGE, Gas Manager.

It is now some three years since we purchased and shipped sundry plant of modern and improved construction on a considerable scale to the Invercargill Municipal Gas-Works, in order to meet the increased output. But notwithstanding these necessary expenses, the works continued to pay, and pay handsomely; and now it is not so much a question of renewal and restoration, as of rebuilding the works on the most approved modern methods on a scale suitable to cope with the present increased needs, and also to provide for the large and ever expanding requirements of a rapidly growing community.

The above is only one of many such cases of which we have lately had experience; and it may be of interest as showing the energy with which the smaller townships are pushing advantageously to the front.

WM. COWARD AND CO., LIMITED.

91, Finsbury Pavement, E.C.,
Sept. 9, 1910.

Free Maintenance and Supervision.

SIR,—My Directors, having read your "Editorial Notes" and Correspondence for some months past upon this subject, decided, as from Aug. 1, to maintain and supervise free of cost all consumers' services, fittings, and burners, and to replace mantles when required.

The experience of my Board is that, owing to the neglect of consumers in keeping fittings clean and renewing mantles when required, on an average only from 65 to 70 per cent. of the illuminating efficiency

f the gas is obtained. This, my Directors think, leads to very numerous (and often unjust) complaints and dissatisfaction—thus leaving the door open for an opposition light.

My Board feel that by taking the whole control of supervision and maintenance into their own hands, the Company will be more than repaid by the increased satisfaction of consumers and consequent expansion of trade, to say nothing of maintaining gas as the only illuminant. My Board consider this subject one of the most import to gas companies of modern times.

A. W. FOSTER,

Secretary, Beechworth Gas Company.

Beechworth, Victoria, Aug. 8, 1910.

High-Pressure Gas Lighting for Textile Mills.—At the foot of the letter on this subject which appeared on p. 660 of last week's issue, the address of the writer, Mr. James Taylor, was given as the Hollinwood Gas-Works, Oldham, instead of the Mossley Gas-Works, of which he is now Engineer and Manager.

MISCELLANEOUS NEWS.

GAS AND ELECTRICITY AT MANCHESTER.

Special Joint Report by Officials of Both Departments—Unanimity as to the Basis for Rate-Aid.

At the Meeting of the Manchester City Council last Thursday, some discussion took place on the Gas Committee's minutes in regard to the supply of gas for cooking purposes where electricity is used for lighting. The Gas Committee desire that, in addition to the cooker, one light shall be placed in the kitchens of houses supplied; and at the previous meeting of the Council they had been requested to reconsider the matter.

Alderman GIBSON, the Chairman of the Gas Committee, said that the Committee adhered to their former conclusion. The matter was a small one; and why it was referred back, passed comprehension.

Alderman WALKER asked that the matter should be again sent back and referred to the Standing Joint Committee for consideration.

Alderman GIBSON, after a conversation with the Chairman of the Electricity Committee (Mr. Howarth), agreed to take the question back again, so that he could consult that Chairman.

Miss MARGARET ASHTON asked that the matter should be considered from the domestic point of view, and not only in regard to profits.

Alderman HOLT said that the question was a serious one. There was contention between two Committees as to who were going to supply a certain thing called light. The sooner the two Committees were joined together in one Light and Power Committee the better it would be for the city. They were now both contending for business; and they had no right to allow competition between the two departments.

The joint report of gas and electricity officials of the Manchester Corporation on matters affecting the relationship of the two departments is now in the hands of every member of the City Council. It is marked "confidential," and signed by the following: Gas—Mr. J. G. Newbigging, M.Inst.C.E., the Chief Engineer; Mr. Fredk. A. Price, the Superintendent and Secretary; Mr. F. P. Smith, the Accountant. Electricity—Mr. S. L. Pearce, the Chief Engineer; Mr. Fredk. E. Hughes, the Secretary; Mr. W. E. Foden, the Accountant. There is a supplementary report by the Electricity Department officials.

The following are extracts from the joint report: The prices charged by each of the respective Committees were considered at some length, with specific reference to the allegation that supplies were sometimes furnished below cost. Schedules of prices as submitted, giving dates on which they were approved by the City Council, are appended:

Gas.—By ordinary meter for general purposes, 2s. 3d. per 1000 cubic feet within the City, and 2s. 6d. without the City; authorized by the Council on May 3, 1903. By ordinary meter for manufacturing purposes on condition that the annual consumption for such purpose is not less than 1,000,000 cubic feet, 2s. within the City and 2s. 3d. without; authorized by the Council on March 7, 1906. By ordinary meter for power purposes, 1s. 9d. within the City and 2s. without; authorized by the Council on March 7, 1906. By automatic meter, 2s. 9d. within the City and 3s. 4d. without; authorized by the Council on May 4, 1898. Hire is not charged for either meters or stoves.

Electricity.—Lighting—ordinary: (a) simple or "flat" rate of 3½d. per unit metered; (b) compound rate, consisting of—(1) fixed charge of £7 per k.w. of demand per annum. (2) Plus running charge of 1½d. per unit metered. Customers may take (a) or (b) at their option. These charges were approved by the City Council on June 3, 1907. Power—ordinary: (a) unrestricted supplies—from 0.7d. to 1.5d. per unit according to demand and consumption, subject to certain minimum charges; (b) restricted supplies (no current to be taken between 4 p.m. and 6 p.m. in November, December, January, and February), 1d. per unit, subject to certain minimum charges; hoists 1½d. per unit, radiators and other small electrical appliances 1½d. per unit. These charges were approved by the Council on April 6, 1910. Hire is charged on all motors supplied by the department. The report proceeds: We came to the conclusion that no arbitrary ruling could be laid down, as so much depended upon the conditions of supply and upon the different factors entering into each individual case. Further, we are convinced that all the prices of each department were fixed on recognized principles. We are unanimously of the opinion that no useful purpose can be served by one department criticizing the other, that if further criticism were

desirable, nothing valid could be urged as to methods of working without a prolonged special study of the problems facing each department. As the situation presents itself to us, it is simply that the City Council has entrusted to the two Committees certain amounts of capital outlay, and that the Council exacts from each Committee annual sums in aid of rates. Such being the case, the question arises, on what common basis can a fair comparison be made. The outlay on permanent works (disregarding floating stocks) should form the first line of comparison. Allowance has to be made for the difference in the economic status of the departments. Owing to the Gas Department having been established many years longer than the Electricity Department, it has had time and opportunity to free a much larger proportion of its assets from debt than is the case with the latter department.

Adopting this basis of comparison, a table of figures is given showing that the capital outlay of the Gas Department at the 31st of March, 1910, was £2,851,184; the encumbered portion being £1,172,463, and the "free" capital—i.e., capital upon which no interest is payable—£1,678,721. In the case of the Electricity Department, at the same date the figures are: Capital outlay £2,678,629, encumbered £2,001,430, and "free" £677,199. Charging these respective total capital sums with 3½ per cent. per annum, the hypothetical interest charges works out at £99,791 for gas and £93,752 for electricity. Deducting the actual interest charges borne—namely, £48,053 for gas and £69,311 for electricity—the respective benefits due to free capital work out at £51,738 for gas and £24,441 for electricity, or a difference in favour of the Gas Department of £27,297. Continuing the comparison, the report shows that, deducting the amount due to greater amount of free capital—namely, £27,297 from the £46,500 handed over by the Gas Department in aid of the rates for the year 1910-11—the percentage of rate aid to capital is 0.67 for gas against 0.56 for electricity, from which department £15,000 has been voted in aid of the rates for the current year.

The report goes on: Allowing for the probability of future gas contributions to rate aid being £50,000 (the normal figure for some years past), the gas percentage would be raised from 0.67 to 0.79, or £22,700—an excess over the electricity figure of £7700, or 23 per cent. On the electricity capital, this difference of percentage represents £6160.

Attention is called in the report to the recent decision of Parliament in regard to the Glasgow Gas Consolidation Bill—the gas undertaking being precluded from carrying any balance of profit to the credit of the Corporation for general purposes; and the following observations are made: It is quite clear, then, that if Manchester were now establishing its gas and electricity undertakings, no option would be given by Parliament as to the extent to which profits could be devoted to rate-aid. Equally clear is it that Parliament considers the benefit (if any) to accrue to the ratepayers must be calculated on the outstanding mortgage debt as being the only true measure of the ratepayers' risk. Applying the principle laid down by Parliament to the Manchester gas and electricity undertakings, the position in regard to rate-aid would be as follows:—

	Mortgage Debt as at March 31, 1910.	Amount of Rate Aid.
Gas	£1,212,685	£12,127
Electricity	£1,970,112	£19,701

The officials have considered how best to deal in the future with gas and electricity supplies to new colonies or estates where both supplies are demanded, and they report: As the ratepayers have a right to demand either or both supplies, provided an adequate return is assured to the Corporation on the necessary capital, it is held that the Electricity Department should continue exercising its powers of requiring an annual gross revenue of 20 per cent. on capital outlay on mains, and that the Gas Department should also demand a corresponding return. In the event of no adequate return being forthcoming for both departments from supplies to such estates, and failing a satisfactory arrangement between the departments themselves, it is suggested that such cases should be referred to a Standing Joint Committee, composed of representatives of each Committee and (say) the Finance Committee. The Joint Committee would not deal with all supply applications, but only those of the nature before mentioned. A Committee so constituted would necessarily consider the interests of the Corporation as a whole rather than those of either department. In conclusion, we desire to say that we are unanimously in agreement with parliamentary practice as to the mortgage debt being taken as the basis upon which rate-aid should be computed; and the adoption of that basis by the two departments would remove all grounds for criticism in the future.

The supplementary report by the electricity officials deals with the point that, after allowing for free capital, the contribution from the Electricity Department falls short of the gas contribution. The report says: "Taking the year 1910-11, the shortage is £2946. Had the gas contribution been at the normal figure of £50,000, the deficiency would have been £6160. As the gas contribution, judging from the experience of recent years, will probably remain at £50,000, and as the electricity contributions will at some time in the near future probably increase, the apparent shortage is in a fair way to disappear."

The Manchester Gas Committee have, in consequence of representations made to them by large consumers, appointed a Special Sub-Committee to consider the question of rearranging the charges for lighting purposes, and frame a scale of prices based on annual consumption. The Special Committee will include the Chairman and Deputy-Chairman of the Gas Committee, together with the Chairmen of the several Sub-Committees.

Metropolitan Gas Company of Melbourne.—The report of this Company for the six months ended June 30 states that, as the result of the recent coal strike at Newcastle, which terminated in March last, the items in the revenue account representing the cost of coal and the returns from coke are considerably higher than in past half years. The net profits, including £2210 brought forward, amount to £84,166. The Directors recommend a dividend at the rate of 5s. per share; leaving £2395 to be carried forward.

HARROW AND STANMORE GAS COMPANY.

Nearly Ten per Cent. Expansion of Business—Works Extensions.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Holborn Restaurant—Mr. ALFRED H. BAYNES, J.P., in the chair.

The SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he ventured to think that the remarks he made at the last half-yearly meeting, as to the prospects of still further progress and prosperity, had been realized; for the report which was now before the proprietors proved that the results of the working of the past half year had been by far the best since the formation of the Company, and indicated very clearly the efficient management of their Engineer (Mr. Chapman). The increase in the sale of gas, as compared with the corresponding period of last year, was 9.63 per cent.; and the Stanmore portion of the Company's district of supply (which had been somewhat stagnant) was showing improvement, with an increased sale of 6.66 per cent. More lamps were being erected, and more gas used for public lighting. The public lamps showed an increased use of gas to the extent of 5.48 per cent. There were added to the connections during the half year, 195 ordinary and 225 prepayment consumers; and 260 new cooking-stoves had been fixed. The amount received for coke was less by £154 than at this period last year, due to the lower prices ruling—the difference being about 1s. per ton. On the other hand, the improvements made in the sulphate of ammonia plant last year were now showing good results. There had been an increased production, at less cost, the result being an improved profit on this residual of £113, which almost covered the loss due to the lower price of coke. Turning to the expenditure, though 164 tons more coal and 3730 gallons more oil had been used, there was a reduced cost of £175, owing to lower prices at which contracts stood during the half year. The item of repairs and maintenance of works was £605 more than at the corresponding period of last year; and of this sum, £500 had been written off disused small holders at the Stanmore works. The item of rates had increased by £210, due to new assessments in several parishes in which the Company supplied gas. The parliamentary expenses (£40) were on account of the new Standard Burner Bill; and the law costs (£137) were chiefly for expenses in connection with the alteration of one footpath and the closing of another on the land lately purchased by the Company. There had been an improvement in the quantity of gas obtained from the coal, and a decrease in the amount of oil used per 1000 cubic feet of gas in its manufacture. There had also been a satisfactory diminution in the unaccounted-for gas for the past half year. This stood at 2.09 per cent. of the total make; while at Christmas, 1909, it was somewhat heavy—being 7.43 per cent. This was largely accounted for by the considerable quantity of gas used by the prepayment consumers just at Christmas time, the coins for which it was impossible to collect until the New Year. The Company were beginning to feel the benefit of the larger mains recently laid, which enabled gas to be supplied at a more even pressure, with a full supply to all consumers. The new gasholder was now completed and painted, and was standing under air pressure at the present time. The earthworks for the railway siding to the works were so far advanced that there was now only the permanent way to be laid; so that in the course of next month the siding was expected to be used for traffic. The result of the half-year's working was that there had been an increase of £1699 in the receipts, and an increase in the profits of £653. The profit for the half year amounted to £6980. From this was deducted the debenture and the loan interest, amounting to £873; and, after the payment of the dividend and loan interest, there would remain a balance of £773. The sum available under the sliding-scale for the reserve fund was £458, leaving a net balance of £315 to be carried to the previous balance of £4569—making together a sum in hand of £4885. The reserve stood at £2254. In his judgment, the report now presented was a most encouraging one.

Mr. A. F. PHILLIPS seconded the motion, which was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. PHILLIPS, dividends were declared at the rates of 10½ per cent. per annum on the original "A" capital, £7 7s. per cent. on the additional "C" capital, and 7 per cent. on the additional "B" capital and guaranteed shares, less income-tax.

It was also agreed, on the motion of the CHAIRMAN, seconded by Mr. SAMUEL CUTLER, to add £458 to the reserve fund.

Mr. A. F. PHILLIPS, in proposing a vote of thanks to Mr. Chapman and his staff, remarked that the balance-sheet showed that the whole of their duties had been most efficiently carried out, and that the results were highly satisfactory. It was particularly pleasing to the proprietors to see that every half year the capital employed by the Company in relation to the quantity of gas sold still decreased. He admitted the capital was large; but still it was very different from what it was a few years ago. During the past half year, Mr. Chapman had had a great deal of additional work thrown upon him in connection with the diversion of a footpath, the construction of a new gasholder, and in bringing a railway siding into the gas-works. The last-named would be of inestimable benefit to the Company. Hitherto the whole of the coal had had to be carted to the works, and all the coke carted from them. When the siding was completed, the Company would be able to discharge the coal direct into the stores, and to load the coke direct into waggons.

Mr. F. LENNARD seconded the motion, which was agreed to.

Mr. CHAPMAN, in responding, said it was to him very gratifying to find that the Chairman's prognostications at the last meeting as to the Company's progress had come so true. Regarding those who worked with him, he had a very efficient staff, who put their whole soul into the work. They all took a personal delight in seeing the results come out as good as they could be.

Mr. F. R. SMITH, in moving a vote of thanks to the Chairman and Directors, said when it was considered that £600 extra had been spent in repairs and renewals of works, £450 added to the reserve fund,

and the carry-forward increased, he thought the proprietors could truly say it was the best balance-sheet they could possibly have expected. The proprietors regretted very much the death of Mr. Horace Rydon, one of the Directors; but the Board had done the right thing in selecting Mr. Cutler—a most experienced gas engineer—for the vacancy. He (Mr. Smith) congratulated the Board and Mr. Cutler on the appointment.

Mr. PILLEY seconded the motion, and fully endorsed the remarks of Mr. Smith as to the late Mr. Rydon and the election of Mr. Cutler.

The motion was cordially passed.

The CHAIRMAN responded on behalf of himself and his colleagues. He thought they had every reason to be satisfied with the outlook; and he believed with Mr. Phillips that great advantage would be derived by having direct communication with the railway.

PROGRESS AT ILFORD.

The Ordinary Half-Yearly General Meeting of the Ilford Gas Company was held at the Offices on Friday, the 2nd inst.—Mr. WILLIAM ASHMOLE presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said the works had been kept in thorough order; and the summer alterations to plant now being completed, they were again ready to meet the winter's demand for gas. The works were thoroughly up-to-date—being able to cope with any increased business. As they had found, during the heaviest portion of the winter, the need of an extra tar-extractor, they were at present putting down a Livesey washer. This was being made, by men at their own works, out of two old purifier-boxes which were abandoned some time ago. It was capable of dealing with 2,000,000 cubic feet of gas per day, and was constructed with a mid-feather, so that one-half could be thrown out of use to allow it to be cleaned out. Work on the district had also proceeded satisfactorily; and the Company were fighting the keen electric competition with great success. A high-pressure installation of gas lighting for the outside of shops had been adopted in the High Street and Cranbrook Road, and had been favourably received by the shopkeepers—the general opinion being that it was better and more brilliant for their particular purpose than electric light. At their last half-yearly meeting, he had referred to the fact that Ilford seemed to have come to a temporary stop in the way of expansion; but this could only be for a time, as there was plenty of good building land in the market in the district, and he had no doubt within a few years another building boom would come along and open up this fresh land. Notwithstanding this slow expansion, it was very pleasing to be able to report an increase of 3.48 per cent. in the quantity of gas sold, compared with the corresponding period of last year. This 3.48 per cent. represented approximately 6,000,000 cubic feet. There was also another item on which the stockholders might congratulate themselves—the payment of the full statutory dividend for the past half year. The Board, recognizing that the Company were in a sound financial position, considered they were fully justified in recommending this. The Company, along with a number of others, promoted a Joint Bill to enable them to adopt the No. 2 "Metropolitan" burner, or what might be termed the standard burner, for testing the illuminating power of their gas. The Bill had not yet actually passed into law; but it was hoped that it would before the end of the year. The Bill was strenuously opposed before the Committee of the House of Lords, and also the Committee of the House of Commons, by certain local authorities who professed to be watching the interests of the consumers, but who in reality were acting as stumbling-blocks to the progress of enabling consumers to obtain cheap gas. It was a very remarkable coincidence that practically all the opposing local authorities were owners of electric light undertakings; and this, no doubt, accounted greatly for the opposition. With regard to the balance-sheet, the amount carried to profit and loss was £7780; being £922 more than in the corresponding half year. The employees had now received the co-partnership books containing their first year's bonus to the end of June this year; and he had no doubt that the scheme would be of lasting good, to the Company and to the workers. The expenditure under revenue account was greater than in the corresponding half year by £853; while the income exceeded it by £1775. The amount received from the sale of gas was £25,951; and rental of meters, stoves, fires, &c., had produced £3970. Residual products compared very favourably with last year's figures. The balance-sheet was one upon which they could congratulate themselves. The Company stood in a good position and on a sound financial footing. The capital expenditure per million cubic feet of gas consumed was lower to-day than it had been for many years past; and the stock of the Company was eagerly bought as a sound investment, and commanded a high figure on the market.

The report and accounts were adopted, and a dividend at the rate of £7 7s. 6d. per cent. per annum on the "A" and "C" stocks and £5 17s. 6d. per cent. per annum on the "B" stock (less income-tax) was declared. The meeting terminated with votes of thanks to the Directors, officers, and staff.

Woking Water Company.—Presiding at the meeting of the Woking Water Company, Mr. A. H. Baynes, J.P., remarked that the report and accounts constituted a record of satisfactory progress and prosperity. The capital expenditure of the Company now stood at £189,373, of which £3684 had been spent during the six months to June 30. The receipts from water-rentals during the half year were £8328, or an increase of £514 over the corresponding period of 1909. Nearly 120 million gallons of water were pumped; and there were now 6507 consumers on the rent-roll of the Company, as well as 617 meter supplies. A dividend for the half year at the rate of 5 per cent. per annum was declared; and at a subsequent extraordinary meeting, a resolution was passed sanctioning the creation and issue of £12,500 of 4 per cent. debenture stock and the reborrowing of moneys borrowed on mortgage.

MANCHESTER GAS SUPPLY.

Sixteen Years' Record.

From the Gas Department of the Manchester Corporation there has just been issued, in a tabular form, says the "Manchester Courier," a financial history of the gas undertaking of the city from the beginning of April, 1894, to the end of March, 1910—a period of sixteen years. In the year ending March 31, 1895, the price of gas per 1000 cubic feet to consumers within the city was 2s. 6d., to those outside the city 3s., and to remote townships 3s. 6d. Automatic consumers within the city got 25 cubic feet for 1d.; and those outside the city, 21 feet. The average price received was 2s. 6½d. per 1000 cubic feet; the total number of consumers was 82,289; the mileage of main pipes was 724; and the output of gas totalled 3683 million cubic feet. Gas to-day within the city is 2s. 3d. per 1000 feet, and 2s. 6d. outside the city and in remote out-townships, with an average of 2s. 3½d. per 1000 feet. The total number of consumers has increased by 96,853 to an aggregate of 178,490; while the output of gas has increased by 2033 million cubic feet to 5565 million cubic feet. In 1902, the reduced price of gas for power purposes came into operation, and was, in that year, 2s. and 2s. 3d. respectively to in-city and out-city consumers—being to-day 1s. 9d. and 2s. respectively. The department has now 938 miles of main-pipes, and has 49,948 cooking-stoves in use; whereas, in 1895, only 3379 were in use. In appreciating these, and subsequent figures, it should be borne in mind that electricity was first of all supplied by the Corporation in 1893, that meter-rents were abolished within the city in 1895 and outside the city in 1898, while the charge for the hire of gas cooking-stoves was abolished in 1903.

Sixteen years ago, the income of the department was £579,277, with a gross profit of £134,697. The interest totalled £30,305, leaving a net profit of £104,392. A sum of £54,044 was paid into the City Fund for the relief of the rates; the amount charged against revenue in respect of renewals was £24,690; the total value of profits and assets was £1,914,331; and the total amount of liabilities aggregated £985,854, with excess of assets totalling £928,477. Stupendous increases have taken place in the sixteen years which have passed since that time. In 1910, the income of the department was £750,700. The gross profits were £169,244, and the net profits £121,191. The amount charged against revenue in respect of renewal of plant was £55,963; the total value of profits and assets was £3,138,836; the total amount of liabilities was £1,390,092; and the excess of assets was £1,748,744. In sixteen years, the total value of property and assets has increased by £1,331,358; the liabilities have increased by £460,743; and the excess of assets by £870,615. A total income of £10,878,185 has been earned in that period, and net profits made of £1,710,908. A sum of £219,100 has been applied to extensions of works where borrowing powers were not granted; while the vast amount of £851,182 has been, in that time, paid into the City Fund for the relief of rates.

It is interesting to observe that the annual grants in relief of rates have not been uniform. In the present year, for instance, £50,000 was the figure allocated; whereas sixteen years ago it was £54,044. The lowest figure granted in the time was £40,000, in 1897; while the highest was £70,000, in 1904. In the sixteen years under review, meter-rents and stove-hire have been abolished; the quantity of gas supplied to automatic meters has been increased from 25 to 30 cubic feet for 1d.; and a reduced price charged for gas supplied for power and manufacturing purposes. This period also marks the introduction of carburetted water gas and the commencement of the manufacture of sulphate of ammonia and sulphuric acid. The area of sites of works and other properties of the department now aggregate 81 acres 3018 square yards.

A final statement of fact adds interest to the foregoing. Alderman Robert Gibson was first appointed Chairman of the Gas Committee of the Corporation in 1894, and has been annually re-elected ever since. Hence the statement just covers his period of office with the Committee.

ABERDEEN CORPORATION GAS UNDERTAKING.

In the Aberdeen Town Council on Wednesday last—Lord Provost Wilson presiding—Councillor A. Milne, the Convener of the Gas Committee, in presenting the accounts of the Department (a summary of which appeared in the "JOURNAL" last week, p. 670), said that upwards of £445,000 had been spent on the gas-works. Of this sum, nearly £80,000 was written off in 1897, when a new valuation was made, and the remainder had been yearly written-down, until now the whole liabilities of the undertaking were only a little over £151,000. The amount received for gas last year was £92,445, as against £95,101—a decrease of £2656, which was accounted for by a reduction of 1d. per 1000 cubic feet made a year ago to ordinary consumers, and of 4d. per 1000 cubic feet to prepayment meter consumers. These reductions represented a sum of upwards of £4000. The revenue from residuals was £26,041, as against £24,808—an increase of £1233. The total revenue was £121,049, compared with £122,637. Coal cost £53,094, and the material for carburetted water gas £6056, together £59,150, as against £60,407—decrease, £1257. These items, with wages, repairs, &c., made up the cost of manufacture to £79,679, as against £80,977—a decrease of £1298. Distribution of gas, in which was included this year the large sum of £1736, the original value of old wet meters broken up, had cost £4909—an increase of £680, due to the increased number of meters broken up. House services had fallen by £327, occasioned, doubtless, by dulness in the building trade. Rents and feu duties were the same. Rates and taxes had fallen by £788, by reason of a reduced valuation, which was subject to fluctuations, due to the rise or fall in raw material—chiefly coal. The other charges were similar, and did not call for any special comment. The balance on the account was £22,972, which was carried to net revenue, to meet interest, sinking fund, &c. This balance, notwithstanding the reduction in the price of gas, was an increase of £219 on the previous year. The amount required for annuities was £4063; for interest, £4051; for sinking fund, £10,909; for insurance fund, £300; and for the renewal fund, £3000.

These sums were much on a par with last year. The net balance was £648, which, added to the balance brought from previous years, gave a sum of £4047 to be carried forward. The contingent fund, for the redemption of gas annuities, now stands at £75,498; the sinking fund for the repayment of loans, at £128,326; the reserve and fire insurance fund, at £37,187; and the renewal fund, at £8555. The increase in the make of gas over the previous year was 18½ million cubic feet, or 2·38 per cent. He wished particularly to refer to the great increase which there had been in the number of gas-stoves hired, and of prepayment meters in use. Taking the accounts as a whole, the Council had reason to be pleased with the result of the year's working. He had received an interesting comparative statement from Mr. S. Milne, the Engineer, showing the progress of the department from 1900 onwards. During the year ending July 31, 1910, they made 568 million cubic feet of gas; and in the past year the make was 795 million cubic feet. In 1900, the number of ordinary consumers was 30,001, compared with 32,613 now; while the number of prepayment meter consumers then was 2444, as against 9394 now. There were 245 gas-engines in use ten years ago, with a total horse-power of 1208, and now they had 329 engines, with a horse-power of 4363. The price of gas in 1900 to ordinary consumers was 3s., and to prepayment meter consumers 4s. 2d., per 1000 cubic feet. The present prices were 2s. 6d. and 2s. 10½d. respectively. In addition, about 600 gas appliances, including grills, gas irons, fires, boiling burners, and lustre stoves were sold during the year. He moved the adoption of the accounts and estimates.

Bailie Todd seconded the motion, and it was unanimously carried.

The prices of gas were continued unaltered.

GAS CHARGES AT BOLTON.

No Further Concession to Prepayment Meter Users.

There was another discussion at last Wednesday's meeting of the Bolton Town Council, on the question of the charge made for gas supplied to consumers by prepayment meter. It will be remembered that the Gas Committee had reconsidered the matter at the request of the Council, and re-affirmed their previous decision that the charge to prepayment users be 1d. per 27 cubic feet, instead of 25 cubic feet, rejecting a proposal made by the Labour members of the Council that the quantity supplied for the penny be 30 feet.

Mr. FRANCE, one of the labour members, expressed the opinion that the Gas Committee were ill-advised in being obstinate. The claim he made was put forward on behalf of the poorer section of the community, and he argued that at 30 cubic feet for 1d. the Gas Committee would have ample margin on the extra cost involved in meters, collection, &c. This was proved by the fact that at Oldham 33 feet were given.

Alderman MILES, a Past Chairman of the Gas Committee, submitted that Mr. France had made a mistake in quoting only one Corporation in support of his contention, and that a town where the prepayment system had been in operation only a short time. He thought the Gas Committee had made out a fair case, and shown that they were dealing reasonably with prepayment users.

Mr. PORTS pointed out that in St. Helens 35 cubic feet were supplied for 1d., in Widnes 50 cubic feet, and in Bury 33 cubic feet. He said that in other towns there was not the same difference between the charges to ordinary consumers and prepayment users as was the case at Bolton. Taking twenty towns, the average difference was about 5½d., showing Bolton had the advantage over those towns of 3½d.

Mr. HEYWOOD, as a member of the Gas Committee, assured the Council that they were most anxious to do what was fair and just to users under the two systems.

The minutes of the Gas Committee were confirmed; but Mr. FRANCE said he hoped at a later date to renew the attack upon this question.

BLACKPOOL GAS UNDERTAKING.

The Blackpool Gas-Works, which are owned by the Corporation, were started in 1850; and the present Manager (Mr. John Chew) took control in 1862. The undertaking has grown to a very big concern. The total outlay to March, 1909, was £210,900; and the reserve and sinking funds in hand amount to £80,000. The price of gas is low—2s. 2½d. per 1000 cubic feet for ordinary meters, 2s. 10d. for slot meters, 1s. 10d. for power. Taking a review of the relative amount of sales of gas and electricity from what is known as the "electrical year," 1893, we find that, both departments starting level, rapid increases were made in each till 1901. From then till 1906, both made little headway; but afterwards further progress was recorded. In 1908, the Electrical Department had a set-back, but the gas-works leaped forward. The Gas Department increased the number of consumers from 5700 in 1893, to 14,800 for the last financial year. Last year the gas undertaking handed over to the rates £9557, and the electricity works £3266, which shows the popularity of the old illuminant. The income in the last financial year from gas sales, residuals, &c., was £85,889, and the expenditure £62,990—leaving an available balance of £22,898, against £22,159 the previous year. Gas manufacture cost £49,200, and distribution £2553. The total quantity made was 555,145,000 cubic feet, an increase of 4·04 per cent. The amount consumed by private consumers was 531,975,200 cubic feet, an increase of 3·81 per cent. There are 98 miles of mains, 2340 street-lamps, and 14,816 consumers. The total length of pipes used for new mains last year was 3½ miles.

The Gosport (Hants) Gas Company have extended their mains to Lee-on-the-Solent; but a difficulty has arisen in the preparation for lighting the place owing to the Rural Authority having declared that the two approaching roads have not been taken over by them. The former arrangements for lighting by acetylene gas have, however, been dropped.

COLONIAL GAS UNDERTAKINGS.

Reports of the working of the following Colonial gas undertakings for the half year to June 30 have recently come to hand (in addition to that of the Australian Gaslight Company, already noticed in our pages).

The revenue of the Brisbane Gas Company from the sale of gas, &c., during the six months was £28,416; and there was a balance brought forward of £7028, making a total of £35,444. The expenditure on gas manufacture, &c., was £14,963; and £3291 was placed to the reserve fund. The net amount to the credit of the profit and loss account was thus £17,190, out of which the Directors recommended a dividend of 6 per cent., which, with income-tax, would absorb £10,080, and leave a sum of £7110 to be carried forward. During the half year, extensions of mains were made in several localities; and additional settings of regenerator furnaces are in course of erection.

The Maryborough (Queensland) Gas and Coke Company, Limited, brought into the accounts for the past six months a balance of £263. Sales of gas, fittings, &c., during the half year produced £2502, residual products £238, and interest £8. Thus there was a total of £3011, from which had to be deducted the expenditure of £2021, which left a disposable balance of £990 to the credit of the profit and loss account. The Directors recommended the payment of a dividend for the half year at the rate of 6 per cent. per annum, tax free, which would absorb £773, and leave £217 to be carried forward. The erection of three generator settings of retorts was completed during the half year.

The general strike of coal miners, which was entered upon at the beginning of November last year, continued until about the middle of March; and owing to the high prices paid for coal during the strike period, the North Shore (Sydney) Gas Company suffered very heavy pecuniary loss. In consequence of this loss, £10,525 has been transferred from the reserve fund to provide for depreciation, and to enable the usual rate of dividend for the half year to June 30 to be maintained. The loss on the sale of gas, &c. (after allowing for depreciation) was £4225; and the balance (£6300) of the sum taken from the reserve fund is absorbed by the dividend of 4 per cent., free of income-tax, for the six months.

GAS AND ELECTRICITY AT CHARTERS TOWERS.

An interesting account reaches us of a fight to a finish between the Gas Company and an Electric Supply Company at Charters Towers, Queensland.

In December, 1907, Mr. Charles A. Watson was appointed Engineer and Manager of the Charters Towers Gas Company, Limited; and he immediately started an active campaign to popularize gas—with results which have been most gratifying both to his Company and himself. A free maintenance system was inaugurated (materials being charged for at wholesale cost price); and "Graetzin" inverted burners, and gas "Arc" lamps were extensively put out. A large number of the latter (of an old type) which were out on rental, were offered for sale to the consumers who had them in use at reduced prices; and where this offer was taken advantage of, it, of course, at once strengthened the position of the Company against the intrusion of electricity. Then the price of gas was reduced from 13s. 4d. to 12s. 6d. per 1000 cubic feet (less discount) for lighting; and this step Mr. Watson followed up by the issue broadcast of comparison cards showing by means of simple calculations the indisputable advantages in the matter of cost which incandescent gas lighting possesses over electricity. Another successful step was to approach, by means of a circular letter, those electricity consumers whose contract for current was about to expire—pointing out the economy of gas lighting, and offering to furnish estimates or to put in a Graetzin inverted light on trial.

The upshot of the campaign was that the Electric Supply Company found themselves in financial difficulties; and an effort to reconstruct the Company and secure fresh capital not meeting with a very sympathetic reception, the Gas Company were offered the undertaking for the amount of its debts. This offer, after due consideration, was accepted—thus getting rid of a very irritating opposition. During the fight, the Electricity Company carried on free wiring, distributed lamps broadcast without charge, and came out with a flat-rate down to about 4d. per unit. These tactics, as has been seen, were unsuccessful with the Company; and electricity is now offered by the Gas Company only on strict business terms. The announcement was made that they intended to supply current at the price of 1s. 3d. per unit allowed under the Order (which has still nearly thirty years to run).

Mr. Watson has been appointed Engineer and Manager of the electricity station, in addition to the gas-works; and it may be hoped that, with the increased price for current, success will attend the Company's new venture.

NATURAL GAS: FROM SUSSEX TO CHINA.

In last week's issue (p. 671) there was reproduced a paragraph from the "Daily Mail" dealing with a circular that had been issued to the shareholders in the Heathfield natural gas enterprise, in which it was stated that negotiations were proceeding between the Asiatic Protection Society of Great Britain and China and the South of England Natural Gas Company, for the purpose of introducing the various governors and officials of the districts of China to the Natural Gas Company, and inducing them to accept this Company as the principal exploration company for the purpose of exploring and developing the natural gas resources in China. It was stated that several foreign banks had been approached in the matter of taking up the shares; and the Society thought it only fair that the shareholders in the Natural Gas Company should have the first refusal of the balance. Our contemporary subsequently published in its "Chat on Change" the following further remarks: "The solicitude of the Asiatic Protection Society, of No. 1A, Shepherd's Bush Green, for the shareholders of the South of England

Natural Gas Company, with its efforts at Heathfield, Sussex, is even deeper than we had gauged. In spite of the fact that 'several foreign banks' had been approached to take up shares, the shareholders were offered the refusal of the balance for ten days from Aug. 20. This period has, of course, expired; but the quality of mercy is not strained, and the natural gas shareholders, in a further communication from the Asiatic Protection Society, are given until Sept. 15 to snatch the shares from the greedy foreigner. After that date, the Society point out, it will be impossible for the shareholders to secure more shares. Such solicitude should be countered by generosity; and in our opinion the shareholders should allow the Asiatic Protection Society to subscribe for the shares themselves. The Society are doubtless all the more eager to do so, because of the advice of two of their officials. One of these, Captain Howard, 'late Commander in his Imperial Highness the Emperor's Regiment,' and the other, 'an expert of natural gas and a pupil of the most noted explorer, the late Mr. H. Stanley,' are stated to be of opinion that, 'as and when the Company have obtained sufficient capital to sink their 2000 feet shaft, they will be one of the most wealthy and prosperous concerns going.' This is why the Asiatic Protection Society 'have taken up' the Natural Gas Company, and will send out the late Commander for the purpose of 'closing some very important contracts with the various Chinese officials.' Perhaps the Chinese officials would like a few of the shares that seem to be going begging. Yesterday the matter was carried further by the following interesting announcement: "We are informed by the Asiatic Protection Society that they have severed all connection with the South of England Natural Gas Company, in consequence of inquiries they have made as a result of the comments which appeared here a week ago. The officials of the Society are anxious that the members should understand this. In the letter they send us, the Society frankly admit they were misled in the matter by inaccurate statements the nature of which they have now discovered. There seems not the slightest doubt that they have acted in perfect good faith throughout the whole matter—indeed, this seems obvious from the alacrity with which they have withdrawn from the curious position to which we drew attention. In any case, there is now an end of the matter; and the shareholders of the South of England Natural Gas Company who received the Society's strange circulars descanting on their prospects, must regard those circulars as having been withdrawn."

LEEDS WATER CHARGES.

Increase Sanctioned.

At the Monthly Meeting of the Leeds City Council last Wednesday, the principal business was the consideration of a proposed increase in the water-rates of about 30 per cent. Before the resolution in the matter was moved, a deputation representing the Leeds and District Property Owners' Association attended to protest against certain features of the proposed new scale. The spokesman said that, in the case of a 5s. a week house, which was the class of property represented to the greatest extent by the deputation, the water charge amounted now to 12s. 8d., including the closet. With the new charges in operation, the same class of house would have to pay 16s. 4½d.—an increase of 30 per cent., or 1d. per week per house. This increase would fall upon the owner of the property, as under present circumstances it was impossible to increase the rent to the tenant.

Mr. WILEY, in proposing the confirmation of the new scale, said the additional charges were an absolute necessity to meet the financial requirements of the Water Department. At the present time, the Corporation had invested in water-works about £3,444,000; and though the undertaking had always been a profit-earning concern, it had, comparatively speaking, earned only a small profit. During the last ten or fifteen years, the revenue had never exceeded £162,000; the lowest mark being about £135,000 ten years ago. As a commercial concern, the undertaking could hardly be called highly successful from the profit-earning point of view, though he admitted that the first object should be to provide an unfailing supply of wholesome water, and that income should be a secondary consideration. The profits had ranged between £19,000 and £14,000 a year; and during the last ten years about £152,000 had been allocated by the Water Committee for the relief of the rates. Now the moment had arrived when nothing more could possibly be provided for the relief of the rates, and there was no prospect of anything being so provided for twelve or fourteen years to come. The need for new charges arose in this way: In 1901, when there was a prospect of a water famine, the City Council obtained powers to make reservoirs at Leighton and Colsterdale, extra reservoirs in the Laver Valley, to lay a pipe-track, and to make new filter-beds. The Council also secured authority to borrow £2,200,000 for these works. They embarked upon the construction of the Kettleing tunnel, the laying of the pipe-line, and the making of the Leighton reservoir. On this work, the Council had expended £888,000. In addition to this, under their Act of Parliament, they had power to borrow money to pay interest on money spent on unproductive works; and under this head they had borrowed £106,000. Therefore what they had to pay off under the Act of Parliament was about £1,000,000. In addition, they had had a very careful estimate made as to what would have to be spent to complete the works he had referred to; and according to this, £500,000 would have to be found before 1921. The Committee were tied hand and foot as to the repayments they would have to make. In 1912, they would have to provide an extra sum of £32,396 out of revenue; in 1913, £49,000; in 1914, £52,000; in 1915, £58,000; and the sum would gradually rise to £86,575 in 1921, which would represent the increased amount to be found out of revenue as compared with the present year. The position was simple and arbitrary. The capital had been spent; and they had, as a matter of course, to find the money to repay it. It must be repaid out of revenue; and the only possible way of repaying it was to increase the price of water. It would be impossible for any Committee to frame a new scale which would satisfy everybody concerned. The Committee knew that they would be treading on some people's toes; but the increased charges were,

comparatively speaking, on a fair and equitable basis, and would not penalize any class of the community or treat one unfairly as against another. It was quite true that in 1911 there would be yielded an increased revenue of £53,000, when only £32,000 would be needed. This would go on for a year or two; but for nine years the new charges would realize some £20,000 or £30,000 less than was required. The money was to be spread equally over the whole period. The proposed increases were intricate; and without going very deeply into them, he would say that, with one or two exceptions, the water charges in Leeds compared more than favourably with the charges made in the other large cities of the country. Referring to the case of lock-up shops, warehouses, banks, offices, and buildings of this character, he said that in 1865 a resolution was passed putting these people upon a special basis. The maximum charge for any one of these buildings, regardless of the amount of water consumed, was £1; and the Committee discovered that for years certain places in the city, with thirty or forty methods of consuming water, had only paid £1 a year on premises of large rateable value. In one case, this £1 a year was paid in respect of a building with a rateable value of £2000. In this instance, the tenant would in future pay £28 10s. The revision of the charges for this class of property would perhaps involve hardship in some cases; but it would bring in much more adequate returns from property now paying only £1, and in which perhaps thirty or forty employees worked, and a great deal of water was consumed. Water supplied by meter to manufacturers would be charged at 9d. to 9½d. per 1000 gallons instead of 6d., which was the cost price of water. Though they were anxious to safeguard the manufacturing interests of the city, it would not be right that any consumer should be getting water at cost price when others were paying a figure that yielded a profit. He would like to point out that, taking into account the capital charges which had to be met, the cost price of water would now be 9d. per 1000 gallons. As to the charges for meters, these compared favourably with those imposed in other towns. The working expenses of the Water Department had gone down by no less than £7000 a year; and this fact would contradict any suggestion that the increased charges were necessitated by extravagance in administration. The consumption of water, too, had dropped to the extent of 2½ gallons per head per day—a saving of 1,250,000 gallons per day on the present population. This was probably attributable to the vigilance with which the officials had discovered and prevented leakages. In regard to the excess of income which would accrue from the new charges for a year or two, he would do everything in his power to see that, by all legal means, this money should be ear-marked for the repayment of indebtedness.

At the conclusion of a lengthy discussion, the resolution was carried by 26 votes to 8.

Gosport Water Supply.—The report presented by the Directors of the Gosport Water Company to the shareholders at their half-yearly meeting last Wednesday, showed that the revenue for the six months ended June 30 had been £5264, and that there was left £3083 for transfer to the profit and loss account. The water-rentals amounted to £5207. The available balance was £5526. Since the last meeting, 39 new services had been connected with the Company's mains.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The death falls to be recorded this week of Mr. T. Whimster, late Gas Engineer and Manager at Perth. Mr. Whimster was over ninety years of age. He has outlived all his compeers. Blessed with good health, he was able to fill the position of Gas Manager at Perth for the long period of forty-four years; and he has lived in retirement for the further long period of fifteen years. He has, in fact, been so long in retirement, that he was not personally known to the younger generation of gas managers. To those whose memories extend further back, Mr. Whimster's figure stands forth as that of a sturdy upholder of the best precepts in public as well as in private life, and a faithful adherent to the right, according to his knowledge. He was a steady supporter of all that led to advance in gas manufacture, and gave his best service to the Companies, and latterly to the Corporation, who employed him, and by whom, in turn, he was greatly respected and honoured.

The Glasgow Gas Committee reported to the Town Council on Thursday the proceedings which took place in the procuring of the Gas Consolidation Act. The benefits derived from the measure are stated as: (1) The consolidation of the provisions of about twenty Acts of Parliament into one Act; (2) definite limits of supply; (3) the division of the limits of supply into (a) a city supply district, and (b) a supplementary supply district, being all territory within the limits of supply outside the city supply district; (4) the right to charge a higher rate for gas supplied in the supplementary supply district than is charged in the city supply district; (5) permission to differentiate between charges for gas supplied for lighting purposes and gas supplied for manufacturing and industrial purposes; (6) the making of contracts with large consumers, and the granting of rebates and discounts to these consumers; (7) power to grant rebates for prompt payment; (8) a lower rate for gas supplied to public lamps than is charged to consumers generally; (9) an equation of the varied sinking funds charged under the old Acts to a uniform sinking fund of 2½ per cent. on all moneys borrowed for gas purposes and on the capitalized value of the gas annuities; (10) power to charge for the hire of meters which the Corporation formerly had to supply free of charge; (11) permission to establish a reserve fund at a rate not exceeding ½ per cent. on the amount of capital outstanding until the fund is equal to 10 per cent. of the outstanding capital; and (12) the reduction of the power of gas from 16 to 14 candles.

In the Peterhead Town Council on Monday, the Gas Manager—Mr. W. Ritchie—reported that during the past year 5074 tons of coal were carbonized, which yielded 52,091,000 cubic feet of gas—equal to a make of 10,266 cubic feet per ton. In the previous year, they carbonized 4805 tons of coal, and obtained 49,427,700 cubic feet of gas—equal to 10,296 cubic feet per ton. The increased make was 2,618,300 cubic feet, which was equal to 5·3 per cent. over the previous year. During the year, there were added 21 ordinary and 264 prepayment meter consumers; making the number of ordinary meter consumers 1612, and of prepayment meter consumers 1505—a total of 3117. The revenue from gas was £7083—an increase of £531. Residual products realized, after deducting expenses, £1581, or £149 less than in the previous year; the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 706.

Issue.	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr. 1	5	Alliance & Dublin Ord.	81-84	..	5 19 1	4,940,000	Stk.	May 12	91	Imperial Continental	186-118	+2	4 15 9
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Aug 12	34	Do. 3½ p.c. Deb. Red.	52-94	..	3 14 5
200,000	5	May 12	7	Bombay, Ltd.	64-65	..	5 7 7	200,242	Stk.	Aug. 31	10	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
40,000	5		7	Do. New, £4 paid.	46-52	..	5 9 3	561,000	Stk.		10	Liverpool United A.	215-217	+1	4 12 2
50,000	10	Aug. 31	15	Bourne-10 p.c.	28½-29½	..	5 1 8	718,100	"		7	Do. B.	161½-163½	..	4 5 8
131,810	10		7	mouth Gas 7 p.c.	16-16½	..	4 4 10	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10		6	and Water 1 Pref. 6 p.c.	14½-15½	..	3 18 8	75,000	5	June 29	6	Malta & Mediterranean.	41½-41½	..	6 4 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	246-249	..	5 0 5	560,000	100	Apr. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	184-186	..	5 2 2	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101-103	+1	4 7 5
50,000	"	"	5	Do. 5 p.c. Pref.	—	..	—	541,920	20	May 27	3½	Monte Video, Ltd.	12½-13	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	3 19 3	1,775,892	Stk.	July 28	4½	Newcastle & G'tesh'd Con	102-103	+½	4 5 0
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	214-217	+5	5 1 5	529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	90-91	..	3 16 11
246,320	"	"	8	Do. A Ord. Stk.	154-157	+4	5 1 11	55,940	10	Aug. 31	7	North Middlesex 7 p.c.	13½-13½	..	5 3 8
460,000	2½	Apr. 1	10½	British	45-46	+4	4 12 4	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Aug. 12	6	Bromley, A 5 p.c.	117-119	..	5 0 10	60,000	5	Apr. 1	8	Ottoman, Ltd.	64-64	..	6 3 1
165,700	"	"	4½	Do. B 3½ p.c.	88-90	..	5 0 0	31,800	53	Aug. 31	13	Portsea Island A.	131-133	..	5 3 0
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	60,000	50	"	13	Do. B.	124-126	..	5 3 2
5,000	"	June 29	3½	Do. 3½ p.c. Deb.	85-87	..	4 0 6	100,000	50	"	12	Do. C.	117-119	..	5 0 10
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	97-99	..	4 0 10	114,800	50	"	10	Do. D and E.	99-101	..	4 19 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	398,490	5	Apr. 29	7	Primitiva Ord.	74-74	..	4 13 4
100,000	10	"	—	Do. 4½ p.c. Pref.	58-60	..	—	796,980	5	June 29	5	Do. 5 p.c. Pref.	58-58	..	4 13 0
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88-90	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,152	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	102½-111½	+4	4 9 8	250,000	10	Apr. 1	9	San Paulo, Ltd.	154-164	..	5 10 9
1,513,280	Stk.	"	5½	Commercial 4 p.c. Stk.	105-108	+½	4 16 3	62,500	10	July 1	6	Do. 6 p.c. Pref.	111-122	..	4 18 0
560,000	"	"	5	Do. 3½ p.c. do.	101-103	..	4 17 1	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	80-82	..	3 13 2	135,000	Stk.	Aug. 31	10	Sheffield A.	229-231	..	4 6 7
800,000	Stk.	June 10	5	Continental Union, Ltd.	98-100	+3	5 0 0	209,984	"	"	10	Do. B.	229-231	..	4 6 7
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	+2	5 0 9	523,500	"	"	10	Do. C.	229-231	..	4 6 7
491,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	70,000	10	May 27	7	South African.	11-11½	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	6,429,895	Stk.	Aug. 12	5/9 4	South Met., 4 p.c. Ord.	121-123	+1	4 8 10
148,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	96-98	..	5 2 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	79-81	..	3 14 1
486,090	10	July 14	12	European, Ltd.	23½-24	..	5 0 0	209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	153-154	..	5 3 11
354,060	10	"	12	Do. £7 10s. paid.	17½-18½	..	4 18 8	605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 12 9
16,179,445	Stk.	Aug. 12	4½	Gas 4 p.c. Ord.	105-107	+½	4 7 2	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
2,600,000	"	"	3½	light 3½ p.c. max.	87-89	..	3 18 8	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-125	..	4 1 4
4,002,235	"	"	4	4 p.c. Con. Pref.	102-104	..	3 16 11	502,310	Stk.	May 12	5	Southampton Ord.	100-100	..	4 9 3
4,531,703	"	June 29	3	Coke 3 p.c. Con. Deb.	83-82	..	3 13 2	120,000	Stk.	Aug. 12	7	Tottenham A 5 p.c.	140-142	+4	4 18 7
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	94-96	..	5 4 2	483,940	"	"	5½	and B 3½ p.c.	111-113	..	4 17 4
82,500	"	"	6½	Do. do. 5 p.c.	117-119	..	5 9 3	149,470	"	June 29	4	Edmonton 4 p.c. Deb.	75-79	..	4 0 10
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	17-17½	..	6 5 9	182,380	10	June 10	8	Tuscan, Ltd.	9-9½	..	8 8 6
131,070	Stk.	Mar. 16	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,781	"	"	5½	Do. B	114-116	..	5 1 3	236,676	Stk.	Aug. 31	5	Tynemouth 5 p.c. max.	111-113	..	4 8 6
65,500	"	June 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	255,636	Stk.	Aug. 31	6½	Wands-1 B 3½ p.c.	136-136	..	4 17 10
								85,766	"	June 29	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

reduction being due principally to lower market prices. Purification cost £110 more, which could only have been looked for, owing to the condition of the purifying plant and the extra quantity of gas to be purified. Wages paid to stokers was £49 more; the increase being due principally to the increased quantity of coal carbonized. Maintenance of works and plant cost £558—a decrease of £119. Renewals and repairs to meters cost £205, or £7 less. The cost of maintaining main and service pipes was £147, or £10 less. Rates, taxes, and insurances amounted to £691—an increase of £35. The total revenue was £8843, and the expenditure £8792; leaving a balance of £51. The improvements and extensions which were at present being carried on at the works, consisting of the erection of a new purifier house and purifiers, and the reconstruction of the property in Longate, were nearing completion, and would prove, in due course, to be a great benefit. The Gas Committee recommended that the price of gas be increased from 3s. to 3s. 2d. per 1000 cubic feet. Mr. Clubb could not see that it was necessary to increase the price of the gas. Bailie Birnie, the Convener of the Gas Committee, explained that the £51 which they had carried to net revenue account was not sufficient to provide for a reserve fund, and that it was necessary that they should provide a sinking fund for the repayment of money borrowed. When the price of gas was reduced from 3s. 3d. to 3s., it was a debatable question whether they should reduce it by 3d. or by 1d. only; but they then thought they could manage without the other 2d. They now found that in nearly every gas-works in the country they had had to advance the price of gas from the day that in Peterhead they lowered theirs. They had tried to keep the price down for the last two years, but they now found it necessary to raise it. Provost Leach said they had to provide £600 for a sinking fund, and it would require 2d. per 1000 cubic feet to do this. Mr. Clubb said he was satisfied. The increase in the price was then agreed to, to take effect as from May 15 last.

Presiding at the annual meeting of the St. Andrews Gas Company yesterday, ex-Bailie Aikman said that the balance-sheet submitted was the best ever produced in the history of the Company. This reflected great credit on their Manager and Secretary, Mr. Robert Hall. The report of the Directors was approved. A special meeting of the shareholders was then held, at which it was resolved that the co-partnership be dissolved, and that a limited liability Company be formed, with a capital of £16,960, divided into 1696 shares of £10 each.

In the Bath Town Council on Monday, the subject of lighting the street lamps on Sunday evenings was considered. The Directors of the Gas Company intimated that the extra lighting asked for would cost £4 per season, but that they would do it for £3. After discussion, it was agreed to accept the Company's offer; and the Convener of the Committee on Lighting was authorized to arrange as to the hours of lighting.

The Gas Committee of the Greenock Corporation have agreed to recommend a reduction of 10 per cent. upon the charges for gas to consumers whose accounts amount to upwards of £100 a year.

In the small town of Insch, in Aberdeenshire, the streets are lighted partly by gas-lamps, partly by paraffin lamps. The gas-lamps are in

the centre of the town, and the outskirts are lighted by paraffin lamps. Residents in the outskirts consider that as they pay the same as the others, they should have as good a light. So a petition, signed by 38 inhabitants, was presented to the Committee in charge of the lighting, asking that the whole district be lighted by gas. To settle what should be done, a public meeting of the inhabitants was held on Wednesday. It was proposed that the District Committee of the County Council be requested to take over the gas-works, and to light the whole district by means of gas. Against this it was proposed that the lighting system remain as at present till such time as the place should be made into a police burgh. The latter motion was carried by thirteen votes to seven.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Sept. 10.

During the week there has been a resumption of the good demand, and a dearer market has once more to be recorded. The purchasing has still been largely for the covering of old contracts; but there has also been a fair amount of new business, and values at the close have reached £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Hull, £12 8s. 9d. to £12 10s. per ton f.o.b. Liverpool, and £12 10s. to £12 11s. 3d. per ton f.o.b. Leith. The forward position seems to be rather neglected; buyers evidently confining their attention to near delivery. There has been some inquiry from consumers abroad, but at prices which no British manufacturer will entertain.

Nitrate of Soda.

There is no new feature to comment upon in the market for this article; the quotations on spot remaining very steady at 9s. 4½d. per cwt. for 95 per cent. quality and 9s. 7½d. for refined.

LONDON, Sept. 12.

Tar Products.

The markets for tar products have been steady during the past week. Pitch has been firm at the existing prices, though the Continent are still disinclined to pay the figures asked by makers on this side. Benzol, 90 per cent., is rather steadier, although there is no improvement in price. The Continent appear anxious to purchase on a basis of about 4½d. to 5d. naked, for delivery all over next year. Fifty-ninety per cent. benzol is steady. There is little demand for toluol. Solvent naphtha is quiet, and business has been done at rather low figures for forward delivery. Carbolie acid is steady without any change in price. Naphthalene is firm; and creosote salts are in good demand. Creosote is quiet, and there is little business doing. Tar maintains its price.

The average values during the week were: Tar, 19s. to 23s., ex works. Pitch, London, 38s. to 38s. 6d.; east coast, 38s. to 38s. 6d.; west coast, 36s. 6d. to 37s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d.; 50-90 per cent., casks

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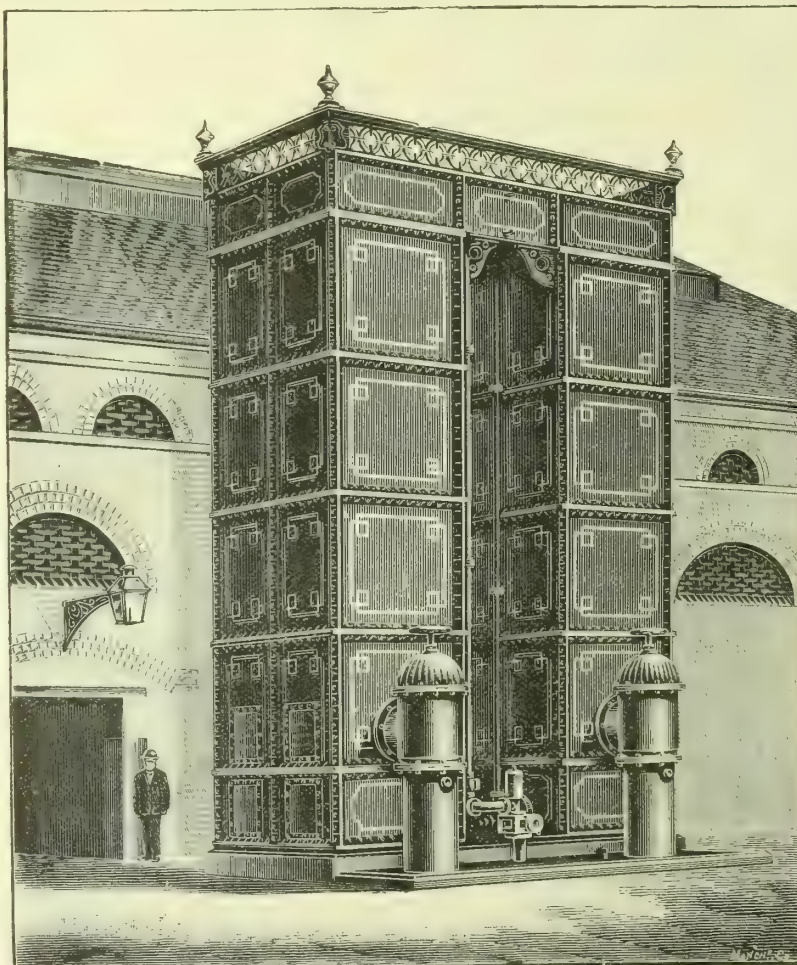
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included, London, 7½d. to 7¾d.; North, 7¼d. Toluol, casks included, London and North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s.; heavy naphtha, London, 11d. to 11½d.; North, 10¾d. to 11d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been very firm indeed throughout the past week, and prices have advanced considerably. The Gas Companies quote £11 15s. to £11 17s. 6d.; while outside makes are £11 8s. 9d. to £11 10s. In Hull, £12 10s. has been paid for the best makes. In Leith, this price has been refused; while similar figures have been paid in Liverpool and also declined. In Middlesbrough, £12 10s. to £12 12s. 6d. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a fair demand in the coal trade for this season; but there are ample supplies of all classes of coal. In the steam coal trade, there is a little ease in the prices generally. Best Northumbrian steams are from 9s. 9d. to 9s. 10½d. per ton f.o.b., second-class steams are about 8s. 9d., and steam smalls are from 5s. 6d. to 6s. 9d. The production is well maintained; and the shipments are now beginning to make up the loss in the early months of the year when there were stoppages at the collieries. In the gas coal trade, the local demand is growing steadily. For Durham gas coals, the price varies from 9s. to 9s. 7½d. per ton f.o.b. for the usual classes, according to quality. There are forward sales of gas coals in negotiation, and there have been some sales for Genoa district, at about 16s. per ton, delivered, though sales at slightly less are spoken of as probable. Some contracts for the supplies of small companies are also probably early for gas coals. As to coke, the market is quiet; and the increased supply of gas coke influences the price, which is about 14s. 6d. to 15s. 3d. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Trade continues sluggish; the foreign trade being the least satisfactory. Prices, however, remain unchanged. The quotations now are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 324,356 tons—a decrease of 8801 tons upon the previous week, and of 11,844 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,953,825 tons—an increase of 850,588 tons upon the corresponding period.

"Coalexld."

The Paris Agent of Coalexld, Limited, reported to them that, in a conversation he had had with a doctor of science in that country respecting the effect produced by the chemicals in the process of manufacture of coalexld, the Doctor made the following statement: "The oxygen gas created by coalexld chemicals changes the nature of the sulphur compound by transforming the sulphur into sulphuric acid, which becomes soluble in water." This information was submitted to the Analytical Chemist of Coalexld; and he reported as follows: "As regards your Paris Agent's remarks, the gas which your chemicals create is oxygen; and this, having a specific gravity of 11.05, is, of course, far heavier than coal gas, whose specific gravity averages about 0.4. The sulphur compounds are oxydized, and the sulphuric acid gas which is formed dissolves in water." The Company have taken a stand at the Smoke Abatement Exhibition in Glasgow; while the following recommendations have been made by a Special Committee of the Glasgow Corporation appointed to inquire into any process of gas making which would produce a form of coal residue available for use in ordinary domestic grates: (1) That the Engineer be instructed to continue his experiments with steam-quenched coke and coalexld; and (2) that the Engineer be authorized to supply coalexld for use in ordinary domestic grates.

Increased Consumption of Gas at Heywood.—At the monthly meeting of the Heywood Town Council last Thursday, Mr. W. Whatmough, the Gas Manager, presented his report for the quarter ended June 30. This showed that the consumption of gas for the three months had been 20,653,840 cubic feet, as against 19,988,980 cubic feet in the corresponding quarter of last year; while the receipts were £2793, as compared with £2706. It was explained that the consumption of gas had been greater than the figures in the report indicated.

The Proposed Extensions at Belfast.—A special meeting of the Belfast City Council was called for yesterday morning, in pursuance of a requisition, to take into consideration the advisability of rescinding the resolution adopted some months ago in favour of the acquisition of the Twin Island site for the proposed auxiliary gas-works, and of taking such further action as may be determined upon. The requisition was worded as follows: "We, the undersigned, request that a special meeting of the Council of the County Borough of Belfast be called to rescind the following resolution passed by the Council on the 16th of March, 1910: 'That the minutes of the proceedings of the Gas Committee of the 17th of September, 1909, relating to the proposed auxiliary gas-works (omitting the reference to the Ormeau Park site), be, and they are hereby, received; that the expert's report called for on the 4th of October, 1909, having now been presented, the site known as the Twin Island site, appearing to be the most advantageous offered, be selected for the proposed auxiliary gas-works, and that the Gas and Law Committees be authorized to take the necessary steps to acquire it,' and to take such further action as the Council may determine." No fewer than 34 members of the Corporation signed the requisition.



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LEST YE FORGET.

Price of Gas at Oldham.

At the monthly meeting of the Oldham Town Council, Alderman Thompson, the Chairman of the Gas Committee, referred to the recent reduction in the price of gas—a reduction ranging from 3d. to ½d. per 1000 cubic feet. He remarked that the idea was that the price now prevailing might be something like permanent—at any rate, for a few years. They had been able to make the reduction in the face of an advanced price for coal. Under the system prevailing before the passing of the last Act, the Corporation had gratuitous gas for public lighting, the cost of which would have amounted to £6500. In lieu of this, there was now a reduction of £9163 to gas consumers. It was only fair to say that one-third of the reduction would go to the out-townships, which would get a little of what they had thought for many years they were entitled to. The consumers within the borough had a permanent reduction of £6000, instead of the borough fund getting indirectly something like the same sum through gratuitous gas. Alderman J. Wild objected that there was one class in the community which never seemed to be catered for by the Gas Committee—that was the class composed of people who used gas-engines. The Committee ought not to charge the same price for driving an engine as they did for lighting an ordinary cottage. Alderman Thompson replied that the Committee had many times considered the question raised by Alderman Wild, but had never been able to see their way to reduce the price for power. To do so would be at the expense of the ordinary consumers. Day or night use made no difference to the Gas Department.

Reduction in Price at Radcliffe.—The Directors of the Radcliffe and Pilkington Gas Company have resolved to reduce the price of gas 1d. per 1000 cubic feet. To ordinary consumers the charge will now be 2s. 10d.; and a concession is made to prepayment meter users.

Salford Corporation's New Bill.—At a meeting of the Salford Town Council last Wednesday, a recommendation was made by the Gas Committee that the Parliamentary and Public Trusts Committee be informed of the desire of the Gas Committee to give notice of application for a Bill for gas purposes similar in terms to the Bill of last year. Councillor Jackson said the Council ought to have more information than was given in the minutes, especially remembering what happened to the last Bill in regard to the gas clauses. Alderman Phillips, the Chairman of the Gas Committee, said it was not desirable to discuss the matter in open Council; but he was prepared to give any information the Council wished in private. It was resolved to hold a General Purposes Committee meeting in private at the conclusion of the business of the Council. At this meeting, Alderman Phillips explained the proposals of the Gas Committee, and the Committee approved of the minute. It is understood that the Salford Gas Committee will arrange terms with the local authorities within their supply area, and thereby avoid the opposition which was put forward against the last Bill by these authorities.

Street Explosion at Loughborough.—Last Thursday morning, a gas explosion occurred at the corner of Biggin Street, Loughborough, which resulted in a considerable portion of the pavement being blown up, as well as an electrical box-cover being smashed. Some of the Gas Company's men were said to have been at work on a leakage a few yards away with a blow-pipe; and the suggestion is that the flame must have thus been conveyed to the chamber, where there was an escape of gas. Fortunately, no damage was done to the surrounding places of business.

Electricity at West Hartlepool.—In the West Hartlepool Town Council, Alderman Macfarlane, who is Chairman of the Electric Lighting Committee, took strong exception to some remarks made by a Mr. Ropner about the electric light undertaking at the recent annual meeting of the Hartlepool Gas and Water Company, and said they would never have been uttered about any private undertaking. If they had, they would have been actionable. The inference from Mr. Ropner's statements was that the Corporation electric light undertaking was not carried on in a businesslike fashion, and that proper allowance was not made for depreciation and wear and tear. As a matter of fact, for several years past the undertaking had paid 7 per cent. on the gross capital invested. Half of this had been devoted to interest, and half to depreciation. There had also been a small balance in hand. Altogether, Mr. Ropner's remarks were utterly unwarranted.

Electric Street Lighting at Watford.—At the last meeting of the Watford Urban District Council, the Clerk stated that a communication had been received from the Local Government Board enclosing five sanctions for electric lighting loans. Mr. Whitlock asked for the letter to be read; but Mr. Goodrich strongly objected to this being done. The fact of the matter was, he said, that there were some strictures at the end of the letter concerning public lighting, and suggesting that the Council should look further into the question of using gas. The answer to this was that 150 street-lamps had been converted to metallic filament lamps, and between 30 and 40 were being changed. No good purpose would be served by making the letter public. Mr. Whitlock said he was acting in the public interest, and he supposed that the reason that the letter was not read was because it was not very complimentary to the Electricity Committee. It was to be remembered that the Gas Company were ratepayers, and were concerned to some extent in the matter. Mr. Rider, after mentioning that he was opposed to municipal trading on principle, went on to say that it would be absurd for the Council to reveal to their commercial rivals their secrets. The Clerk thought the Board's letter was for the information of the members of the Council, and not of the general ratepayers of the district. Mr. Whitlock pressed for the letter to be read. There was an Association opposed to the granting of the loan; and he considered it was only fair that they should know the feelings of the Local Government Board. The Chairman (Mr. Mobbs) said if Mr. Whitlock had the best interests of the undertaking at heart, he would not go further with the matter. It was finally decided to consider the matter in committee at the end of the Council meeting.

BRADDOCK'S

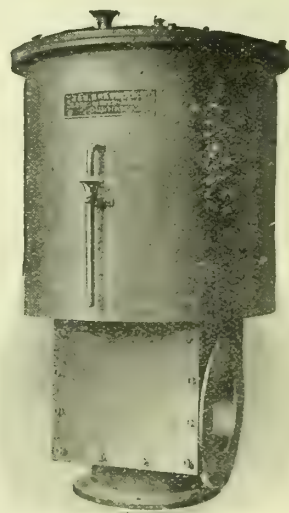
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A Loss at Pontefract.—It was reported to the Pontefract Corporation last week that there was a loss of £500 during last year on the gas undertaking, caused by defalcations from the safe, prosecutions, a special audit, and the cost of a Special Act of Parliament.

Keswick Gas Company.—Mr. E. Jackson, presiding at the annual meeting of the Keswick Gas Company, was able to lay a very satisfactory state of affairs before the shareholders. The year ended June 30 had, he said, been one of steady trade and slightly increased revenue. After paying the usual dividend of 10 per cent. upon the original and 7 per cent. upon the additional capital, and putting aside £100 for contingencies, there would be a carry-forward of £66. The gas sold amounted to 20,601,400 cubic feet, or an increase of 1,588,800 feet over the previous year. The make per ton was 10,622 cubic feet, or 403 feet more than the year before; while the sale per ton was 9777 cubic feet, or 98 feet more. The Company are erecting a new showroom near the works. It was announced that the Board have decided to reduce the price of gas used for power by 3d. per 1000 cubic feet.

The Stockport Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for the whole of the coal and coke handling plant, including a "Telfer" scheme, in connection with the new inclined retort installation in course of construction. It will be remembered that the same firm carried out the whole of the coal and coke installation in connection with the first large installation of inclined retorts erected at Stockport.

Mr. W. O. E. Meade King, of the Local Government Board, held a public inquiry at Hebden, near Grassington, last Tuesday, respecting an application to borrow money for works of water supply. Agreements were presented showing that the riparian owners consented to certain water being taken, provided that water be supplied to specified land in the event of its being deprived of water in consequence of the works. The scheme was explained in detail by Mr. A. Rodwell, the Engineer to the Skipton District Council. The present supply was ample, he said, except during the dry summer months; and it was proposed to augment it by taking in part of a spring at Brown Haw Well. There was no opposition on the part of the landowners.

A conference of the travellers of the Davis Gas Stove Company, Limited, recently took place at the Diamond Foundry, Luton, and was attended by all the firm's representatives, as well as three of the Managing Directors. The conference lasted for two days, the first of which was devoted to a general discussion concerning several important measures to be adopted with regard to next season's cookers and other summer specialities. The greater part of the second day was occupied by an inspection of the large number of new gas-fires and other heating apparatus introduced for the present season. The representatives were personally conducted by the experts of the firm's chemical and physical laboratories, and also the new enamelling works—the latter branch particularly making a considerable impression upon those present.

It is stated that a writ has been served upon the Stafford Town Council for a declaration by the Chancery Division that the water-works at Milford are not authorized by the powers of the Corporation, and for an injunction restraining the Corporation from maintaining or using the works, or proceeding with any extension of them.

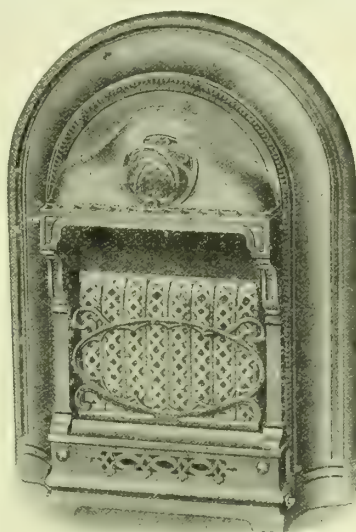
Messrs. John Spencer, Limited, of Wednesbury, have issued the 25th edition of their iron and steel tube and fittings price list. It is of convenient size for the pocket or desk, and is filled with illustrations and particulars of the firm's specialities, many of which are, of course, of a kind that is useful in connection with gas and water supply.

APPLICATIONS FOR LETTERS PATENT.

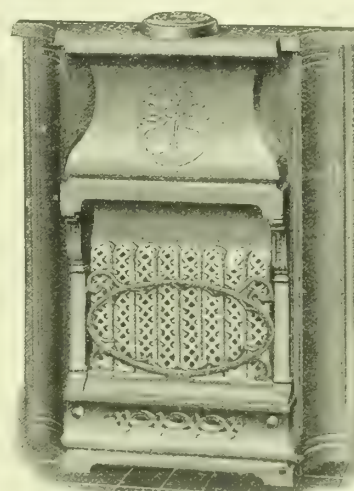
- 19,943.—DESSAUER VERTIKAL OFEN G.M.B.H., "Liquid seals for dip-pipes." Aug. 26.
 19,964.—HANWELL, H. W., "Anti-vibrators." Aug. 26.
 19,992.—ELLIOTT, S., "Purifying fumes and gases." Aug. 27.
 20,072.—DOD, G. E., "Gas-turbines." Aug. 29.
 20,083-4.—HUBERS, J., "Inverted gas-lamps." A communication from Julius Pintsch Akt.-Ges. Aug. 29.
 20,090.—SIEMENS BROS. DYNAMO WORKS, LTD., and KIEFFER, E. O., "Non-return valves." Aug. 29.
 20,135.—ALDRIDGE, J. G. W., "Chargers for gas-retorts." Aug. 29.
 20,137.—EDMONDS, J. E. J., "Automatic water-pipe cleaner." Aug. 29.
 20,144.—KOPPERS, H., "Levelling the charge in ovens for manufacturing gas and coke." Aug. 29.
 20,173.—WHITE, O. H., and SHARPE, J., "Supplying heated air from burners, stoves, or the like." Aug. 30.
 20,231.—WILSON, J. S., "Measuring the depths and velocities of fluids." Aug. 30.
 20,245.—FALDING, F. J., and CATHCART, W. R., "Purifying gas and recovering values present therein as impurities." Aug. 30.
 20,343.—MANSFIELD, A., "Incandescent burners." Aug. 31.
 20,401.—LAMKIN, A. E., and BRIDGE, L. F. M., "Gas-heating appliances." Sept. 1.
 20,442.—WARNER, W. J., and LICHTY, D., "Instantaneous water-heaters." Sept. 1.
 20,445.—CAMPBELL, J. A., "Retort-furnace settings." Sept. 1.
 20,546.—BROWN, A. A., "Boxes for mantles." Sept. 3.
 20,562.—SCHÄFFER AND BUDENBERG, LTD., "Pressure-gauges." A communication from Schäffer and Budenberg G. M. B. H. Sept. 3.
 20,566.—OFENBAU G. M. B. H., "Gas-holders." Sept. 3.
 20,569.—HUBERS, J., "Gas-lamps." A communication from Julius Pintsch Akt.-Ges. Sept. 3.
 20,571.—DICKIE, D., "Mantles." Sept. 3.
 20,572.—WELLER, F. W., "Regulating the flow of gas." Sept. 3.
 20,574.—COWPER-COLES, S. O., "Reflectors." Sept. 3.
 20,604.—GILSBACH, C., "Gas-turbines." Sept. 3.



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Assoc.M.Inst.C.E., Engineer and Manager of the Hex-
ham Gas Company, Lecturer at Rutherford College,
Newcastle-on-Tyne.
For Terms, &c., address ELVASTON ROAD, HEXHAM.

SATURATORS, Tanks, and Sulphate
of Ammonia Plant made or repaired by an
Experienced Workman. Efficiency Guaranteed. Any
distance. Ten Years at Beckton. Odd jobs taken.
LEADBURN, 118, Galloway Road, LONDON, W.

ACCOUNTANT (Age 30), with Expert
Knowledge of Gas Accounts and Secretarial Ex-
perience, desiring change, is open to accept RESPON-
SIBLE POSITION in Gas Company's Office.
Address No. 5285, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

YOUNG Man requires situation as
METER INSPECTOR and COLLECTOR. Able
to advise consumers; thorough knowledge of Fitting;
City and Guilds Certificate. Seven Years' experience
in large and small Gas-Works. Excellent references.
Address, COMPETENT, 100, Knox Road, Welling-
borough, NORTHANTS.

SUCCESSFUL GAS DISTRIBUTION.
SUPERINTENDENT (Age 30), with
thorough knowledge of all technicalities and
proved ability to educate consumers privately or by
public demonstration. First hand knowledge of U.S.A.,
Colonial, and Continental Methods for securing maxi-
mum economical consumption; has recently visited
leading Metropolitan and Provincial Undertakings and
noted latest Revenue Yielding Ideas; unbroken record of
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Salary partly based on results preferred.
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WANTED, at once, Capable Manager
for Small New Gas-Works being built, able to
Superintend Erecting and Main Laying.
Replies, stating previous Employment, and Wages
expected, to No. 5287, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, immediately, Two or Three
DRAUGHTSMEN, fully Experienced in the
Design of Modern Gas Plant.
Apply, by letter, Stating Age, Qualifications, and
Salary required, to No. 5268, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

GAS-STOVE Manufacturing Company
requires a GENERAL MANAGER possessing good
Commercial Experience, and Technical Knowledge.
Salary offered £400 per annum with Commission.
Applications, stating Age, and full Particulars of
Qualifications, should be addressed to No. 5284, care of
Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED by a Firm of Ironfounders
and Chemical Engineers, with Established Trade
among Chemical Manufacturers, to undertake the Sole
Rights of Making and Selling Chemical Specialities in
Great Britain.
Apply No. 5262, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

RETORT-HOUSE FOREMAN.
WANTED, a Retort-House Foreman,
Age 30 to 35, must be a Good Mechanic and
thoroughly acquainted with Modern Methods of Car-
bonizing. One with Electrical Knowledge preferred.
Apply, stating Age, Qualifications, and Salary re-
quired, to No. 5281, care of Mr. King, 11, Bolt Court,
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WANTED, by the Leyburn Mutual
Gaslight and Coke Company, a Practical GAS
MAKER and FITTER, able to Take Meters if necessary
and Capable of Managing Small Works. Annual make,
Two to Three Million Cubic Feet. House, Coal, and
Light found. Must be a Steady Man. Testimonials
wanted from previous situation.
Applications, stating Age, Experience, and Wages re-
quired, to the SECRETARY, Leyburn, YORKSHIRE.

**WANTED, at once, for a Foreign Ap-
pointment, a thoroughly Well Qualified GAS
ENGINEER, about 28 to 35 years of Age. Salary
offered, £350 per Annum, with a further sum to be
agreed upon for each Works erected or extended. The
Gentleman selected must be fully Qualified to Advise as
to the Capacity, Design, and Cost of every part of a
Modern Gas Plant, and Capable of Superintending, first
the Erection and subsequently the Working of the
Plant. In the first instance it is not necessary to send
any Testimonials; these will be asked for later from
Applicants whose Experience seems to render their
Appointment suitable. Term of Appointment, Three
to Five Years.**
Applications to be addressed to No. 1047, SELL'S
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FOR SALE—A First-Class Safety Gas
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Address No. 5288, care of Mr. King, 11, Bolt Court,
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FOR SALE—Filter Press in Perfect
Condition. Self-Contained Engine and Pump.
Apply to the SECRETARY, Gas Company, Sutton,
SURREY.

OFFERS wanted for the Files of the
"JOURNAL OF GAS LIGHTING," "GAS WORLD,"
and "CHEMICAL TRADE JOURNAL," for the Years 1905
to 1909, inclusive, unbound.
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GASHOLDERS—16 ft., 24 ft., 26 ft., and
45 ft. Diameter GASHOLDERS, Cheap for im-
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Tanks Complete to Plan and Specification. Can be
seen Temporarily Erected at our Works.
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UNDER Pressure Main Drilling Apparatus FOR SALE, complete with Cup Drills and Change Blocks, for Cutting Connections for 3 in. to 6 in. diameter. Also APPARATUS complete with Cup Drills and Change Blocks for Making Connections from 7 in. to 12 in. diameter. Both Machines quite New, and packed in suitable Boxes.
Address No. 5283, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SALE OF STREET LAMPS, &c., BY PRIVATE TREATY.

THE Carmarthen Town Council have for DISPOSAL about 230 STREET GAS LAMPS, COLUMNS, and BRACKETS, and a Number of INCANDESCENT BURNERS. Offers are invited for the whole or part. All Particulars can be obtained at the Borough Surveyor's Office, John Street.

Tenders, marked "Tenders for Lamp Posts, &c.," to be sent to the undersigned not later than the 15th of October, 1910.

The highest or any Tender not necessarily accepted.
JAMES JOHN,
Town Clerk.

Town Clerk's Office, Carmarthen,
Aug. 18, 1910.

WISBECH WATER-WORKS COMPANY.

TENDERS are invited for the Supply of about Six Miles of 3-inch CAST WATER MAIN, full Particulars of which can be had on Application to the Company's Engineer, at his Office, Wisbech. The lowest or any Tender will not necessarily be accepted.

J. G. HAWKINS,
Engineer and Manager.
Gas and Water Offices,
Wisbech, Sept. 9, 1910.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 15,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth, between Oct. 1 next and March 31, 1911.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than Sept. 16.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.
Wandsworth and Putney Gaslight
and Coke Company, Fairfield Street,
Wandsworth, S. W.

BOROUGH OF ABERAVON.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of the following GAS MAINS and SPECIALS to be delivered free at the Great Western Railway Company's Station, Port Talbot.

2100 Yards of 10-inch coated S. & S.

3400 " 4-inch " " "

Specials per Ton " " "

Tenders to be delivered to M. Tennant, Esq., Town Clerk, Aberavon, not later than the 17th inst., marked "Tender for Gas-Mains."

The lowest or any Tender not necessarily accepted.

A. J. BOND,
Manager.
Gas-Works, Aberavon,
Sept. 2, 1910.

NEWTOWNARDS URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Newtownards Urban District Council (Co. Down) are prepared to receive TENDERS for the Supply of 3000 to 4000 Tons of GOOD COKING COAL, NUTS OR SLACK (Washed or Otherwise).

Further Particulars may be had on Application to the Gas Manager, Mr. W. H. Roberts.

The Council reserve the right to fix the whole or part of the Contract with one or more Contractors.

The lowest or any Tender not necessarily accepted.

Sealed Tenders, marked "Tender for Coal," will be received by me up to Thursday, the 29th of September, 1910, at Four o'clock.

H. MCCARTNEY,
Clerk to the Council.
Sept. 6, 1910.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 21st inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect Two Directors in the place of those who go out by rotation; and to appoint Two Auditors.

NOTICE IS HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 10th inst. and RE-OPENED on the 22nd inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
Sept. 2, 1910.

PATENTS AND DESIGNS ACT, 1907.

NOTICE is Hereby Given that Joseph Margreth, of Locarno, Switzerland, seeks leave to FURTHER AMEND the SPECIFICATION OF LETTERS PATENT No. 24,490 of 1904, granted to Franklin Wise Howorth, for "IMPROVEMENTS IN ACETYLENE STORM LAMPS."

Particulars of the proposed amendment were set forth in the Illustrated Official Journal (Patents) issued on the 7th of September, 1910.

Any person, or persons, may give notice of opposition to the Amendment (on Patents Form No. 18), at the Patent Office, 25, Southampton Buildings, London, W.C., within one calendar month from the date of the said Journal.

W. TEMPLE-FRANKS,
Comptroller General.

ABEL AND IMRAY,
Consulting Engineers
and Chartered Patent Agents,
Birkbeck Bank Chambers, London, W.C.

THE Proprietor of the Patent No. 19,479

of 1905, for "Improvements in or relating to Meters," is desirous of entering into Arrangements by way of License and otherwise, on Reasonable Terms, for the purpose of Exploiting the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, and CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINESBURY CIRCUS, E.C.

GAS STOCK.

SALE OF DEBENTURE STOCK AND ORDINARY STOCK IN THE

WESTON-SUPER-MARE GASLIGHT COMPANY.

LALONDE BROS. & PARHAM have received Instructions from the Weston-super-Mare Gaslight Company to SELL BY AUCTION, under the Provisions of the Weston-super-Mare Gas Act, 1901, at their Rooms, West Street, Weston-super-Mare, on Tuesday, the 20th of September, 1910, at Six for Seven o'clock in the Evening, subject to Conditions of Sale,

£2000

FOUR PER CENT. PERPETUAL DEBENTURE STOCK and

£3000

NEW FIVE PER CENT. MAXIMUM ORDINARY STOCK

of and in the above-named Company, in Lots of the nominal value of £50 each.

The Stocks will be Sold and Registered in the Books of the Company Free of every Expense to the Purchasers thereof.

For further Particulars and Conditions of Sale Apply to the AUCTIONEERS, High Street and Station Road, WESTON-SUPER-MARE, and 7, Royal Promenade, BRISTOL; to J. H. GRAY, Secretary to the WESTON-SUPER-MARE GASLIGHT COMPANY; or to J. H. & F. W. BERE, Solicitors, WESTON-SUPER-MARE.

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Stock Brokers,

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PRINCE'S CHAMBERS, BIRMINGHAM.

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Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

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PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
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NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
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STEEL OF ALL DESCRIPTIONS.

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ANVILS, VICES,
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London Office:

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MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

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KOPPERS' PATENT CHAMBER OVENS.

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HEATHCOTE GAS COAL from the GRASSMOOR COLLIERIES, CHESTERFIELD.

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Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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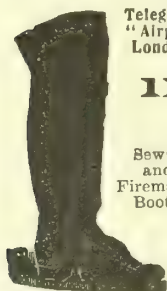
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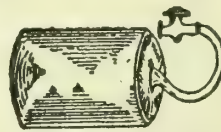
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Vide "JOURNAL OF GAS LIGHTING," &c., Aug. 30, 1910.

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No Preparation required. Readily Portable.
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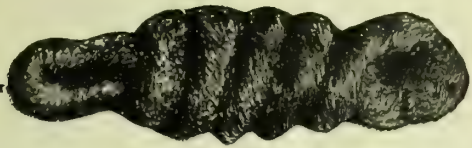
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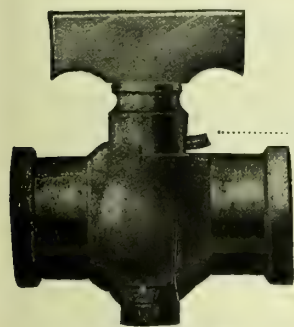


FIG. 1. The Old Style with the Old Trouble.
Note the Pin A.

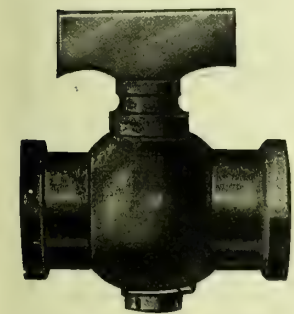


FIG. 2. Evered's Patent "Safety Stop." No Pin, No trouble.



FIG. 3. Underside showing "Safety Stop" in lieu of Pin.

EVERED'S PATENT "SAFETY STOP."

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT "SAFETY STOP"

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B**, working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

Any fitting specifically so ordered will be made with the "Safety Stop."

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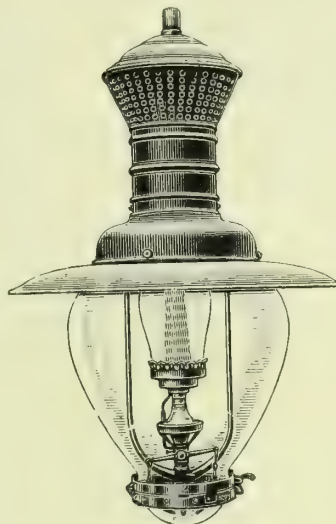
Surrey Works, SMETHWICK.

THE STEADY SALE OF THE

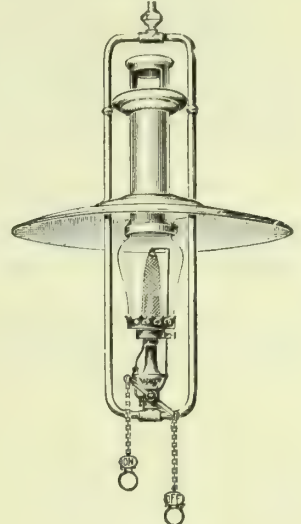
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Is the Best Proof of its Usefulness.



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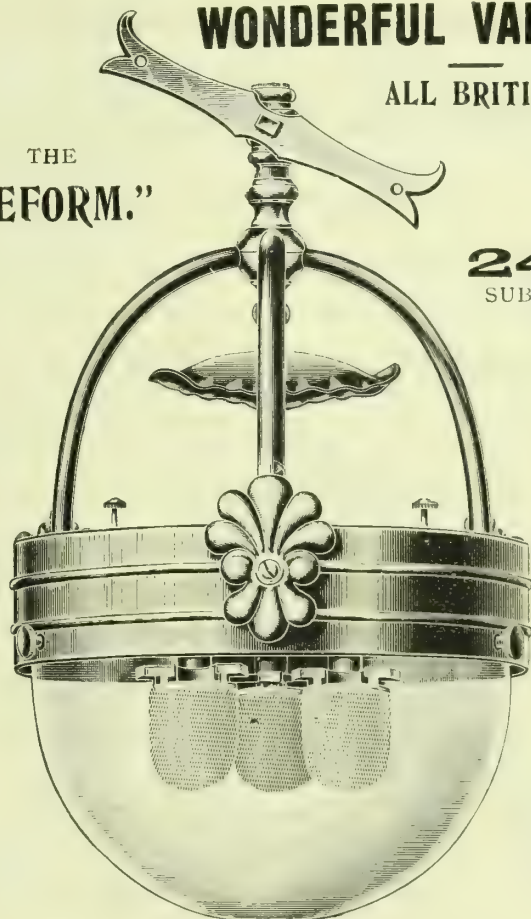
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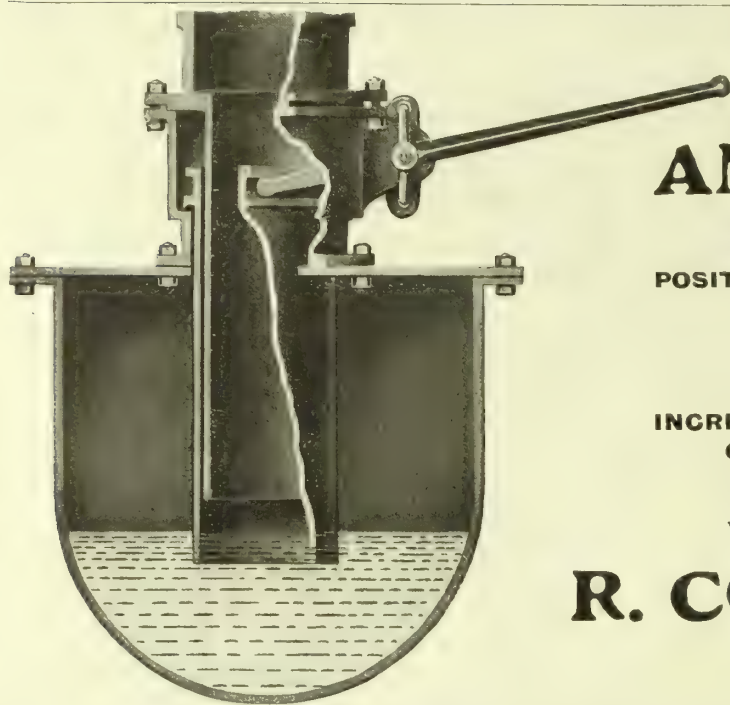
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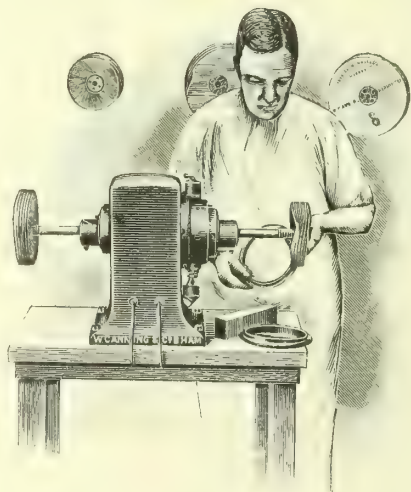
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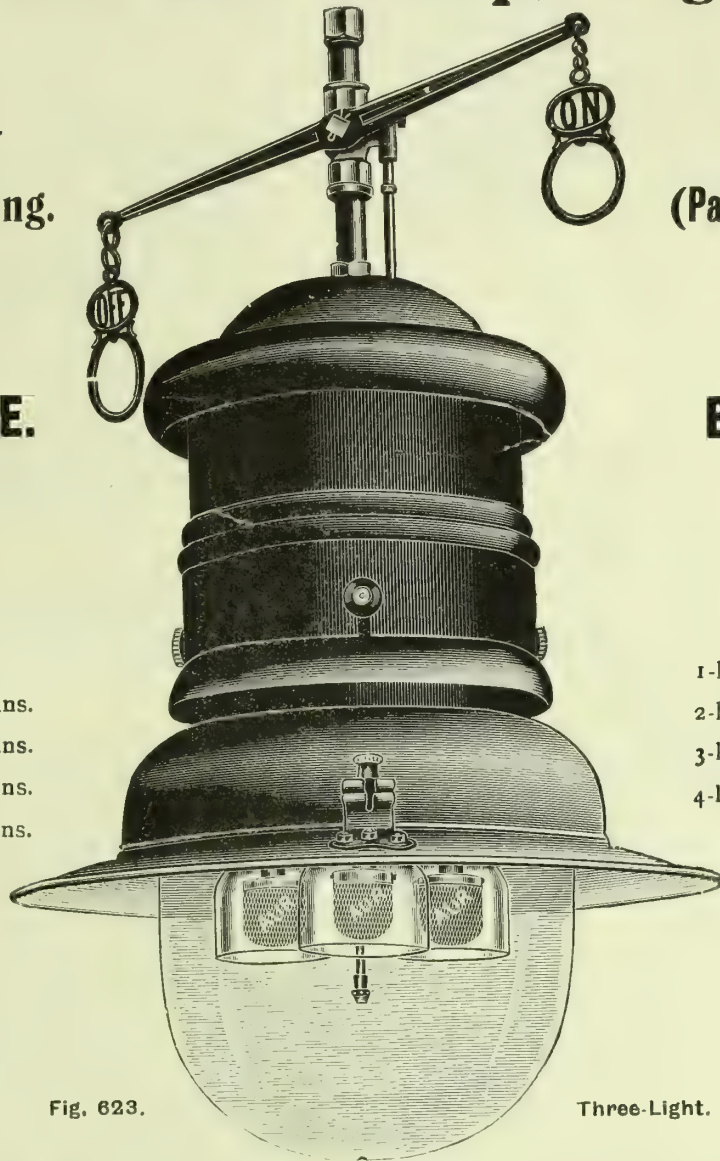
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

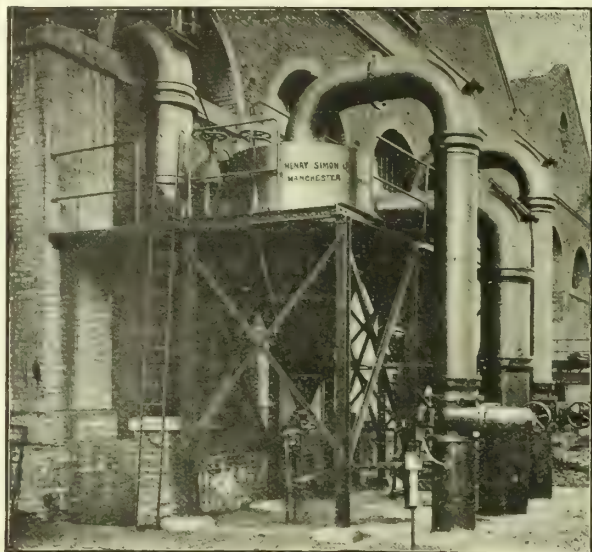
	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made
Case contains	80	18	18	12	Welsbach Mantles, 4½d. each, or 4s. 3d. per dozen,				subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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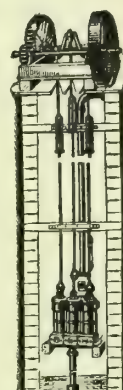
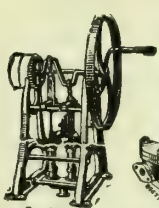
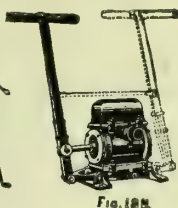
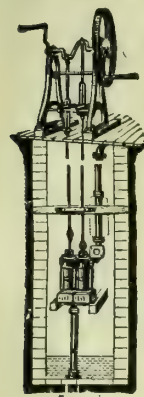
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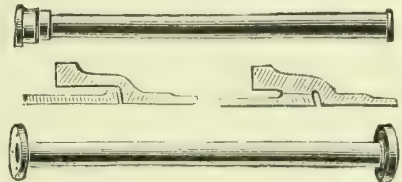
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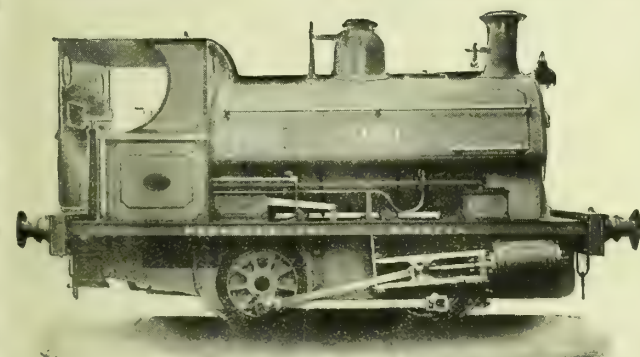
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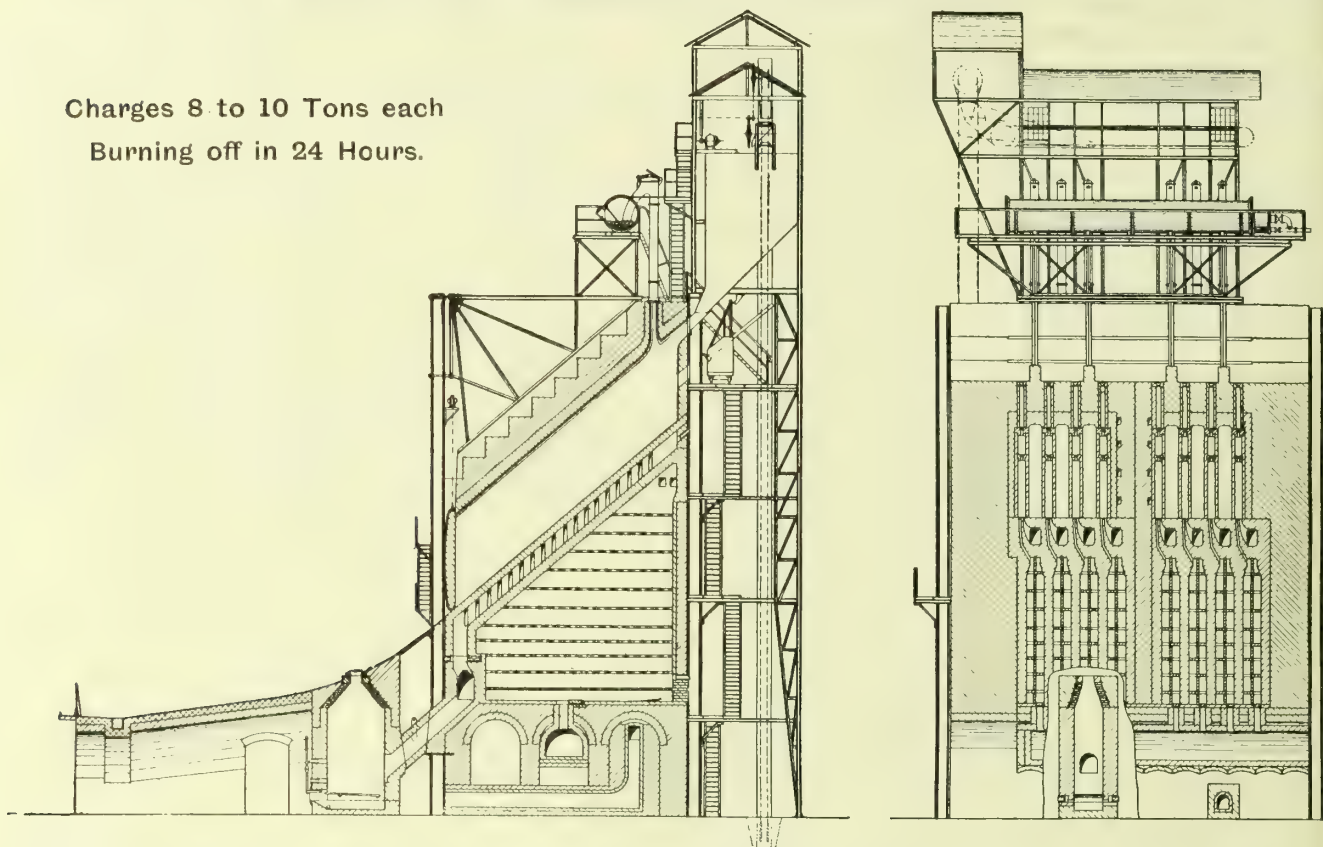
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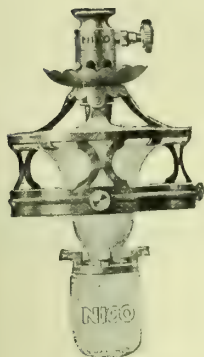
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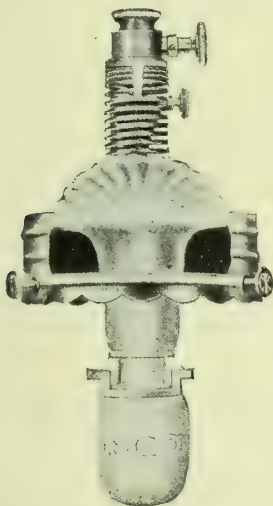
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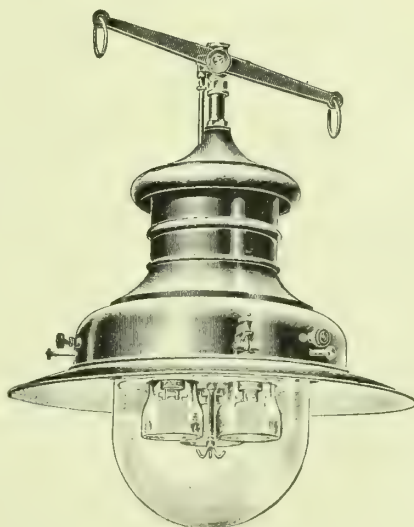
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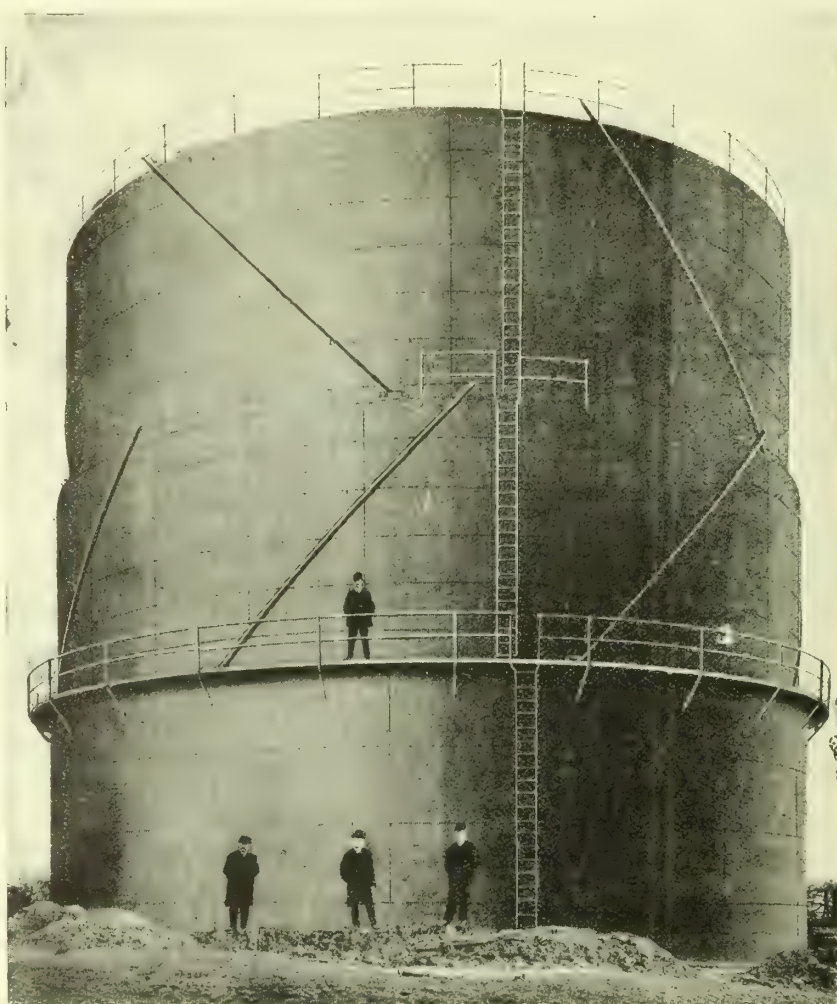
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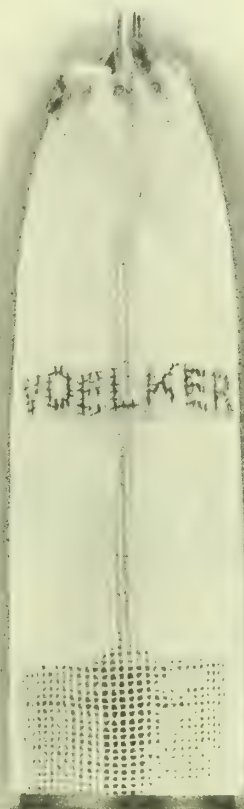
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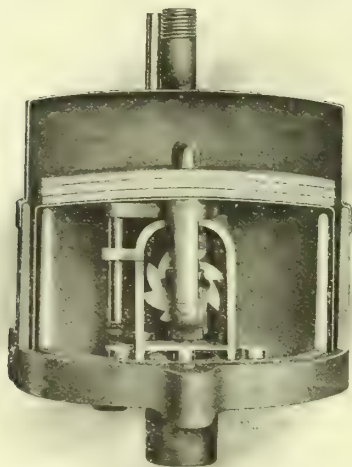
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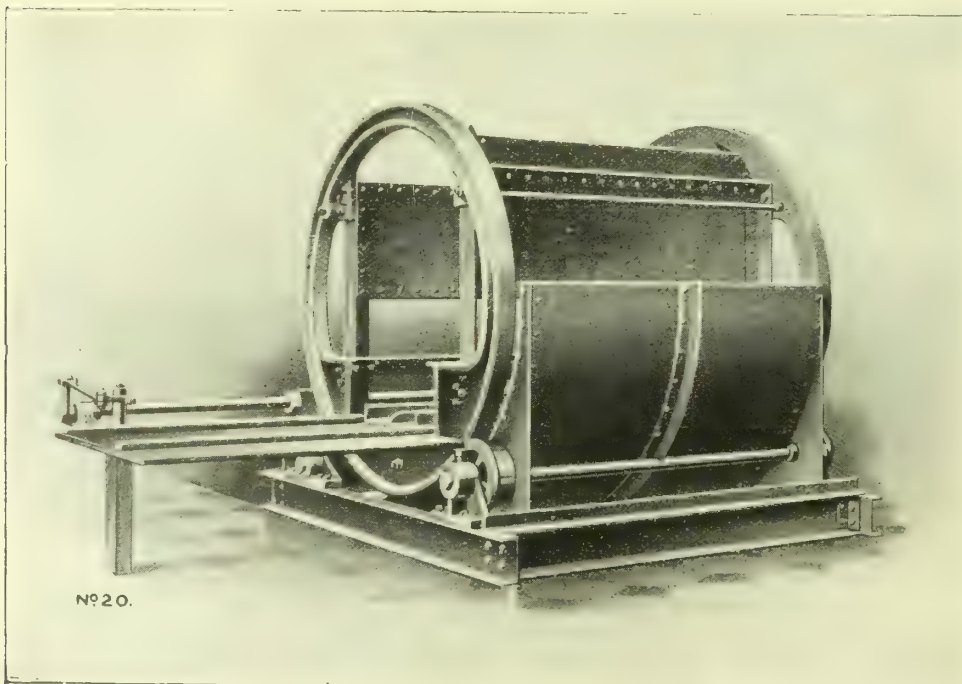
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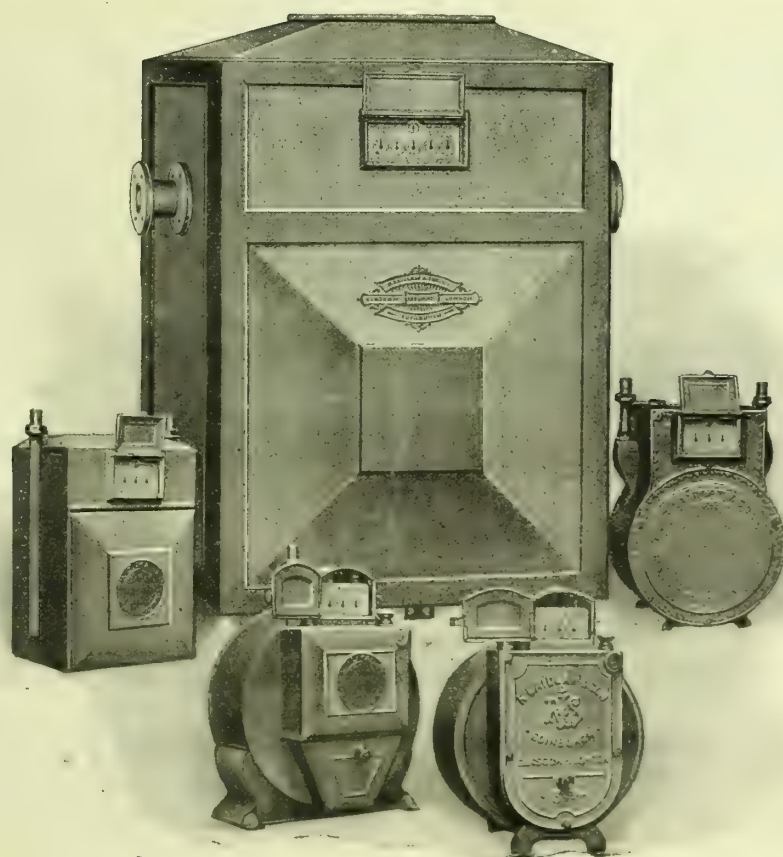
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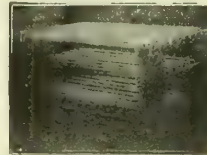


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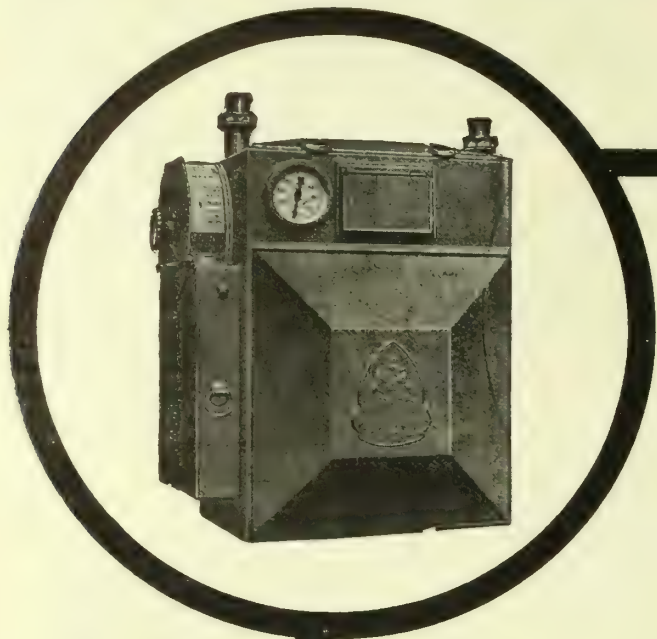
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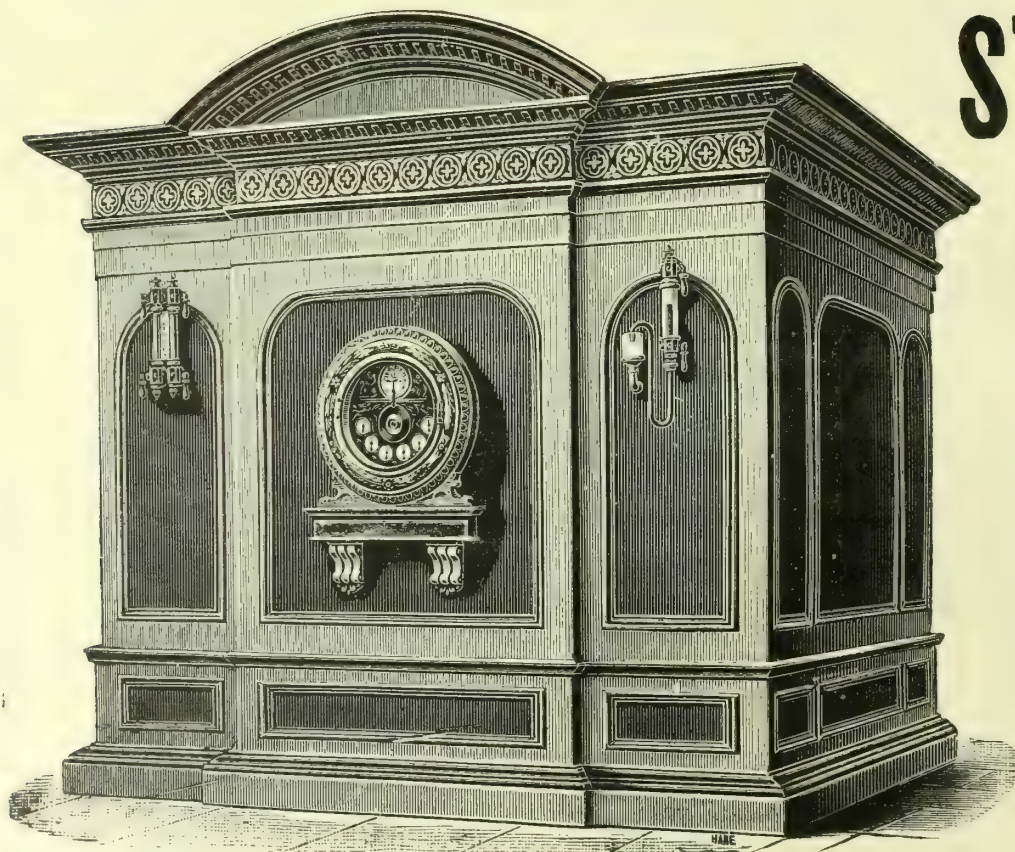
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EDITORIAL NOTES—GAS, &c.

The Relations of Municipal Gas and Electricity Departments.

SERIOUS efforts are being made by the executive officers of the Manchester Corporation Gas and Electricity Departments to compose their differences, and to establish a policy of goodwill and peace between the two undertakings. This is no doubt very right and proper; but it must be confessed that we are not very sanguine of permanent success. An indication of the contents of a report by the chief executive officials of the two concerns appeared in the "JOURNAL" last week; and it shows that they at all events are, as the result of conference, in a very conciliatory mood just at the present time. But the fact that conference was deemed necessary under the conditions that have grown up since the Electricity Department came into being, and that the report in question has been prepared, are really a reflection on the municipal direction of trading enterprises, and on certain of the issues of that direction. It is against the economic interests of such undertakings as gas and electricity supply and of the consumers (*quâ* consumers) that there should be anything but the keenest competition; but such competition can only be obtained on level ground where the management is by competing private enterprise, and where conditions of favouritism and undue financial burdens are not laid upon the consumers, as sometimes happens in the case of the municipal control of gas and electricity undertakings. It is beyond the power of any code of regulations, or of resolutions, or understandings with two undertakings each striving to get all the business it can, to prevent transgression at many points, and whenever opportunity offers. Moreover, such a code of regulations, or such resolutions, or understandings will not lessen misgiving and watchfulness on the part of the two departments; the very existence of regulations, resolutions, or understandings must inure to the sharpening of the look-out to discover signs of, or actual, transgression. It cannot therefore be seen that, after the novelty of understanding has worn off, there will be any softening of animosities engendered by what are to all intents and purposes antagonistic interests.

In this report from Manchester as to the findings of the chief executive officials of the two departments, one conclusion is that, in respect of the prices charged for gas and electricity by the undertakings, the officials have, on the one side and on the other, been convinced that all the prices are fixed on recognized principles, and that no useful purpose can be served by the one department criticizing the other. But we fancy that Mr. S. L. Pearce, the Chief Engineer of the Electricity Department, has had more difficulty in persuading Mr. J. G. Newbigging of the soundness of charges ranging from $3\frac{3}{4}$ per unit for lighting and a bottom price of 0.7d. per unit for power, than Mr. Newbigging has had in convincing Mr. Pearce that there is justification in the differences in the ordinary charges for gas in the city of 2s. 3d. per 1000 cubic feet for lighting and of 1s. 9d. for power purposes. We should like to see what would be said if the bottom price for gas for power in Manchester was (say) 5.4d. per 1000 cubic feet.

Another point on which the executive officials have arrived at an understanding is a most important one; but whether it will ever get any farther than being a mere expression of opinion, until there is enforcement by the Legislature, it is impossible to say. It is patent, however, that the large municipal corporations who have with merciless hand been dipping into the profits of their gas undertakings in aid of the rates, are now becoming genuinely alarmed over what has been happening in Parliament; for they have visions of the days when they themselves will be before Parliament giving an account of their stewardship, and having to confess to the gross abuse of the appropriation privilege allowed in days long since. But the habit has grown so strong, that we are doubtful as to any voluntary relinquishment pre-

ceding the compulsory one in conformity with the latest practice of the Legislature. Take Manchester, the Council have appropriated from the gas profits more in aid of the rates than the sum of the loans raised for gas-supply purposes; and the normal amount they have annually taken for many years now has been £50,000. On the other hand, the Electricity Department has only lately found it possible to scrape together a few thousands to silence the clamorous voice for profits. Strong and dignified has been the protest by Alderman Gibson, the Chairman of the Gas Committee, against the robbery of the gas consumers; and no less so has been the antagonism of Mr. Newbigging to the system. Still the Council declined to favourably hearken to the voice of justice. Now the Electricity Committee are disinclined to quietly submit to their customers being plundered when they could well do—the same with the competing department in relation to gas—with the profits to assist them in rendering the best electrical service to the city. The Gas Department, however, is the one with the greatest cause of complaint; while the Electricity Department look upon the question perspective with the history of the Gas Department throwing a heavy shadow over their reflections.

However, the executive officials of the two departments have, in regard to this matter, got into the same boat; and they are unanimously agreed that the departments should be treated alike in respect of profit contribution to the rates. It must, it occurs to us, be a little *infra dig.* for the Electricity Department to find themselves such comparatively small contributors to the rates in comparison with the rival Gas Department. If, however, the difference can be lessened, so much the better for the reputation of the Electricity Department, and so much the more advantageous for the Gas Department. The agreement is to the effect that the officials who have been conferring concur with parliamentary practice as to the mortgage debt being taken as the basis upon which the rate-in-aid should be computed; and they believe the adoption of such a basis would remove all grounds of criticism in the future. But parliamentary practice in the case of Glasgow and Kirkcaldy in the present session of Parliament went a step further than this, by the blank refusal of profit appropriation in aid. But no one will deny that, if the practice of Parliament in this matter, in the case of English local authorities, is going to be on the lines of a percentage on outstanding mortgage debts, while the objectionable principle will not be removed, the limitation will be decidedly better than the existing much-abused licence. But what would the result be as affecting Manchester, and the relations of the two competing departments? The electricity undertaking would have, as the mortgage debts now stand, to contribute to the rates a larger sum annually than the gas undertaking. *Prima facie*, this does not appear to be just. But that it is just, under the circumstances, is easily demonstrable by looking back at what the Gas Department has been called upon to do, and has done—though, truly, in no particularly willing or submissive spirit.

After all, the pious hopes in a righteous cause of the Manchester officials will not, we fear, until some higher power intervenes, pass from the abstract to the concrete state. After the tough fights that Alderman Gibson has had, though his hand is more strongly supported now than formerly, it will take some powerful force to loosen the grasp of the City Council upon the huge amount of gas profits that have annually been used in relief of the rates—in large part, of the rich electrical consumers. We sympathize freely with the officials in this matter, as also in the current feeling that better relations should be established between the Gas and Electricity Departments, by better understandings as to conduct, and by the stamping out of the financial differences that have been the source of irritation. But we cannot bring ourselves to believe that two undertakings whose businesses are essentially competitive can be conducted in anything but a competitive spirit, particularly when managed (as they should be managed, and are managed

at Manchester) by men jealous of the interests entrusted to them, and animated solely by a desire to serve those interests in the best possible manner. However, at the base of the policy of a municipal authority controlling two such competing undertakings should be placed the principle of "a fair field, and no favour." The Electricity Department at Manchester has been a much-favoured, though somewhat at times unfortunate, child, while the gas undertaking has been a veritable beast of burden.

"Cause Unknown."

WITHIN a few yards of each other in the Brixton Road stand the blackened ruins of what were at one time two well-known and popularly patronized drapery emporiums. In one of the premises, there have been in recent times three fires, one of which was without doubt due to the fusion of an electric wire in one of the shop windows. The cause or causes of the other two fires cannot, in the absence of thorough investigation, be satisfactorily ascertained, and must be a matter of conjecture. In the case of the other building also, which was completely gutted on Aug. 20, no cause can be assigned. The last fire in the neighbourhood—that at Mr. Wallace Hughes' establishment—has resulted in the death of a lady assistant through a fatal leap taken in fright, and two other young women were seriously injured by also jumping from their bedroom windows. In these instances, there cannot be the same assurance concerning the initiation of the conflagrations as there was in the cases of the tragic Clapham and Accrington fires. They are cloaked in mystery; and it is high time—through the growing frequency of fires in such establishments, which fires are labelled "cause unknown"—that very searching technical inquiry was made into the origin of the outbreaks, which claim life, undermine health, and render girl assistants highly nervous, and keep them, or those who "live in," on tenter-hooks both day and night. Since the Clapham and the Accrington fires, the assistants in many such places have been losing all sense of security. At the opening of the inquest, last Thursday, on the young woman who lost her life through her fearful leap at Brixton, one of the assistants stated that she and her companions had become so nervous of fire that, when going to bed, they placed their clothes at the foot in readiness for any emergency. That is anything but a pleasant condition for the young women assistants in these drapery establishments to get into; and there is little wonder that, when the critical time does come, there is a tendency to lose their heads. However, there is the fact.

And what is this very mysterious something that is at the bottom of it all? At the inquest in question, the South London Electric Supply Corporation, Limited, were represented by Counsel. The opinion of the public as to the origin of the fires is strongly set; and the Electric Supply Corporation recognize this. There is no suggestion of foul play being associated with the Brixton fires. They have mostly broken out at night time after all lights have been turned off, and when the assistants are in bed. If the situation of the seat of the fire is known, that may offer suggestion; but otherwise further track is covered by the destruction occasioned by the fire. In connection with the first fire at Mr. Wallace Hughes' on Aug. 11, the manageress states that she saw a streak of light in one of the windows about 18 inches to 2 feet long, and directly afterwards the window was in flames. That window was electrically lighted. The second fire started in a basement; and a Fire Brigade officer declares that it was impossible for (say) a lighted match to be thrown through the outside grating anywhere near the place where the fire started. In regard to the third fire—the cause of which is recorded as "unknown"—the head porter at the premises states (according to the newspaper report before us) that, after the fire, he found the electric wires were in perfect order. Counsel for the Electric Supply Corporation was elated; but if the porter found them in order, a man with technical knowledge should find them so now. Are they in order? Judging from the condition of the premises to-day, we have misgivings on the point; but this statement does not preclude us from accepting more positive evidence if adduced at the adjourned inquest.

However, according to the "Evening News" last Wednesday, at least one fire insurance company has been stirred up by the "numerous fires at drapery establishments due to "electric light fittings." This Company are, in consequence, proposing to offer "to see to" the electrical installations of

those who insure such premises through their office; and for the reason that "our experience, unfortunately, is that people "do not realize the dangers from faulty electric light fittings "and defective wiring." This all tends to show that the danger of electric lighting is not a matter that can be dismissed in the airy manner affected by our electrical contemporaries; and that, in the interests of both public safety and the electrical industry, the sooner there is a thorough expert investigation the better. The number of fires which are so frequently labelled now "cause unknown" is producing widespread uneasiness; and if anything can be done to learn more of their origin, it should be done, no matter the cost. The City Coroner has advised that there should be a public inquiry into every fire; and we are in full agreement with him. Who could be otherwise after recent happenings?

Labour in Congress.

FRESH from the factories and workshops of the country, delegates to the Trades Union Congress met in Sheffield last week, following, in doing so, rapidly in the wake of the meeting of the British Association for the Advancement of Science. In their respective realms, there is in one respect a similarity between their proceedings. A vast amount of good work is now being done by the British Association, as witness the reports that we have published; but there always is, and we fancy always will be, a part that is irrational practically. It is in this latter aspect that there is a correspondence—not proportionately, but in character—with the Trades Union Congress; for a large part of the proceedings is from the practical standpoint irrational, and only a small part gains, as being practical, the sympathy of those who have the well-being of the country's workers at heart, and who are intellectually superior to the influences of the doctrines and the nostrums of socialism—more particularly the modern brand. There was one striking feature about last week's proceedings at the congress. Naturally there were the customary vehement and wild speeches. But they were fewer than have been heard at some previous congresses; and there seemed a disposition to try to keep within the bounds of sanity.

It is possible, too, the circumstances of the labour world at the moment had some restraining influence. These large congresses are being held year by year; all the machinery of the trades unions and of the socialistic leaders is kept well-oiled; and labour questions were never more prominently discussed than now. But look around, and mark what has happened in the fields of labour represented by coal, cotton, shipbuilding, and railways. Over the whole organization (other than the National Free Association) of labour as now existing, there is written large the verdict "Failure." The work of the unions as ordered and conducted by their socialistic masters, has forced the employers into unions of their own, and thus has made the operations of the Labour Unions more difficult. To that extent it has weakened their own power, and rendered them less effective instruments in the cause of labour. Among the rank-and-file of the trade unionists, there is a growing insubordination, and the instances of this, and of violation of agreements entered into by their leaders, have become a positive terror to the latter. The Osborne judgment likewise dealt a heavy blow to the leaders and to those parliamentary representatives of labour who have been comfortably sitting in the enjoyment of a fixed income extracted, illegally by compulsion, from the members of the Trades Unions. The Osborne case involved the Unions in an expenditure of £8000; and that is not pleasant in view of the recent small yield of parliamentary enactment affecting labour. The yield there has been of late has done more to create disquietude than the short-visioned leaders imagined that it would. From all which, it is seen that the congress assembled last week in anything but a congenial atmosphere; and this the older and more sober-minded leaders recognize has been created more than anything else by the mating of socialism with the workers' unions.

The "JOURNAL" need not occupy itself much with the proceedings at the Congress. As has been said before in these columns, the industry's own workers are comfortable and contented. But the industry, being largely dependent for material and custom on other industries, it has an interest in the external labour factors that affect its own prosperity. Briefly, then, the President at the Congress (Mr. J. Haslam, M.P.), in his address, read a little homily to the insubordinates in the rank-and-file, upon the necessity for

discipline; for discipline and loyalty are at the root of the power of collective bargaining. He has no sympathy with those who break the laws of the Unions; but how can he expect the rank-and-file to obey the laws of their unions, when socialistic leaders are constantly inciting them to rebellion and to transgress the laws of the land. The resolutions passed at the congress were, as usual, voluminous; and they would, if in the main they were given effect to, be far-reaching in evil. Steps are to be taken to restore the "rights" removed by the Osborne judgment. How anything can be a "right" that is legally non-existent is not explained; but the leaders of the unions are careful to avoid any admission that what they have been doing they were not legally competent to do, though by not admitting it they infer that the Law Lords are wrong in their judgment. It has also been resolved to make an effort to get the Coal Mines (Eight Hours) Act amended, so as to enact that miners shall, from surface to surface, only be below ground eight hours during any consecutive twenty-four hours. A universal eight-hours day is again claimed. The Parliamentary Committee have also been instructed to promote a Bill for the nationalization of the railways. So we might go on, with little that is practical, and much that is impracticable, through scores of resolutions, many of which we shall hear nothing more about until the next Trades Union Congress. With a tithe of the matters referred to them to prosecute, the Parliamentary Committee would have quite sufficient work to do, though from it the harvest, for obvious reasons, cannot fail to be small.

The Advance of the Gas-Fire.

APART from all external symptoms, there has been substantial proclamation in our columns during the past few weeks that the heating season is again at hand. This is the time at which we get in these pages a, so to speak, synopsis of the development accruing from the work of our gas-fire makers during the period lying between one heating season and another. In this department of gas heating, there is—and we welcome it, as all in the gas industry must do—a healthy rivalry between the makers. Not one of them can afford to show any inertia in the matter of progressive work. The domestic fire field for them, as it is for the gas-supply industry, is the biggest that remains to be conquered. It is a larger one, though only having periodical importance, than the gas cooking field. For house warming, gas is the ideal fuel. Eminent professors may appear before learned societies, and talk loftily of par-carbonized coal as a smokeless fuel; but such fuel is only a half-way stage in the general domestic economy to the fuel that creates no dust, and demands no—or rather the irreducible minimum of—labour on the user's part. With gas there is no ordering of fuel when once a meter is fixed, there is no creation of dust on delivery, no cellar required for storing it, no carrying of fuel from the cellar to the several rooms, no wood needed for ignition, no daily labour incurred in cleaning stoves and hearths and lighting fires, and that abomination to the housewife, the chimney sweep, has to find some other occupation. The par-carbonized solid fuels do not eliminate any of these disadvantages. But gas does. Therefore gas is the superior fuel. Again, the solid fuel that gives no flame is of very little use for oven work in ordinary kitchen ranges. The uncomplicated gas-cooker comes in there. For water-heating, too, there is the gas-boiler that can be connected up to the hot-water circulating system. Thus for the house, the gas-supply industry can offer the superior universal fuel.

Last heating season, the gas-fire had quite a little boom; and the makers were kept very busy (some of them day and night) in executing orders, though electricity at 1d. per unit for heating was being offered freely throughout the country. This coming season we hope to have reports of greater successes still. The boom of last season encourages the hope. It was the sign of public appreciation of the new order of things in gas heating. And when public appreciation attains the dimensions that it did last season, it may confidently be expected that the appreciation will not stand still, but will develop. With 40 million tons of coal used for domestic purposes annually, there is an extensive opportunity for gas; and the gas-fire is the means by which this huge monument to the barbaric usage of raw material may be reduced by transference of coal from the domestic grate to the gas-works retort. The makers of gas-fires are fully alive to this; and for some time past, there has been, on their part, a greater application of science in advancing

the efficiency of their productions in this line. This year, too, we see the imprint on their work of the results of the investigation that is being carried out, through the Institution Gas-Heating Research Committee, at the Leeds University. The issues of this independent work prove both remedial and directive. Many structural defects are being exposed; and the directions of increased efficiency are being pointed out. If the Leeds University work had only the one result of stimulating energy in the competition for perfection, or if it had only the one result of suppressing inefficient goods, the reward would be a material one for the expenditure in money, time, and labour. The business for which we are aiming through the gas-fire is of such inestimable value, that there must be no economy in effort to secure it.

As we have just said, the gas-heating research work at the Leeds University, is making its impress on production. Every manufacturer is trying his utmost to get greater radiating efficiency. Before the last report of the Research Committee was submitted by Mr. E. W. Smith, M.Sc.—giving, among other matter, the results of the radiating efficiency of the gas-fires that had been under test—makers were already realizing 50 per cent. efficiency. The things of yesterday are not the things of to-day. There is, however, this season no radical departure to chronicle. The improvements in details which in combination produce higher result and more convenience, are things that count. But to be able to record 50 per cent. radiating efficiency, through improved regulation of gas and air and chimney draught, improvement in fuel and arrangement, and improvement in the internal construction of the body of the stove, marks a point in gas-fire history at which there may be gratification. The endeavour is to realize all possible advantage. There is, for example, a striking tendency to dispense with the fire-bars. The idea is not new; but when it was first advanced, it was looked at askance. Admitted that the fire-bars obstructed some small amount of radiation, there was doubt, on the ground of security, as to the wisdom of abandoning them. But the columnar "fuel" of the day enables, as will have been observed, the application of various locking devices—for instance, locking clips, top grooves and bottom sliding bricks, and nickel wire holders—to keep it in position. There is also now "reinforced" fuel; but there is a question in the minds of some as to the effect of the unequal expansion and contraction of metal and fireclay. But those who use the system, have made long and many experiments, and express their satisfaction. Then the locking of the "fuel" in position has the advantage of ensuring it being maintained in a central position over the nozzles of the burner. One firm add to safety by slightly inclining the fuel towards the back, and in association therewith claim a large radiating surface. It will be interesting to learn whether or not the inclination has any effect upon the direction of the radiations.

Instances are to be seen of still further elongation of the fuel beyond the point of active contact of the flame, on the ground that there must be a proportion of heat radiation from those parts of the "fuel" that are not actually made incandescent. Further attention has been devoted to the fire-brick—in one case, the waste products are caused to pass through the brick, so as to extract from them some of their heat; in another case, the slip brick has been made with a cavity on the rear side, in order to provide an air cushion at the back of the fire with the view of reducing the escape of heat at that part. There is an instance, too, of an interior design with the view of lessening the volume of cold air passing over the top of the fuel. The means of gas and air adjustment appear to have for a time exhausted ingenuity in this particular; but we find a safety gas-tap introduced to prevent accidental turning, and duplex burners are a feature of the season. Gas consumers want educating up to the usefulness of the duplex burner in giving them better efficiency from the gas consumed (when they only require half of the power of the fire) than can be obtained by the single burner, and merely reducing the consumption at the tap. In some examples, there are found new designs of canopies, with the view of obviating any escape of products on lighting up. The range of heating capacity is also being extended, by the production of wider fires. Interchangeability of all parts takes an important place in the consideration of the makers, as facility of maintenance is a matter of inestimable advantage to gas suppliers, with the growth of the gas-heating business. In external design and finish, manufacturers are studying more than ever the contem-

porary fashion in house decoration, furniture, and fittings in order to design fire casings that have an appropriateness therewith. And so as time advances, the peaks of efficiency, convenience, and suitability in the means of gas heating attain greater altitudes.

Gas Matters in Melbourne.

As was the case with the Australian Gaslight Company, whose meeting was reported a fortnight ago, the Melbourne Metropolitan Gas Company have naturally suffered extensively in their finances from the disastrous coal strike, which caused such havoc all through the Colony. Here, again, however, owing to the foresight and energy displayed by the administration, it was found possible to get through without any interruption to the maintenance of a full supply of gas; while no increase in price was made to the consumers. These are points upon which the Company and their customers are to be heartily congratulated. As will be seen from the lengthy report of the Melbourne Company's meeting which we give to-day, the Chairman (Mr. John Grice) devoted a very considerable portion of his remarks to dealing with a lot of attacks made on the undertaking by an influential local paper. A series of extracts from articles appearing over a lengthened period shows that the Board have good reason for complaint in this respect. All the Company ask for is fair play. This is not much; but it is evidently more than they can get in the quarter alluded to. In replying to the criticisms to which he had drawn attention, Mr. Grice was easily able to make out an excellent case for gas; and it is to be hoped that his facts and figures were given equal prominence locally to that which was accorded to the arguments in favour of electricity. The attacks on the Company from a financial point of view were also proved to be altogether wide of the mark; and altogether the Chairman may be complimented on the first-class "fighting" speech that he made. Conclusive statements of fact such as he was able to adduce cannot fail to impress those who approach them with an open mind, and give them the full consideration they deserve. Turning to the business of the half year, it is noticed that the quantity of gas sold shows an increase of $7\frac{1}{2}$ per cent. over the corresponding period of 1909; but it was pointed out at the meeting that no doubt during the strike period, when coal was dear, more use was made of gas-cookers. A feature of the Company's operations is the increase in the number of persons using gas-stoves; and every effort is made to see that they are employed economically, so that satisfaction may be given to the consumers. Three lady demonstrators are engaged in visiting houses where stoves are installed, so as to show householders how to get the best value for their money. This is a step in the right direction; and it seems that it is properly appreciated. In spite of newspaper articles, the gas industry flourishes fully as well in Melbourne as we are accustomed to see it do elsewhere; and, with so energetic an administration as the Company possess, it will continue to do so.

Changes at Belfast.

The Corporation Gas-Works at Belfast having had an experience which is fortunately not uncommon in connection with the industry—namely, that of being in need of extension to cope with the continually growing demand for gas—consideration was given to the provision of a scheme that would meet the case. The matter was talked up and down; and at last the Gas Committee took the commendable course of calling in experts to advise them. Mr. Charles Hunt and Mr. W. R. Herring were the gentlemen chosen; and they were to be assisted by members of two local firms of Contractors. After careful consideration, they submitted a report, quite early in the year, which dealt with a number of questions on which the Committee were wishful to have opinions expressed. The report was to the effect that urgent need existed for making provision to meet future demands for gas, as even with the existing consumption operations were being "carried on with very considerable difficulty and some danger, owing to the extremely congested condition of the works." One thing which they pointed out should be kept in view was the fact that it would doubtless be more advantageous to eventually transfer the whole of the manufacturing operations to a new site than to attempt to modernize the existing works by reconstruction; and therefore they recommended the securing of a large

site, upon which a works should be built in sections. Of eight suggested sites, the experts had no hesitation in recommending the adoption, as being eminently suitable for gas-works purposes, of one at the Twin Island. The report came before the Council at a special meeting, when it was resolved that this site should be selected, and "that the Gas and Law Committees be authorized to take the necessary steps to acquire it." This was in March; and it was calculated to convey the idea that the whole matter was then settled. Not so, however; for now, six months later, we have a full-dress debate at a special meeting of the Council, convened in pursuance of a requisition, as a result of which the resolution selecting the Twin Island site has been rescinded. Of what use is it to call in experts, if their advice is not going to be taken? And of what use is it to authorize the Committee to take the necessary steps to acquire a site, if the site is not to be bought? It must be confessed that there is some little difficulty in following the train of thought of the Council, though, at the same time, it has been long evident that there was in the city a sharp division of opinion on the subject. Over three columns of our news space to-day is occupied with a report of the debate—not anything like in full—and it will be seen that, after the previous resolution had been rescinded, it was unanimously agreed "that the whole question of the extension of the gas-works be referred back to the Gas Committee, with instructions to confer with Mr. J. D. Smith, the new Gas Manager, as to the possibility, with the adoption of modern machinery, of utilizing the present gas-works for some years to come." Here the question for the present must be allowed to rest; but, meanwhile, the members will probably ponder over the warning of the Lord Mayor, as to the probability that, if the matter were ever raised in Parliament on a Bill, "they would be referred back to their decision on the report of their experts."

The Glasgow Exhibition.

"No More Smoke!" Those are the most striking words on the front of the cover of the catalogue of the Smoke Abatement Exhibition that has been organized by the Glasgow Corporation, and is now being held in that city. "No more smoke!" The words arrest attention; and at once meditation starts as to what they really mean when considered in relation to the economies of our daily life and to the advancement of human happiness. The prospect is too extensive for passing reference; but the fact forces itself through even that sombre, heavy pall of smoke that one associates with Glasgow and several other large industrial cities and districts, and in lessened degree with most other centres of population, that Science has so far advanced knowledge, and the lessons have been applied in such practical way, that there is no occasion for the atmosphere of any city or town being transformed from a state of purity to a miasmatic condition in the necessary operation of obtaining heat or power for domestic or industrial purposes. This the Glasgow Corporation have accepted as a material and important fact. It should be so accepted by every local authority throughout the British Isles; and the magnificent example of Glasgow should be followed. If our local authorities would only grasp the simple truth that the sanitation of the atmosphere is of just as much importance as sanitation in other directions, they would set to work at once on a crusade similar to that undertaken in Glasgow—mainly through the instrumentality of the chief Corporation officials more immediately concerned in the question.

Educational Work.

Such a crusade must necessarily be educational in character. People are not to be forced from long-lived and indurated custom. They can only be led. An important contribution to the educational work in Glasgow was the classical report on the relative heating efficiency and contaminating influences of gas and coal fires—prepared by the Corporation Chemist (Mr. F. W. Harris), the Sanitary Inspector (Mr. Peter Fyfe), and the Chief Engineer to the Gas Department (Mr. Alexander Wilson)—which was published and commented upon in the issue of the "JOURNAL" for Jan. 4 last. Now the Corporation have followed this up by an exhibition (which will continue open until Oct. 8, and so will cover the visit of members of the German Association) at which the object-lessons are many—carrying proof that the heavy contribution of countless domestic chimneys to the pollution of the atmosphere is as unnecessary to-day as is the old stage-coach in locomotion. By the cordial assistance of the manufacturers in all

branches of modern smokeless heating appliances, the Exhibition Committee, and the organizing heads of the sections—Mr. Alex. Wilson (Gas), Mr. W. W. Lackie (Electricity), Mr. Peter Fyfe (Smokeless Fuel), Mr. S. B. Langlands (Lighting)—have brought together a show that far exceeds originally-formed expectations; and we most heartily compliment one and all upon it. Gas, electricity, smokeless fuels, and lighting all have their exponents of utility; but gas, it is acknowledged on all hands, has provided the most formidable section. The Gas Department of Glasgow has always done well for the city and district; and had it not been for gas having been supplied for domestic and industrial purposes at the low prices which have obtained, the atmosphere of Glasgow would in these times have been worse than it is. Let us mention just one direction of its effective work. There are 80,000 gas-cooking appliances in use in Glasgow. Supposing the work done by all these cooking appliances required the provision of heat by the combustion of the soft bituminous coals generally employed in Glasgow, it would represent a no mean contribution to the smoke contamination. The exhibition, we hope, will work wonders in forwarding the crusade in the main inaugurated by the Gas Department, and serve to modernize the views of both householders and manufacturers. All who are within convenient reach of Glasgow should take this opportunity of visiting an exhibition of which our Scotch Correspondent (see pp. 772-4) and others who have seen it speak in terms of the highest praise.

Experimental Gas Lighting in the City of London.

Considerable progress has been made during the vacation with the work of installing the various systems of high and low pressure gas lighting that are being experimentally fitted up for the Corporation of the City of London. The Gaslight and Coke Company, having obtained possession of the vaults under the northern approach to London Bridge, are busy putting down the new compressing plant that is to be used in connection with the Cannon Street centrally hung high-pressure gas-lamps fitted with lowering gear, as recommended by the deputation of the Streets Committee of the Corporation as the result of their visit to the Continent. The work of laying the new 6-inch steel main is already well advanced; the Company working night and day, as well as Sunday, on this work in King William Street and Cannon Street. Equally busy are the Company's contractors in fixing to the fronts of buildings the various attachments for holding the necessary suspension wires, services, winch boxes, &c., for lowering tackle; also in the thoroughfares where the ornamental brackets are to be fixed for the four-burner low-pressure inverted lamps—viz., Cheapside and Poultry. Naturally, much of this work has to be done during the night and on Sunday, to minimize the annoyance that would be caused to the occupiers in the heart of the City during the busy hours. At the present rate of progress, it is not unreasonable to expect that the whole of the new lighting may be finished before November; that on the northern approach to Blackfriars Bridge and New Bridge Street having already been completed.

A Weight-Driven Petrol Plant.

A petrol plant for lighting and heating, driven by a wound-up weight, in a manner precisely similar to a grandfather's clock, is now being manufactured by Messrs. Mansfield and Sons, of Derby Square, James Street, Liverpool; and the principle is found so satisfactory in operation that the firm are recommending it in preference to plants driven by a hot-air motor. The only attention required is the daily winding-up of the weight, which takes not more than five minutes, and can be done by anyone. These plants are absolutely automatic, starting themselves, accelerating themselves, and stopping themselves, according to the number of lights in use; while it is claimed that the quality of the gas made never varies, whether one or two lights or the maximum number for the apparatus are in use. It is, say the makers, a plant that can be depended upon to give the best effects; and at the same time it eliminates the great difficulty of selective evaporation of petrol. In fact, the aim of the Mansfield plant, and what it is guaranteed to accomplish, is the attainment of the very good results which can be depended upon for a definite quantity of air and a definite quantity of petrol which will vaporize without the troubles of selective evaporation.

Scottish Junior (Eastern) Gas Association.—The opening meeting of the session will be held in the Heriot Watt College, Edinburgh, next Saturday. In addition to the inaugural address of the President (Mr. Walter Dunlop, of Kirkcaldy), there will be a short address by Mr. J. Falconer King, F.I.C., F.C.S., City Analyst of Edinburgh. The programme of the session 1910-11 includes four business meetings, and visits to the works of Messrs. Henry Balfour and Co., and the gas-works at Leven, to the Bonnybridge Fire-Brick Works of Messrs. James Dougall and Sons, to the Fife Coal Company's Colliery, and to the Airdrie Gas-Works—jointly with the Western Section of the Association.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 792.)

AGAIN the apparently never-ending theme of our weekly review of doings on the Stock Exchange is—with almost exasperating iteration—a state of things approaching absolute inaction. And a remarkable feature of it is the cheerful tone which generally prevails in spite of it. Markets are in a condition of suspended animation; and if they do not rise, they do not fall. On the opening day, the tide was fairly favourable, though Consols gave way $\frac{1}{2}$. Railways were better, on hopeful views prevailing as to the labour embroglio. The Foreign Market, too, was strong; and Americans, doubtful at first, grew firmer later on. On Tuesday, the settlement was in course, and, being a light affair, caused no perturbation. The general tone was good. Consols rose $\frac{1}{2}$ on some little buying with cheap money; Railways brightened on good traffics and prospective pacification; the Foreign Market was firm; and Americans rose at the bidding of Wall Street. On Wednesday, there was some promise of rousing from the torpor. The tendency was good in most lines; and a feature of the day was the strength of brewery stocks. But on Thursday things fell back again into their old state of quiet, coupled with a weaker tendency. Consols fell $\frac{1}{2}$, Railways were dull, and many of the popular speculative markets were weak; but breweries were again in favour. On Friday, there was something of the usual Friday realization, which set the tide back here and there, but there was nothing at all pronounced. Saturday was dead-quiet. There was nothing doing; but no weakness supervened, and the little movement, such as it was, was for the better. In the Money Market, the supply was excessively abundant, frequently seeking employment and finding none. In the Gas Market, there was a fair amount doing in the aggregate; but it was nearly all confined to the three biggest issues, coupled with the South American. Everything was very firm, and quotations continued to advance. In Gaslight and Coke issues, the ordinary was very firm at from 105 $\frac{5}{8}$ to 106 $\frac{1}{2}$. In the secured issues, the maximum marked 88 $\frac{1}{2}$, the preference from 103 $\frac{1}{2}$ to 104 $\frac{1}{2}$ (a rise of 1), and the debenture from 80 $\frac{3}{4}$ to 81 $\frac{3}{4}$. South Metropolitan was firm at from 121 $\frac{1}{2}$ to 122 $\frac{1}{2}$; and the debenture was done at 79 $\frac{1}{2}$. In Commercial, the 4 per cent. changed hands at 105 $\frac{3}{4}$, the 3 $\frac{1}{2}$ per cent. at 103, and the debenture at 81 $\frac{1}{2}$. Among the Suburbans and Provincials, Alliance and Dublin was dealt in at 83 to 83 $\frac{3}{4}$, Brighton ordinary at 155 and 156, and South Suburban at 121. On the local Exchanges, Liverpool "A" changed hands at 216 (a rise of 3), and Sheffield "A" at 230. In the Continental companies, Imperial was active and firm at from 186 to 187 $\frac{1}{2}$, ditto debenture marked 92 $\frac{1}{2}$ and 93 $\frac{1}{2}$, Union 98 and 98 $\frac{1}{2}$, European 23 $\frac{5}{8}$ and 23 $\frac{3}{4}$. Among the undertakings of the remoter world, Primitiva was dealt in at from 7 $\frac{1}{2}$ to 7 $\frac{3}{4}$, ditto preference at from 5 $\frac{1}{16}$ to 5 $\frac{3}{8}$, ditto debenture at 98, and San Paulo at 16 $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Why Municipal Authorities and not Companies?—Tariff Principles—Terrible Fear of the Gas Expert—More Electrical Cooking Fancies.

CONTROVERSY continues around the London street-lighting contracts; the electricians seeking their hardest to minimize in the public sight the severity of the defeats encountered. But it is so difficult. They have to resort to evasion and distortion of facts. There is a very important fact that they avoid as much as possible. And it is the influence that municipal possession of electricity undertakings has upon this question in the majority of instances. The "London Observer"—an anti-municipal trading paper—has grasped the point; for it says "the fact that those local authorities which are not burdened with an electricity undertaking of their own are gradually substituting gas for electricity shows which is the more economical illuminant." Our contemporary might also have said that, in nearly all those boroughs in which the councils are not the owners of the electricity supply undertakings, the authorities have not been persuaded by the electricity supply companies that a change from gas to electricity would be an economical procedure. The Chairman of the Electric Supply Publicity Committee (Mr. H. B. Renwick) makes the point, in a letter he has addressed to the newspapers, that "only ten out of the twenty-nine London authorities are wholly without electric street lighting." The "wholly without," of course, suggests that some of those with electric lighting have precious little of it, and that the bulk of their lighting is still by gas. But Mr. Renwick would have sadly spoilt his point had he said that no less than fourteen of the nineteen electricity patronizing boroughs were the owners of the electricity supply undertakings, and that the Hackney and Bethnal Green Councils have put a stop to further progress in street electric lighting by entering for a term of years into a new contract for gas lighting. But if we add the ten boroughs to the fourteen possessing electricity undertakings, there are at once 24 boroughs accounted for out of 29. And if Mr. Renwick makes a close inspection of the returns of the London County Council, he will find five boroughs to make up the 29 with a number of electric street lamps of which he would not care to boast, in case some unkind critic produced the corresponding figures for gas. Thus it will be seen what a big influence ownership of the electricity

undertaking has upon this street lighting question. It would be an interesting study for those who have time to devote to it, to ascertain the reason why borough councils not owning electricity supply undertakings, and so being disinterested, cannot find any economy for the ratepayers in public lighting by electricity, while the councils supplying electricity think that they can, or say that they can. We fancy their economy is of the sort referred to in the "Memoranda" last week in connection with Marylebone; and in it all there is more than meets the eye through the medium of the figures published by the electricians. We may conclude this reference by pointing out that the number of street lamps under supply by the three London Gas Companies at June last was 77,349; while the County Council returns for 1908-9 show that the total number of electric arc street lamps in use in the administrative area (which is not, being somewhat larger, coterminous with the areas of the three London Gas Companies) was then 6574, and other varieties of electric lamps numbered 2641—a total of only 9215, against the 77,349 gas-lamps. Of the totals for electricity, 4859 arcs and 2429 of the incandescent type were in the municipal electricity supply areas. The figures for the electric lamps require some amendment, owing to the conversions from gas to electricity during the past year in Marylebone, Hampstead, and Shoreditch. But the figures for gas are absolutely correct up to June 30 last.

That perennial subject of discussion and heart-burning, the charges for electricity supply, had an innings before the Economic Section at the meeting of the British Association, in a paper read by Mr. E. W. Cowan—a paper which, through the lofty style of its author, requires a depth of investigation to get to the bottom of his reasoning. His contention is that electrical engineers blunder, and blunder seriously, in founding their tariffs for electricity on the cost of production, and particularly so when they endeavour to obtain equal profits from each class of custom. It would be too much of a "fag" to endeavour to penetrate the whole of Mr. Cowan's opacity; and so we take a few lines from the "Electrical Times," which attributes to the author the view that the mistake of electrical engineers is due to "their regarding electricity as a single commodity, whereas it is really light, heat, and power that they offer for sale. And each of these commodities has its own market value, determined not by the cost of production, but by demand." But although electrical engineers are charged with making this mistake, and, almost with common consent, reject the "principles" laid down by Mr. Cowan, when we make a comparison of some of the tariffs that come before us with the "principles" of Mr. Cowan, it is impossible to find that he has much to complain about. Turning to an abstract of the paper given in the "Electrical Review," we find illustration of what happens when regard is had for demand, and consideration for cost of production is set on one side: "Assume that the conditions of supply are such, in a supply works, that doubling the output would reduce the cost of production per unit by 25 per cent., and further assume that 1,000,000 units per annum are demanded for lighting purposes at 4d. per unit, and that the mean cost of production also amounts to 4d. per unit at that output, so that no profit is made by the undertaking. Then let us suppose that a factory within the area of supply offers to take another 1,000,000 units per annum at 2½d. per unit, under the same conditions in respect to the 'load factor,' 'diversity factor,' &c., as the existing supply. With the output doubled, the mean cost of production per unit will be reduced from 4d. to 3d., but only 2½d. is offered. Is this consumer's offer to be accepted at a price which represents a 'loss' of ½d. for every unit supplied to him? Under the maximum demand system he must be refused; and yet, if we figure it out, we find that an aggregate profit of 500,000 pence will be made by the undertaking with this customer on their mains, and, *ex hypothesi*, they can earn no profit without him." But supposing a few more factories spring up, requiring two or three million units per annum at the same price, how is the undertaking going on then? We have not the time to figure the matter out; but there is a lurking feeling that the principles of Mr. Cowan would not have any very gratifying bearing upon the ultimate financial success of the concern.

A laughable incident has occurred at a meeting of the Hastings Guardians; and it shows a curious twist in the economic ideas of these trustees of the public interests. The lighting of the workhouse and the cooking is now done by gas, and has been since 1903, when the house was built. The gas account comes to something like £280 a year. It has before been matter of comment in these columns that representation on local bodies (such as boards of guardians) by members of municipal authorities owning electricity plants does not tend to a fair consideration, from the points of view of economy and efficiency, of the question of the lighting of such establishments as workhouses, infirmaries, and some other public institutions. Attempts have previously been made to evict gas from the Hastings workhouse in favour of electricity; but the capital cost of wiring the institution has been found to be an obstacle. Now another effort is being made; and a member of the Corporation Electricity Committee who is a guardian, by the fairly positive statements that he advanced when the matter was under discussion by the Board, showed pretty conclusively that he had come to the meeting well primed by the Electricity Department to show what they were prepared to do. The question was discussed on a motion by Mr. Slack, that the matter be referred to the Building and Repairs Committee to obtain an estimate for wiring the place, and to inquire of the Town Clerk whether the Corporation would be prepared to supply electricity at the same cost as gas.

Up rose Mr. Hill, a member of the Corporation Electricity Committee, and endeavoured to instil into the minds of his fellow members that the cost of wiring was a mere bagatelle. Supposing it cost the insignificant sum of £500 (which does not include the money spent on installing gas), interest and sinking fund would only represent about £40 a year; and it was just possible that the Electricity Committee would take £40 less a year than was now paid to the Gas Company. [Are we to understand that this would include cooking?] This is certainly municipal "management" with a vengeance.

So things looked simple enough; but another member of the Board (Mr. Hunter) dropped a fly into this beautifully prepared pot of ointment. He saw that the proper course, in the interests of economy, was to call in Mr. Botley, the Gas Company's Engineer, to see whether he could advise any improvement in the present system of lighting, combined with the realization of economy, in view of the advances gas lighting has made. But a majority of the Guardians were afraid of Mr. Botley, and had some notion that he would spoil the little plan devised in the interests of the Electricity Department. So they resolved to dispense with Mr. Botley at this stage. This is funny. There is the whole place piped for gas; and the Guardians have no knowledge whether or not additional efficiency and economy can be secured from the existing installation. The influence of the Electricity Department so overpowers them, and over-rides their sense of duty in relation to the guardianship of the poor-law purse, that they must ascertain first (and preferably only) what electricity can do for them. That is the position. But before the Guardians commit themselves to anything, it is hoped they will throw off the electrical shackles, recognize their responsibility as an independent public authority, and open the matter of lighting to fair and unfettered competition between the Gas Company and the Electricity Department. There was also some talk respecting the "safety" of electricity at the Guardians' meeting. We have heard of a few extinctions of the electric light at Hastings; and the Guardian who used that word "safety" cannot surely have been carefully reading his newspapers since last Christmas, or certain tragic occurrences would not have escaped notice. While the Guardians are waiting for the reply of the Corporation Electricity Department, peradventure they may find something to interest them in a report of a Departmental Committee appointed by Mr. John Burns to inquire into (*inter alia*) this matter of the lighting of poor-law institutions. The report was dealt with in the "JOURNAL" for March 9, 1909 (pp. 679, 700).

An article copied from an American source on "Cooking and Heating by Electricity" has been published by the "Electrician." The author is Mr. P. A. Bates, and, in the course of his writing, he makes use of the usual extravagances of the electricians. Among other of his "facts" is this, that it has been found that, with the ordinary gas range only 15 per cent. of the heat produced is usefully applied, while, with the various high-grade electrical cooking devices now obtainable, 70 per cent. or more of the heat produced is utilized. Judging by recent correspondence in our electrical contemporaries, of high-grade electrical cooking devices—adopting the laconic information contained in a famous chapter on snakes in a certain country—"there are none." The 15 per cent. efficiency of gas ranges is absurd. But supposing it were true, taking a unit of electricity at 1d., and 30 cubic feet of gas purchasable at 1d., the 15 per cent. would exceed in useful B.Th.U. the 70 per cent. ascribed to electricity. Taking gas-fires, certain of our makers have so far improved these that 50 per cent. of the heat developed is now given off in the shape of radiant heat, a smaller percentage as convected heat, and the balance escaping up the flue, and partially necessary for creating a draught, has been considerably reduced. But to return to electrical cooking, the advantages stated by Mr. Bates are: Rapidity with which food may be—not can be—cooked, uniformity of the temperature obtained (which makes cooking by the clock a possibility), comfort and convenience, cleanliness, freedom from smoke and smell, and food free from all gas or odour. There is a big field over here in which Mr. Bates could profitably exercise his talents in advising the manufacturers of electrical cooking appliances. What a pity it is they do not invite him, and make it worth his while to come, over here to aid them. But, after reading all that Mr. Bates has so far said, an astonishing thing is that in America "there are few noteworthy installations; and of these the number that have been tested with the view to obtaining exact and useful information as to actual performance is astonishingly small." We wonder then whence Mr. Bates got the information which enables him to speak so positively. As to the taint from gas fumes, we have seen electrical engineers make a good square meal off gas-cooked (and in the electrical imagination, gas-tainted) food; and they have looked very comfortable afterwards. A large proportion of the 40 to 50 per cent. day load of gas undertakings is represented by the consumption of cooking-stoves, and at lighting prices too. The people of this country must surely be fond of gas-tainted food. Is it not time that electricians dropped their ridiculous talk on this subject?

For the position of Manager of the Rochdale Corporation Water-Works, rendered vacant by the resignation of Mr. W. T. Tomlinson, after forty years' service, 91 applications have been received. The salary offered is £250 per annum, rising to £350 by four annual increases of £25.

OBITUARY.

JAMES STELFOX.

THOSE connected with the gas industry, among whom he was widely known and deservedly much esteemed, will learn with deep regret of the death of Mr. James Stelfox, M.Inst.C.E., who for over thirty years held the position of Manager of the Belfast Corporation Gas-Works, with—to quote the words of a resolution unanimously passed by the Council—credit to himself and profit to the community. Born at Salford (where his father was Gas Manager) in 1842, Mr. Stelfox was in his 69th year. After his retirement in 1906 on a substantial allowance, he was laid aside by illness, as his friends know, for a long time; but he had apparently quite recovered from this, and his death (which took place at his residence, "Delamere," Chlorine Gardens, Belfast, last Sunday week) was somewhat sudden and unexpected. On the Saturday morning he was about as usual; but during the night he became ill, and subsequently had an apoplectic seizure—passing peacefully away about midday.

In 1852, his father—Mr. James Stelfox, sen.—was appointed Manager at the Belfast Gas-Works, then the property of a private Company, with headquarters in Leicester. Under his direction, the works prospered more than ever they had done before. The undertaking remained in the hands of the Company until July, 1874, when it was taken over by the Corporation; the terms of purchase having been arranged in the previous year. On the transfer, Mr. Stelfox, sen., was continued in the office of Engineer and Manager; but he had intimated to the Corporation that he would only hold the position temporarily, and when he retired the following year his son was selected to fill the vacancy. The new Manager was by no means a stranger to the duties which thus devolved upon him, as he had for many years been associated with his father in the control of the undertaking. Beginning his connection with the establishment at the age of sixteen, immediately after leaving the school which he had attended in High Street, he was, while still quite a young man, deputed to act as accountant and book-keeper, and later was appointed general assistant to his father. In the latter capacity, he acquired a great deal of knowledge that he turned to good advantage when he was entrusted with the chief control of the works.

Everyone who knew the deceased will agree that all his work was characterized by thoroughness and ability; and it will be admitted that the success which has attended the Gas Department was largely due to his wise supervision. One of the most important changes made during his managership was the introduction of carburetted water gas. This step was taken some sixteen or seventeen years ago, at a time when the large increase in the demand for gas had led to very great congestion in the works, and the difficulty of securing a site for suitable extensions was severely felt. Mr. Stelfox was confident that the manufacture of water gas would prove effectual as at least a partial relief; and the result of the experiment was satisfactory. He devoted a great deal of time to superintending the carrying out of the project. It was also during his tenure of office that prepayment gas-meters were introduced into the city; the first of these having been fixed on Jan. 20, 1904.

Mr. Stelfox's wife (who won golden opinions during the time of the Gas Institution meeting in Belfast, when her husband was President some dozen years ago) died about nine years since; but he is survived by three sons and two daughters. In addition to his engineering qualifications (which led to his being elected a member of the Institution of Civil Engineers in 1896), Mr. Stelfox was an ardent naturalist; and he found his principal recreations in photography and microscopy.

It was announced that the funeral was to be of a strictly private character.

PERSONAL.

The Directors of the Derby Gas Company have decided to allow their Engineer (Mr. J. FERGUSON BELL, M.Inst.C.E.) to take private practice, from which he has hitherto been restricted except under special circumstances; and they have appointed Mr. W. E. CATON to be Assistant-Engineer.

Mr. JOHN CHAPMAN MOUNT has tendered his resignation as Borough Surveyor and Water Engineer to the Lancaster Corporation; and it will come before the Council at their next meeting. Mr. Mount was trained under Mr. Creer and Mr. John Cook, now Engineer to the Fylde Water Board. He succeeded Mr. Cook in 1902.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—The next meeting of the Institution will be held in the Gas Offices, Newport (Mon.) on Wednesday of next week. The proceedings, which will open at 11 o'clock, will include the Inaugural Address of the President (Mr. J. H. Canning) and a paper by Mr. T. Canning. It is also intended to consider, and if approved pass, the rules of the "Special Purposes Section," and receive a report on the proposed evening classes. At the close of the meeting, the members will adjourn to luncheon at the Savoy Hotel, on the invitation of the Chairman and Directors of the Newport Gas Company; and a visit will afterwards be paid to the Crindau Gas-Works, under the direction of the Engineer, Mr. T. Canning.

A NEW WEST-END SHOW-ROOM.

No one who "knows his London," in these days of motor omnibuses, tubes, and other means of conveyance, will be inclined to question the accessibility of Oxford Circus, and therefore its convenience as a position for a gas apparatus show-room. In addition to this, the neighbourhood has another and even greater advantage for the purpose named—it lies in the very heart of the shopping centre. Hereabouts the ladies throng; and it is, of course, the ladies who are likely to have more to say in the matter of gas-stoves than anyone else.

These considerations led Messrs. R. & A. Main, Limited, to take some very extensive premises at No. 25, Princes Street, W., which are situated within a stone's throw of Oxford Circus itself. Handsome show-rooms have here been fitted up, which will afford ample scope for the proper display of the firm's numerous specialities. Besides the ground floor area available, which measures about 70 feet long by 22 feet wide, there is a large window space so arranged as to afford an unobstructed view of all the goods shown. In fact, the insurance people state that the window is the biggest piece of plate glass they have ever insured. The polished floor and oak fittings set off to advantage the array of gas cookers, fires, radiators, &c., which are the occupants of the show-room; while a roomy basement is available for the larger apparatus which is suitable for hotels, restaurants, clubs, hospitals, and so forth. Downstairs, also, quite a fine workshop is being fitted up, so that repairs can be promptly undertaken. A large private office is to be found on the ground-floor; and upstairs there is a comfortable, top-lighted drawing-office. In a gas show-room, of course, artificial lighting is an important point; and it is one that Messrs. Main would not be likely to neglect. There is in position a fine installation of Bland burners; and the whole of the front of the building will later on be lighted by means of high-pressure lamps, for which purpose compressors and a gas-engine are to be installed. Street and other lamps will be fitted in the basement as well, so as to demonstrate their capabilities.

Under the courteous guidance of Mr. A. P. Main, a representative of the "JOURNAL" was last week able to assure himself that the scheme laid down will admit of the best possible use being made of the ample accommodation available. In the show-room proper, hidden flues have been fixed so that eight gas-fires can be seen in operation at one time; the whole of the products of combustion being carried away into the chimney. Four of these are on either side of a "St. Nicholas" grate-fire, which has an attractive polished steel and brass setting; and an inspection of this, naturally led Mr. Main to speak of the firm's latest departures in the heating line, an illustrated description of which will be found in another column, under the heading of "Simplicity in Gas-Fires." The "St. Nicholas," to which may first be devoted a word or two, is not absolutely a newcomer, as it was introduced last year. It is, however, quite new enough, and successful enough, to deserve special attention. Its success was manifested by the fact that at the Dundee Gas Exhibition—the first place where it was shown—no less than 320 were sold in one week. The "St. Nicholas" adapts itself to any modern grate interior; and no fitting is required. The existing bars of the grate are simply lifted out, the gas-fire pushed into position, the supply connected, and the fuel correctly laid. No burner is visible; and the similarity to a coal-fire is enhanced by the fact that the top layer of fuel is black. It is perhaps hard to understand why anyone should prefer the appearance of a coal-fire to that of a gas-fire; but such people do exist, and for them the "St. Nicholas" is a boon and a blessing. As the result of considerable experiment, the exact angle has been settled at which the fuel should be placed for making the gas draw right through to the back of the fire from the vertical nozzles. The fuel projects well in front of what would be the case were coal being used in the grate; and the fire is very low down—which is regarded as a big point with the public nowadays. There is a simple gas and air adjustment, and the burner is reversible; while a boiling-trivet and a toaster may be attached to the fire if desired.

Leaving the grate-fire type, attention was drawn to the new "D. S. O." series of gas-fires, the main features of which will, as already mentioned, be found outlined elsewhere. Realizing the need for cheapness in popularizing the gas-fire, the firm have in this series reduced the number of castings to two—the fire itself and the flue-chamber at the back—and the design has been made as simple as possible, though, of course, ornamentation can be added if desired. They are absolutely barless; and interchangeability is not a feature, as there is nothing to interchange, and no screws to undo. It was a nursery fire that Mr. Main had at hand when explaining the advantages of this new series of stoves; and he pointed out that, if objection were taken to the open front, a detachable brass fire-guard could be supplied. There is a boiling-burner at the top, and a filling-in plate for placing over the burner when it is not in use. Emphasis was also laid on the reversible burners and the simple form of air adjustment. The patent fuel extends from the fret right up under the canopy. A good flue is thus created; and the fire has a finished appearance. Another thing is that the fires are absolutely adaptable to any standard make of long fuel, should gas undertakings be possessed of stocks that they desire to use up. But naturally the firm recommend their own fuel, which has been designed to secure certain definite objects. The fuel is so tilted that if broken it would not fall forward; but this tilting has a further object—inasmuch as it has a

tendency to bring the flame, going up, to the front of the fuel, where it is wanted. But there is another important feature besides the fuel. Mr. Main mentioned that, in the course of the discussion at the last Institution meeting, the question of getting the very best results from the new type of fires was brought up; and attention was drawn to the importance of the canopy in this respect. The ordinary canopy would be open in front to catch the fumes. One speaker, however, pointed out that, with a fairly strong chimney draught and a wide open canopy, a large quantity of air would be drawn across the front of the incandescent fuel, thus cooling the fuel. To meet this objection, there is added to the patent fuel a patent brick, which forms a hot-air chamber behind the canopy. The products of combustion are led up through the fuel into this brick. The flame is thus given time to do its work, and the heat is not drawn away up the flue.*

LABOUR DISPUTES DURING 1909.

It cannot be claimed that Labour is failing just at the present time to get its fair share of attention in the public Press. If anything, one would be inclined to say that the opposite was the case; but then it must be remembered that big issues are at stake. The Labour leaders are dissatisfied with the law of the land; the members of the Trades Unions are dissatisfied with the leaders; and the employers are dissatisfied with the actions of their men. The result in the three cases respectively is agitation, insubordination, and retaliation. Strikes and lock-outs are once more the weapons of which the disputants are evincing a disquieting readiness to make the fullest possible use. The end is yet to come; but, meanwhile, as the subject is so much to the fore, the appearance of the report of the Labour Department of the Board of Trade on Strikes and Lock-Outs in the United Kingdom during 1909 (which is signed by Mr. G. R. Askwith) may be considered opportune. It is the twenty-second volume of the series; and it deals also with the work of the Conciliation and Arbitration Boards. Notice of the latter may be left to another occasion; the strikes and lock-outs of last year will be sufficient to take note of in the present article.

The result of a dispute which involves a cessation of work, is impossible to calculate with absolute exactness, as the immediate outcome (whether it may be the gaining of their point by the masters or the men) may be far more than offset by temporary or permanent effects of the trouble on the trade concerned. For once in a way, the principal cause of disputes last year was not wages, but hours of labour. This, of course, was owing to the interference with previously existing conditions which arose from the operation of the Mines Eight-Hours Act. Of the 170,258 workpeople directly involved in the disputes commenced in 1909, 87,367, or 51 per cent., were concerned in disputes on questions of hours of labour. In the nine preceding years the question of wages was the most frequent cause of trouble; but the proportion of wages disputes has varied considerably—falling as low as 49 per cent. in 1902, and rising to nearly 79 per cent. in 1908. Last year, the proportion was only 25 per cent. Disputes as to the employment of particular classes of persons were more numerous in 1909 than the previous year. The majority of the workpeople engaged in them were in the coal-mining industry, and were concerned in questions arising out of the suspension or discharge of fellow-workers. Disputes on details of working arrangements (about three-fourths of the people involved in which were in the coal-mining industry) were about the same in number as in the preceding twelve months, but involved fewer workers. Troubles arising out of refusals to work with non-Unionists, and other questions of Trade Union principle, showed little change. Of the 12,935 employees directly connected with these disputes, 78 per cent. were engaged in the coal-mining industry—nearly all being in South Wales and Monmouthshire collieries, where for years past, as the report points out, a continuous effort has been made by the South Wales Miners' Federation to compel all non-Unionists to join that body.

An interesting table is that which shows to what extent the disputes of the year were settled in favour of the employers or the workpeople, or were compromised. In disputes arising on questions of wages, the striking feature is the small proportion of workpeople who obtained complete success—whether seeking an advance in wages, resisting a proposed reduction, or disputing on any other points that affected wages. Only 10 per cent. of the workpeople involved in these disputes were completely successful, while 41 per cent. were entirely unsuccessful, and 47 per cent. effected compromises. In disputes regarding hours of labour, the great majority of the workpeople involved were, as already remarked, connected with the branch affected by the Coal Mines Regulation Act, in most of which cases amicable settlements were effected between the parties. In troubles arising out of questions of Trade Union principle, the great majority of the strikers were successful; but, as usual, in a number of instances the disputes were between one body of workpeople and another, and not between employers and employees. In all other classes of disputes, the balance of success was on the whole against the workpeople, who were completely successful as regards only 15 per cent. of their number, while 52 per cent. were unsuccessful, and 32 per cent. effected compromises. Taking all the disputes of the year together, the report says, it is found that only 11·2 per cent. of the workpeople directly involved were completely successful in attaining their object; and this proportion would be mate-

rially reduced if disputes concerning the employment of non-Unionists (which do not usually concern the employers to the same extent as other disputes) were excluded. The proportion of workpeople who were unsuccessful was 22·2 per cent., and of those who effected compromises 66 per cent. The proportion of workpeople successful in the previous year was about 3 per cent. smaller than on this occasion, and that in favour of the employers greater to the same extent—the percentage compromised remaining practically the same. From these figures, it would seem that there should be no difficulty in arriving at the conclusion that the strike is a hazardous weapon to employ. The chance of success is, on the whole, smaller than the risk of failure; while when the result is a compromise, it could doubtless often be truly urged that a similar end might have been attained without the adoption of such extreme measures.

The total number of disputes which began last year was 436, as compared with 399 in 1908, and 601 in 1907; but though the number was thus substantially larger in 1909 than in 1908, the total workpeople involved was only about 5000 more—the persons directly and indirectly concerned being 300,819. The workpeople indirectly involved are those thrown out of work at the establishments where the disputes occurred, although not themselves on strike or locked-out. Workpeople indirectly involved at other establishments than those at which the disputes occurred are not included. The aggregate duration of all the disputes in progress during the year amounted to a little more than 2½ million working days. The number of workpeople involved was the highest since 1894, the year of the general strike in the Scottish coal trade. This increase was largely due to the stoppage of work which occurred in a number of the principal coalfields, consequent on the failure mutually to adjust conditions of working when the Coal Mines Act of 1908 was put into operation. In fact, of the 300,819 workers involved in all the disputes of the year, 49 per cent. were idle through this cause. Fortunately, the disputes were short; and as there were no other serious stoppages of a general character, the aggregate duration of all the disputes in progress in 1909 amounted to little more than one-quarter of that recorded for 1908, when there were great disputes in the engineering, shipbuilding, and cotton trades.

The proportion of the total number of workpeople employed in the various industries who were involved in disputes last year (though the highest recorded since 1894) was only 2·9 per cent., as compared with a similar figure in 1908, and 1·4 per cent. in 1907. The proportion was highest in the coal-mining industry, where it amounted to 26·5 per cent., and was lowest in the building trades. As stated above, the mining and quarrying industries in 1909 accounted for the greatest number of workpeople involved in disputes—over 90 per cent. of the workpeople engaged in all the disputes of the year being in these industries. Apart from the Mines Act disputes, there was a considerable increase in the numbers involved in coal-mining disputes in 1909, as compared with the six previous years. Other industries were comparatively free from disputes; this being specially marked in the metal, engineering, and shipbuilding trades and in the textile industries, in both of which groups the figures were the lowest on record. The aggregate duration of all the disputes in progress in 1909—2,773,986 working days—was less than one-thousandth of the whole number of working days available for the industrial population, exclusive of agricultural labourers and seamen. Thus, when spread over the entire industrial population, the amount of working time lost owing to disputes in the year 1909 was only about one-quarter of a day per head. In the coal-mining industry, the average loss of time was about two days per head of those employed; while in the metal, engineering, and shipbuilding trades it amounted to only about one-eighth of a day per head. The majority of the disputes were, as usual, of short duration—42 per cent. of the 436 disputes which began in 1909 having lasted less than a week, while the proportion lasting less than a month was 74 per cent. Of the 2,773,986 working days lost in 1909, the mining and quarrying industries accounted for 80 per cent.; while the duration of disputes in those industries was, with the exception of 1902, the highest in the past decade.

Coal-mining disputes were responsible for a loss of 2,168,508 working days, and other mining and quarrying industries 60,979 days. Of the 207 disputes in the mining and quarrying industries which began in 1909, wages accounted for 124, hours of labour for 16, employment of particular classes of persons for 22, working arrangements for 21, Trade Unionism for 9, and miscellaneous causes for 15; but in the 16 hours-of-labour disputes more than one-half of the total number of men affected by stoppages were concerned. Of the nine "Trade Unionism" strikes—probably all arising through refusal to work with non-Unionists—seven ended in favour of the men, and two were compromised. Altogether, in these two industries, the proportion of workpeople successful in the disputes beginning in 1909 was 10·2 per cent., unsuccessful 19·4 per cent., compromised 69·8 per cent., and indefinite or unsettled 0·6 per cent.

Association of Engineers-in-Charge.—At the annual general meeting, the Chairman (Mr. A. E. Penn) was able to give a very satisfactory account of the Association from all points of view; and he announced that the President-elect was Captain H. Riall Sankey, whom they all knew so well and held in such high esteem. When the time came for taking up his position, they would, he said, find Captain Sankey with an excellent address.

TRADES UNION CONGRESS.

Meeting in Sheffield.

FOLLOWING close upon the meeting of the British Association in Sheffield, the Trades Union Congress this year assembled in the same city—after an absence from it extending over 36 years. It was the forty-third annual gathering; and at the opening session in the Victoria Hall, on Monday of last week, there were 501 delegates present, representing 1,700,000 members. Generally speaking, the questions figuring on the agenda for consideration were much of the same character as those which we have been in the habit of seeing discussed at these meetings. But an incident in connection with the very outset of the proceedings gave rise to excitement. The Lord Mayor of Sheffield (Earl Fitzwilliam) having, it appears, had a lock-out of the men at his Elsecar Collieries, and having refused to negotiate with their leaders—the Yorkshire Miners' Association—the Congress Reception Committee felt they could not accept his hospitality as Lord Mayor. For some days previous to the congress, negotiations were proceeding; and it was not until the eleventh hour that the officials were able to announce that the Earl had receded from his original position, and had agreed, if the trouble could not be settled without arbitration, to negotiate with the Miners' Association. This made it possible for the Committee to adhere to the arrangement proposed, under which the Earl was to officially welcome the congress to Sheffield and subsequently to entertain the delegates at a reception. This programme was duly carried out amid general satisfaction. It is true that two delegates left the meeting as a protest; but we do not gather from the Press reports that they were greatly missed. "Sweet reasonableness" is not invariably an outstanding feature of Trades Union policy; and thus one is the more ready to acknowledge the good sense shown by the vast bulk of the delegates in regard to the welcome and reception of Earl Fitzwilliam, when he had consented to an arrangement which was perfectly acceptable to the men directly concerned. The congress having been opened, a large part of six days was spent in discussing matters, practical and otherwise. We have heard most that was said before; but a new programme cannot be expected every year, while so much of the old ones remains unfulfilled. The Osborne judgment was, however, somewhat of an exception, and as such the most was made of it.

Naturally the chief item in the first day's proceedings was the address of the President, Mr. J. Haslam, M.P., who began by referring to the existing unrest in the Trades Union world, and sounded a warning to which heed will have to be given in some quarters, if the whole fabric of Trade Unionism as it now exists is not to be brought to the ground. He pointed out that the principle underlying the Trade Union movement was that of collective bargaining; and they must do all they could to maintain the power of collective bargaining, which, on the one hand, demanded recognition from the employers, while, on the other, it equally demanded confidence in the leaders of the Trade Unions and the officers of the various organizations. They must urge upon the members of the different Unions the absolute need for loyalty and discipline, if their word, and their bond, and their agreements were to be respected. On the subject of the decision of the House of Lords in the notable Osborne case, the President's remarks were very much as might have been expected. So long, he said, as this decision remained the law of the land, their work would be hindered, and the full effects of organization would not be realized. Right along from the year 1872, when the first two representatives of Labour were elected to the House of Commons, to the decision in the Osborne case, the Trade Union world had no other idea than that it was one of their objects, not only to work for, but to maintain in Parliament Labour men representing the Trade Union forces of the country; and from 1874 onwards the funds of Unions had been applied to the purpose of paying and returning members to the House of Commons. They would gather from this that at least from a moral point of view no members of the Unions could claim that the money had been paid in ignorance. Every member of a trade organization ought to have known that it was part and parcel of the work of their Union. Even those who had taken action against the Amalgamated Society of Railway Servants had themselves, by their conduct, proved conclusively that they had no objection to Labour representation so long as it was of a character which they themselves approved of. For years and years these men were content to pay for Labour representation; and it was only when, through the formation of the Labour Party some ten or eleven years ago, the forces of Labour as representing the Trade Union movement and the Independent Labour Party were brought together, that objection was taken. So far as the costs were concerned, this one case would take from the funds of the Unions something like £8000. About £3000 of the amount would be borne by the railway servants themselves. The remainder—amounting to almost £5000—would have to be borne by the Affiliated Unions of the Labour movement, and levies would be made in order to defray it. In addition to this case, the many injunctions which were now being sought were costing the Unions in some cases hundreds of pounds, and in his view unjustifiably, because in no single case had a Union embarked upon Labour representation without receiving instructions from members by ballot-vote—in almost all instances with overwhelming majorities in favour of the principle. "My view," he continued, "is that

nothing short of the reinstatement of the Unions' position previous to the Osborne decision can be accepted. For nearly fifty years, Trade Unionists have carried on this work, not only with advantage to ourselves, but to the country as a whole. Subjects affecting the workers, organized and unorganized, have received the attention of parliamentary representatives; and I claim that the influence of Labour in Parliament has been for the good of the community."

The report of the Parliamentary Committee, the discussion of which was the main business on the second day, contained a statement which may be said to amount to an assertion that promises have been more plentiful than performances in the way of Labour legislation since the present Government came into power. On the other side, "Labour has experienced, through the Courts of Law—and by no means for the first time—one of those periodical attacks which it is accustomed to receive from those whose duty it is to hold the scales of justice evenly; the decision in the Osborne case being an undisguised attack on the hitherto unchallenged right of the Trade Unionists to engage in political work and to send forward and maintain representatives in the House of Commons. As in the past, so in the future, must Trade Unionists assert themselves by active and vigorous efforts to regain the freedom of engaging in political action, of which, for the time being, judge-made law has deprived them." The concluding paragraphs of the report were of a decidedly optimistic character: "In the event of what is known as the 'conflict between the two Houses' being settled in a satisfactory manner, thereby avoiding another appeal to the electorate, the coming session should be productive of much good so far as the interests of Labour are concerned. Your Committee gladly welcome the determination of the Government to press forward and pass during the Autumn Session the Shop Hours Bill, which it is estimated will affect about two million workers. Opportunity will be taken to press forward the Labour Party's Bill dealing with unemployment as drafted by the Joint Board, and with the proposals for dealing with invalidity and unemployed insurance promised by the Government, having for their object the completion of the scheme of which the establishment of Labour Exchanges was the first instalment. Your Committee may naturally, and with some degree of confidence, anticipate being in a position to chronicle this time next year that considerable progress has been made in securing for the workers some of those remedial measures of which they stand so much in need, and towards the realization of which Labour's representatives will assuredly work zealously and without cessation."

When it was suggested that the Osborne case should have an early place in the discussions, one London delegate had the temerity to state that this matter was not of overwhelming importance, and that the vast majority of Trade Unionists were in favour of the judgment. Naturally, however, this did not meet with much approval among those present. The Salvation Army having been once more castigated (by word of mouth) in regard to alleged sweating in their joinery and other works, the Parliamentary Committee were appealed to to obtain from Mr. Haldane a clear expression of opinion that, under no circumstances, should the force of the Territorial Army be used against workers in the case of disturbances arising out of trade disputes; and it was decided that some more specific assurances should be sought. The musicians and variety artistes having appropriately had a "turn" with a resolution protesting against the introduction of "seven-day labour," and other matters of particular interest to the former of these two branches, motions were submitted with regard to the proposed unification of the whole of the Labour forces of the kingdom. One resolution, which was carried, suggested the advisability of considering the possibility of determining all industrial agreements on a given date in each year. Mr. Ben Tillet, on this subject, said he wanted something to be done to bring the forces of Labour much closer together than at present. They had seen the Miners' Federation become a great force, and the engineers also; and the whole tendency was in the direction of unification. The development on the Capitalists' side had been much more swift and effective than on the Labour side; and he wanted congress to commit itself to the principle of federation. He looked forward to the time when the whole of the Trade Unions would be so well organized that they could terminate work on the same day; for they could not fight the Capitalists in sections. Several sections of Labour were threatened at the present time; and employers would always be able to use the bludgeon, and lock-out, so long as the various sections of Labour were divided. Another proposition, which was also agreed to, was to the effect that the present sectional Trade Unionism was unable to successfully combat the encroachments of modern Capitalism, and that the existing Unions should be amalgamated by industries, with one Central Executive elected by the combined Unions, with power to act unitedly, thus making the grievance of one the concern of all. As to this, one speaker thought sectional Unions should be abolished, because employers could easily deal with them as long as they were in sections; while another exclaimed that it was "amusing to see the number of tinpot Unions there were."

Early in Wednesday's proceedings, the following resolution was unanimously agreed to: "That, in view of the impossibility of dealing successfully, in any one year, with so many reforms as congress usually approves of, it be an instruction to the Parliamentary Committee to select from the motions passed by congress two or three which are of general importance, that special

attention be given to these reforms, and that, if necessary, an agitation be raised by the Committee with a view to educating public opinion regarding them, and so making their immediate acceptance more likely. Further, that the Parliamentary Committee in this policy co-operate, as far as possible, with the Labour Party." The acceptance of this view, looks something like a confession of failure of the hitherto existing methods. Next a motion was carried, amid applause, condemning the practice of international importation and exportation of workmen to act as "blacklegs" during trade disputes, and urging the Government to prevent the practice in the United Kingdom. The mover of this asserted that Britishers were the worst offenders. Railway amalgamations were also condemned; but, somewhat singularly, almost in the same breath, approval was expressed of the principle of railway and canal nationalization. The day's speech-making was considerably enlivened by the outspoken remarks of two American delegates, the gist of whose speeches was that the grievances of the workers in the States are very much like those which we are accustomed to find voiced in this "effete old" country of ours.

The Osborne judgment came in for much debate on the following day. It is impossible here to deal with the speeches—which were sometimes lively—but we may note that one delegate was suspended, while another, amid some confusion, was heard to describe Mr. D. J. Shackleton, M.P., as a "swashbuckler." The resolution, which had previously been taken back by the Parliamentary Committee, "to be strengthened," was finally carried by 1,717,000 votes against 13,000. As will be seen, it was of a somewhat comprehensive character: "This congress desires to register its emphatic protest against the judgment given in the Osborne case, involving, as it does, the prevention of effective parliamentary representation by organized labour; makes it impossible for Trade Union branches to join in the work of local Trades Councils; strikes at freedom of discussion and resolution which has always been enjoyed by the Trades Union Congress in so far as congress has taken action of a political character in the interest of the wage-earner. This decision denies the right of Trade Unions to carry out their nominal statutory purpose of 'regulating the relations between employers and employed,' in so far as modern conditions of industry and the highly organized state of capital render parliamentary action necessary for this purpose. It deprives Trade Unions of a freedom which they have enjoyed for nearly fifty years, and which they have exercised only with the approval of their members and to the advantage of the community. This congress claims: That these rights be restored at once, so that Trade Unionism may be put in a position to fulfil its statutory functions in such a manner as the members of the respective Unions according to their rules shall decide. Therefore, having regard to the injustice of the decision, and to the urgency of the matter, congress calls upon all affiliated organizations, in view of the misrepresentations of the position which have appeared recently in the Press, to bring all possible pressure to bear on the Government to provide, at once, facilities for the passing into law of the Bill, as presented by the Labour Party, to reverse the judgment; and determine to make it a test question at all parliamentary elections."

A motion was agreed to in favour of the Trades Disputes Act being amended so as to make it illegal for any employer, during or pending a strike or lock-out, to house any person or persons, other than the caretaker and his family, in any premises which have not been duly approved and certified, prior to such strike or lock-out, for use as a dwelling-house. The delegates having showed their sympathy with the suggestion that the law should be altered to provide for the payment of members of the House of Commons and their official election expenses, the Labour Exchanges came in for much unfavourable attention. Among a heap of other resolutions agreed to were several for improving the working conditions of miners; and the "cruel and inhuman system of evicting workmen and their families from their houses during trade disputes" was condemned. Education had a considerable amount of time devoted to it; and the congress agreed to the establishment of a central Legal Defence Fund; the object of such fund being to meet the legal costs incurred by affiliated Unions in carrying to the highest legal court any test-case affecting the fundamental principles of organized labour. The Parliamentary Committee were instructed to prepare a report on the various existing forms of conciliation and arbitration in industrial disputes, both British and foreign. The principle of an eight-hour day received approval, as did a suggested amendment of the Workmen's Compensation Act in numerous very important respects. The Government were also called upon to pass the "Right to Work" Bill; and the question of State insurance came in for attention.

At last, however, the delegates separated, after having decided to meet next year in Newcastle.

Institution of Municipal Engineers.—The North-Western District Section of the Institution of Municipal Engineers will visit the Bolton Corporation Water-Works next Saturday afternoon, by permission of Mr. L. Mitchell, the Borough Water Engineer. The party will meet at the Bolton Town Hall, and leave there for Ferns Park, to view the mechanical filters. Then they will go to the Heaton reservoirs and filters, on to Sweetloves reservoirs, and afterwards to the new Delph reservoir works, now in progress.

SMOKE ABATEMENT.

Interesting Exhibition in Glasgow. Opened by Lord Pentland.

[FROM OUR OWN CORRESPONDENT.]

An Exhibition, promoted by the Corporation of Glasgow, and having for its object the education of the community in the use of smokeless fuels, was opened in Glasgow on the afternoon of Friday last by Lord Pentland, Secretary for Scotland. The exhibition is located in the Victoria Skating Rink, in Victoria Road, near the Eglinton Street Station of the Caledonian Railway. The building is an extensive one, having a floor-space of 18,000 square feet; and some idea of the magnitude of the exhibition may be formed when it is stated that the estimate of the Manager is that the exhibits aggregate a value of £20,000. There are sixty-six exhibitors, of whom thirty-three show gas appliances, ten are devoted wholly or partially to electrical appliances, and twenty-two to solid fuels. Of the exhibitors, thirty-two belong to Glasgow; eight to London; twelve to England outside London; seven to Scotland outside Glasgow; and one is foreign.

Though the place is not so arranged, the exhibition naturally classifies itself into the three divisions of (1) what can be done in the way of using solid fuels to minimize the output of smoke; (2) what can be done by gaseous fuels; (3) what can be done by electricity?

Of the first class, the most numerous displays of apparatus are those in which anthracite is used as the fuel. Of more general importance are a few exhibits in which ordinary coal is used. In the fires and ranges of the Whiteflame Fire Company, of Stirling, the principle is that behind the brick which forms the back of the fire is a hopper filled with coal, and the coal which is being consumed is raked out from below the bottom edge of the brick. A day's supply of coal is fed into the hopper at a time, the coal gets thoroughly dried in the hopper, and when it reaches the fire-well, it burns with a clear, bright flame—almost smokeless. A somewhat similar arrangement is shown on the stand of Messrs. W. Kemp and Co., of Glasgow.

There is one prominent exhibit illustrating what can be done by the use of ordinary coke to provide for cooking and heating. This is upon the stand of the Ferrybridge Foundry Company, Limited, of Ferrybridge, Yorkshire. The apparatus is known as the "Howmatash." As shown, it is consuming coke supplied from the Glasgow Corporation Gas-Works. The red glow of the fire is visible; the heat continuously given out, available for use in both cooking and heating, is enormous; and the combustion is so slow that, at the Glasgow price of 9s. per ton, an ordinary room can be kept warm for fifteen hours for not more than 2½d.

In two exhibits, coal preparations are put forward. One of them is to be found upon the stand of Coalex Ltd of Lancaster. The substance resembles a superior variety of coke. It is produced in the Glasgow Corporation Gas-Works—a chemical being used in its preparation; and it is shown in the furnace, burning freely and without smoke. The cost is said to be only half that of the best coal.

Another preparation of much the same sort is charco, shown by Charco Limited, of London. It consists of coke, treated as it comes from gas-retorts or coke-ovens, and is represented as giving 43 per cent. more radiant heat than before treatment, while, it is said, undesirable chemical compounds—such as volatile hydrocarbons, arsenic, and sulphur—are eliminated.

Among the solid fuels may be noticed peat, which is shown by the Glasgow Distress Committee; the material being brought from their colony at Palacerigg, near Cumbernauld. It is being burned in a grate specially made by Messrs. R. & A. Main, Limited, and is represented as "an almost smokeless fuel," and "the fuel *par excellence* for a drawing room." While this may be so, the odour from the fire is very strong, and not altogether pleasant.

Geographically speaking, the exhibition is almost equally divided; the northern portion being occupied by gas, and the southern portion by electricity exhibits; the solid fuel exhibits being found in both sections. On entering, the visitor finds himself between two large white structures, the one of which is known as the Corporation Gas House, and the other the Corporation Electricity House. In these two erections are to be found focussed all that is elsewhere shown in the Exhibition.

The Gas House is a dwelling-house without the outer walls, the absence of which enables the visitor to see the interior arrangements without entering. In the dining room, there is a Carron fire, and "Telephos" gas lighting by Messrs. James Milne and Son, Limited, which can be controlled from any part of the room. The kitchen has been furnished with a Wilsons and Mathieson's "Deighton" range, which has the oven on the same level as the gas cooking burners, and at a height more convenient for being seen into than is usual. The space below, which is occupied by the firebox and the oven in coal-ranges, is a receptacle for pots and pans; and an attendant has ingeniously placed in front of it an ordinary asbestos gas-fire, the glow of which gives a cheerful appearance to the apartment. There is a Wilson "circulator," for the supplying of hot water to radiators in the different rooms; a Wright's "Sun" boiler, for the supply of the bath in the bath room and the troughs in the laundry; and a "Hot-well" boiler for the service of the kitchen sink. A "Glasgow" cooker, with Richmond plate rack and hood, a vegetable steamer, hot plate

pastry tablet, and coffee roaster, are also shown connected. In the bathroom is fitted a large enamelled bath, with Ewart geyser; towel rails, one warmed by hot water and the other by a gas-burner within it; and a washhand basin with a Ewart's "Gem" instantaneous water heater. The bedroom is a dainty apartment. It is heated by a Main "St. Nicholas" gas-fire, and lighted (as are the laundry and the bathroom) by Messrs. M'Innes and M'Lachlan, of Glasgow; the lighting including a conveniently placed reading-lamp fitted with an inverted incandescent burner. On what may be termed the verandah of the house are shown a variety of gas appliances and utensils, such as cookers, boilers, fires, and the like, all of which may now be obtained from the Corporation on the hire-purchase system.

The house is without a chimney. Every part of the service in it is rendered by gas. Visitors have provided a demonstration of how efficiently a dwelling may be lighted and warmed by gas appliances; while the suitability of gas for cooking purposes is made manifest by demonstrations which are given by the attendants. The advantage of using gas is well brought home by a placard, upon which is pointed out that, in capable hands, breakfast, dinner, and tea for a family can be cooked by a consumption of 85½ cubic feet of gas, which, in Glasgow, costs 2d. It may be mentioned that the hire-purchase system of supplying gas appliances came into operation on Friday, and that under it articles may be hired at rates varying from 2s. 6d. to 30s. a year—payments to be made three times in the year, and the total payments to be in twelve equal instalments.

The Gas House is the product of much study on the part of the Gas Engineer (Mr. Alex. Wilson) and his staff, upon whom the task lay to make a selection of the appliances most suitable for an ordinary household. It is imaginable that the difficulty would lie, not in the finding of suitable articles for selection, but in the necessity there was for rejecting many articles that might well have found a place, had space permitted. It will be generally admitted that the selection which has been made is one which is capable of illustrating how much more comfortably as well as economically a householder can get along when he gives up the use of raw coal and makes the gaseous products of coal his servant. That the public may see the matter in the same light will be the object and the duty of the attendants.

The Corporation gas exhibit forms the head of two long lines of stands which are occupied by appliances for the utilization of gas in the forms of heating, cooking, motive power, and lighting. A finer display of gas appliances has seldom, if ever, been seen. All the leading manufacturers of goods for use with gas are represented, most of them upon stands of capacious dimensions.

Messrs. R. & A. Main, Limited, on one of the largest stands, show, among other wares, their D. S. O. series of fires, which are placed before the public for the first time here. The makers claim that this series is the embodiment of all the elements combining cheapness with efficiency and good appearance; and they point with pride to the fact that it was the first gas-fire selected by the Corporation of Glasgow to be sold on the hire-purchase system. The fires have a beautiful majolica enamel finish.

To fully describe the goods shown by Messrs. Wilsons and Mathiesons, Limited, of Leeds, would require more space than is available. The firm, it may be recalled, were exhibitors in the first great gas exhibition in Glasgow—that of 1880, which was held in Burnbank Drill Hall, and which was also a gas and electricity exhibition. In the water-heating appliances of the Leeds firm, a cubic foot of gas raises a gallon of water to 160°. It is claimed that 97½ per cent. of the heat applied is absorbed by the water. In their gas-fires the makers are introducing fittings for the delivery of the gas to the burner on the Venturi tube principle, which is found to be of great advantage. A regenerative reflector is shown in front of an ordinary gas-fire, by means of which heat which would otherwise be lost upon the floor is deflected into the room, increasing the radiant heat in front of the fire by, it is claimed, as much as 30 per cent.

Messrs. Fletcher, Russell, and Co., Limited, of Warrington, in preparation for the season, have brought out a number of new gas-fires, among which may be mentioned the "Palermo," the "Borneo," and the "Tokyo." As usual, they have an interesting display of laboratory and workshop appliances.

The Carron Company are exhibitors of some large goods, among which may be mentioned a roasting oven suitable for hotel service, capable of cooking from 250 lbs. to 300 lbs. of meat at a time. They have a series of four sizes of the "Glasgow" cookers, for the manufacture of which they are the sole contractors to the Corporation. These are supplied by the Corporation of Glasgow on the hire-purchase system, at annual rates of 4s., 6s., 8s., and 10s., and are fixed free by the Corporation.

The Parkinson Stove Company, Limited, the Davis Gas-Stove Company, Limited, and the Richmond Gas Stove and Meter Company, Limited, have all very large, interesting, and up-to-date exhibits.

Messrs. John Wright and Co., of Birmingham, have improved upon their fire-clay fuel by the introduction of a new and patented variety known as "Thermo X," by which heat radiation is very greatly increased; the increase being due to the shape and the position of the back brick as well as to the composition of the "radiants." They have also brought out a new patented adjustable flue outlet, which permits of the nozzle being adjusted at any angle, to suit different types of chimneys, and by which up-draught is accelerated. The "Hygeia" trivet burner for nursery use, placed at the side of the fire, is claimed to be an advance

upon the method of fixing a boiling burner on the top of the stove. The firm also show a patented "Unitap," which takes the place of the old arrangement in the case of duplex burners, which required two separate taps. In this tap, successive movement of the plug admits the gas to the whole or any part of the fire as required. The "Garajo" boiler, shown by the firm, is a dome-shaped gas-heated boiler for hot water circulation, all of cast iron, specially constructed for heating motor garages, greenhouses, &c. The boiler has no internal parts or interspaces to get choked up. It has no automatic valve, but is constructed so as to do its work with so very small a proportional gas consumption that the gas supply is made a fixed quantity—safeguarded against fluctuation from varying pressures by an ordinary governor.

Among other exhibits in the Gas Section which may be noted are the following: Messrs. James Milne and Son, Limited, have an assortment of gas meters, gauges, &c.; the Automatic Light Controlling Company, Limited, who show "Gunfire" controllers; Messrs. G. Bray and Company, Limited; J. & W. B. Smith, of London; and the Ramie Company, Limited, of Bredbury, who occupy stands displaying lighting appliances; Messrs. Peebles and Co., Limited, of Edinburgh, upon whose stand are seen the Company's appliances for governing gas supplies, a pressure balance distance gas-lighter, and the patent inverted gas-burner of Mr. Alex. Wilson, of Glasgow, in two sizes, one for the lighting of stairs and courts, giving, with three-quarter foot of 16-candle gas per hour, a light equal to 12 candles, and a larger size for use in workshops, ship yards, &c.; Clark's Syphon Stove Company, Limited, of London; the Pharos Light; the Ovee Light Company, of Manchester; and the James Keith and Blackman Company, Limited, of London, whose gas compressing plant is employed in the lighting of a portion of the exhibition.

In the Gas Section coal gas is paramount; the only instance observable of any other variety of gas being used being upon the stand of Messrs. M'Innes and M'Lachlan, of Glasgow, where an installation is shown of the "Empire" petrol gas plant.

As in the gas so it is in the electricity department, the first exhibit is a house which is wholly served by Corporation electricity. Differing from the Gas House, the Electricity House has outer walls, and the visitors all walk through the building, having the appliances described to them *en route*. There are no fireplaces; all the heating being done by Murray radiators, parabolically fixed, which are to be found below furniture or against the walls in different parts of the rooms. The lighting is by all the known methods, excepting the arc lamp. In the entrance lobby, the ancient device of the holophane globe, believed by some to be a new application, is employed to diffuse the light. In the bedroom is shown, besides the ordinary lighting, over the head of the sleeper, a bed lamp which can be turned down, and a bedside food warmer. The bathroom contains a "Therol" water heater, which serves the laundry as well. In the laundry the work of ironing and dressing garments, by means of electrically heated irons, goes on almost continuously. The kitchen is shown as a working one. It contains an oven and several heaters, which are fitted with double heating arrangements—a high and a low. In the case of the oven, the high heat is stated to consume two units of electricity per hour. The "Therol" water-heater is said to pass continuously current at the rate of one-fifth of a unit per hour, and to be capable of delivering 30 gallons of water per day at 110°, or 9 gallons of water at 212°. In general, it is claimed, both in the "house" and upon outside stands, that by the use of electricity, 15 gallons of water may be boiled by means of a penny-worth of current.

Upon the numerous stands in the exhibition most attention is paid to lighting. Of industrial devices most is made of ironing appliances, in connection with which perfection seems, in the minds of electricians, to have been reached when it was discovered that, with the heating arrangement inside the iron, it is possible, by turning the utensil upside down, to use it as a cooker. The arrangement strikes the visitor as an ingenious one; but somehow admiration for the ingenuity and adaptability of the device cools rapidly when it is stated that the iron, stand, and fittings cost 21s. Cooking is carried on upon one or two stands; Messrs. Malcolm and Allan, Limited, of Glasgow (among others), showing the efficiency of the "Tricity" range.

The lighting of the exhibition is under the charge of Mr. S. B. Langlands, the Lighting Inspector for the City of Glasgow. The arrangement of the gas installation is: Central passage, two of Messrs. James Milne and Son's "Sunlight" lamps; Outside passage, nine of Keith and Blackman's 1500-candle power lamps; Inner passage, four 1600 and four 2200-candle power lamps of the Ovee Light Company; round the Gas House, three "Pharos" lamps of 2000-candle power each; and outside the exhibition, five "Pharos" lamps of 4000-candle power each, and three Graetzin street lighting combined lamps and standards. Lighting by electricity is confined to the interior of the exhibition, and the arrangement of it is: Central passage, five 10-ampere magazine type flame arc lamps, "Angold," of 2500-candle power each; Inner passage, five 10-ampere flame arc lamps of 2500-candle power each; and round the Electricity House, eight Osram lamps of 1000-candle power each.

The opening ceremony took place in the presence of a large and distinguished company.

Councillor D. M. STEVENSON, who presided, called attention to the aims of the Corporation in holding the exhibition. What they wished to do was to try and improve the atmosphere of the city, as they had been

improving their river. Historians told them that Glasgow used to be a *rus in urbe*—a little model garden city, with its Cathedral at the one end, and a pure river at the other. They were trying to make a pure river again; but the atmosphere they had in the old days (the sunshine and the clear blue sky) were things very much of the past. What they wanted to do now was to try to bring it back. The progress of civilization was very much the undoing of the evil results of the various steps in that very progress. In this connection, in Glasgow, after having taken the necessary sanitary steps to give them public health, they had to set about a sewage scheme to get the river back to what it used to be. In the same way, industry in Glasgow had given them a smoky atmosphere; and now they were setting about trying to purify it. But not only were the industries the sinners in this respect. The whole city was; and it was chiefly in regard to domestic evils caused by atmospheric pollution that the exhibition was being held. Those who had already passed through the galleries must have seen that there were numberless appliances for making it possible to have a pure atmosphere in the city. The appliances there were almost entirely directed to domestic uses. There were the latest and most modern appliances for cooking and heating under smokeless methods, by gas, electricity, and smokeless fuel. The Corporation were hopeful that the citizens would try to take advantage of these methods, and help to restore to Glasgow some of its ancient prestige as a beautiful city as well as a great industrial centre.

Lord Provost M'INNES SHAW expressed the pleasure he had in being present at the opening of so interesting an exhibition. The question of air purification had been discussed for many years; but nothing definite had hitherto been done to focus attention upon the methods and processes by which the evil might be ameliorated. During the past twelve months, however, the public conscience had awakened to the desirability of successfully tackling the question, particularly with reference to large centres of population, where the health of the community was of primary importance. He was glad the Corporation of Glasgow had taken this rightful place in this matter; for nowhere in the British Empire could such a question be more appropriately dealt with. Their city, from its nature, was one of the offenders in the matter of the pollution of the air. They might not wish to minimize this nuisance if it were to have the effect of curtailing industrial and commercial enterprise. But they had come to a stage when it was possible that these industrial and commercial enterprises could aid them in the matter, without in the slightest degree militating against their success or development. The object of the present exhibition was to show by what means all classes of the community could assist in the purification of the air. It was extremely gratifying to know that in the organization of the exhibition, the Commissioners had had the co-operation of manufacturers of appliances for lighting, cooking, heating, and power, as well as of smokeless fuels, all over the kingdom; so that the citizens, in whose interest the exhibition had been projected, would have a unique opportunity of studying the great question, and of comparing the various methods and processes which had been devised to cope with this clamant problem. They expected great things as the result of the exhibition. So far as the Corporation were concerned, they were determined that they would leave no stones unturned to make the city sweeter and purer, by the elimination of unnecessary smoke from the air. He therefore appealed to the citizens to support the Corporation in their present effort, by visiting the exhibition in large numbers, inquiring into the merits of the various processes, and adopting one or other of the many inventions to be seen there. Councillor Stevenson had asked him, on behalf of his Commissioners, to declare the exhibition open; but they had Lord Pentland present with them that day, and he (the Lord Provost) would like very much to be allowed to transfer this function to his Lordship, whom he had great pleasure in introducing to them.

Lord PENTLAND said he could only assure those present that it was with great pleasure he fell in with the wishes of the Lord Provost. The subject which this exhibition was intended to illustrate was nothing more nor less than the health and the working power of the great community of Glasgow. There might be obstacles to overcome before the object which the exhibition was designed to attain could be achieved; but the whole history of the development of Glasgow was a conquest over obstacles in the path of development. Everything that they knew of Glasgow and her citizens gave confidence that when they were informed upon a subject, when they knew what the object was, and could see it clearly, they would, as sure as anything, achieve it. The exhibition, he understood, was designed to instruct, and to show them how great the economies were which were in their power, if they used the proper methods. He was not sure that the delightful weather they were experiencing was quite the best time in which to impress upon the citizens the need for these appliances; but they and he, who knew Glasgow at other times of the year, knew well that nothing could lift a greater load from off the industries of Glasgow than to purify its atmosphere, and to relieve it, even from the point of view of health, from the gloom which often overtook it on winter afternoons. If they could lengthen the daylight, they would lengthen the working power of the day. He felt sure that the citizens would support the Corporation in the efforts they were making, and that not only employers but householders would recognize that, in organizing this exhibition, the Corporation were doing a thoroughly public-spirited and beneficial thing. He had the greatest pleasure, at the bidding of the Lord Provost, in declaring the exhibition open, and in wishing that many might profit from the sights they would see there.

Bailie PAXTON, the Sub-Convener of the Gas Commissioners, in moving a vote of thanks to Lord Pentland and the Lord Provost, said that, in the matter of air purification, they felt that it was time that talking should cease, and that something tangible should be offered to the public. The Gas Committee had been working strenuously, and not without success, since it was instituted (he thought in 1869) to forward the movement. As the Lord Provost had said, the public conscience had quickened during the last twelve months. This had brought directly to the Gas Commissioners the question of what they were going to do to help the public to purify the air. The Town Council had not gone so far as he would have liked in this direction. They were being led, in this connection, by smaller towns in the neighbourhood. In Paisley, they were giving gas grills, stoves, and meters free. This

statement also applied to other towns—including Dundee; and he was assured that the giving of these gas appliances, in the various towns, was paying the corporations, in the profit which they made on the sale of gas. It was time, therefore, that they in Glasgow should do something to press forward the question.

Councillor W. P. SMITH explained that the origin of the exhibition was a motion by Mr. Stevenson that the Gas Department should hold an exhibition to show the latest appliances for heating and cooking by gas. But it at once became apparent that they ought to enlarge the scope of the exhibition, and include in it all smokeless methods of heating. The exhibition now represented the attitude of the Corporation towards the prevention of the pollution of the air by smoke from domestic chimneys. The Corporation asked the citizens to come to the exhibition, and to judge for themselves as to which method of heating they preferred. They wished the citizens to consult their own ideas and their own questions of taste, so long as they chose some form of heating which was smokeless, in order that they might have better health and a more beautiful city. He proposed a hearty vote of thanks to the Chairman, as the originator of the idea of holding an exhibition.

The vote was cordially given, and acknowledged by Mr. STEVENSON.

At the close of the opening ceremony, Lord Pentland was conducted round the exhibition by the Lord Provost.

AWARDS AT THE BRUSSELS EXHIBITION.

FROM the complete list, which was published in "The Times" last Thursday, of the awards to British exhibitors at the Brussels Exhibition, we extract the following names in the classes in which "JOURNAL" readers are more particularly interested.

MATHEMATICAL AND SCIENTIFIC INSTRUMENTS, &c.: Silver Medal—John J. Griffin and Sons, Limited, London; Townson and Mercer, London.

MEDICINE AND SURGERY: Grand Prix—John J. Griffin and Sons, Limited, London. Gold Medal—Fletcher, Russell, and Co., Limited, Warrington.

STEAM PLANT: Gold Medal—National Gas-Engine Company, Limited, Lancashire; Sturtevant Engineering Company, Limited, London.

OTHER KINDS OF ENGINES: Grand Prix—Crossley Brothers, Limited, Manchester; Pump and Power Company, Limited, London; Campbell Gas-Engine Company, Limited, Halifax; Power Gas Corporation, Limited, Stockton-on-Tees. Gold Medal—National Gas-Engine Company, Limited, Lancashire. Bronze Medal—Reavell and Co., Limited, Ipswich.

GENERAL MACHINERY: Grand Prix—Appleby Crane and Transporter Company, Limited, Glasgow; Pump and Power Company, Limited, London. Diploma of Honour—Reavell and Co., Limited, Ipswich. Gold Medal—Aerograph Company, Limited, London; Sturtevant Engineering Company, Limited, London.

IMPLEMENTS AND PROCESSES USED IN RURAL CULTIVATION: Gold Medal—South Metropolitan Gas Company, London.

METALLURGY: Grand Prix—Glenboig Union Fire-Clay Company, Limited, Glasgow.

METAL WORKING: Diploma of Honour—Fletcher, Russell, and Co., Limited, Warrington.

APPARATUS AND PROCESSES FOR HEATING AND VENTILATION: Diploma of Honour—Fletcher, Russell, and Co., Limited, Warrington. Gold Medal—John J. Griffin and Sons, London.

APPARATUS AND PROCESSES EMPLOYED FOR LIGHTING OTHER THAN ELECTRIC LIGHTING: Gold Medal—Gas Economizing and Improved Light Syndicate, Limited, London; Reflector Syndicate, Limited, London; C. C. Wakefield and Co., London. Silver Medal—Ropley, London. Bronze Medal—John Dugdill and Co., Manchester.

APPLIED CHEMISTRY AND PHARMACY: Grand Prix—British Cyanides Company, Limited, London; Curtis's and Harvey, Limited, London; Gaslight and Coke Company, London; Power Gas Corporation, Limited, Stockton-on-Tees; South Metropolitan Gas Company, London. Diploma of Honour—Fletcher, Russell, and Co., Limited, Warrington; John J. Griffin and Sons, Limited, London; Townson and Mercer, London.

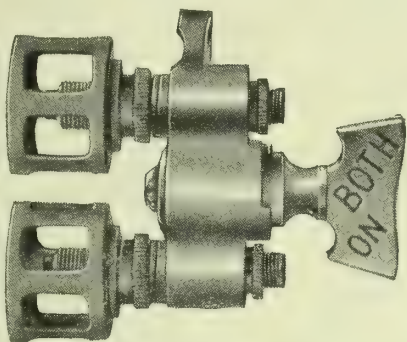
EXHIBITORS PLACED HORS CONCOURS: Cambridge Scientific Instrument Company, Limited (Mathematical and Scientific Instruments, &c.).

Our contemporary remarks that the list of awards shows the quality of British exhibits to have been very high.

Eastern Counties Gas Managers' Association.—As already announced, the forty-fourth general meeting of the Association will be held at Cambridge next Friday. Members and friends will assemble at the gas-works (which will be opened for inspection at 12 o'clock noon), and will be afterwards conveyed to the University Arms Hotel, where, on the invitation of the Chairman and Directors of the Cambridge University and Town Gaslight Company, they will be entertained at luncheon. The business meeting will be held in the new Lecture Room at Emmanuel College, at 3 o'clock, and will consist (in addition to formal matters) of the Inaugural Address of the President, Mr. J. W. Auchterlonie, and a lecture by Mr. J. B. Peace, M.A., on "Theory and Practice in Engineering." Subsequently the members will dine together at the Lion Hotel.

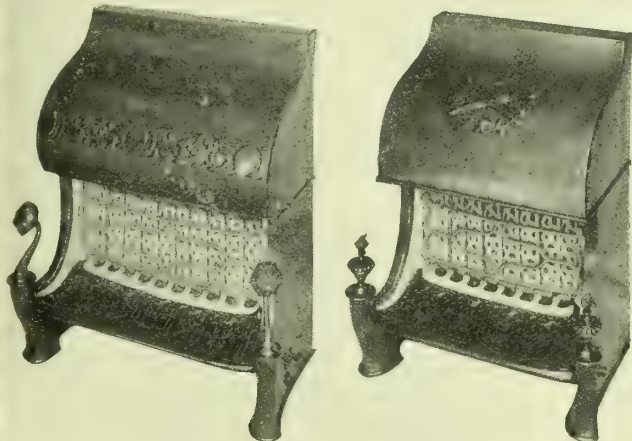
RICHMOND'S GAS-FIRE IMPROVEMENTS.

WHERE high efficiency already exists, the more difficult it is to add to it. This is what the Richmond Gas Stove and Meter Company have found in connection with their "A," "B," "C" ("Arabian," "Bavarian," and "Castilian") series of gas-fires; and although several improvements (tending to additional efficiency, economy, convenience, range, and style) have been made latterly in preparation for the forthcoming season, it speaks highly of the careful consideration that was given to the scientific and practical lines of design prior to the introduction of the series three years ago, when it has to be said that it is found hard to introduce improvement. In other words, though the firm have remodelled what may be called the brick and fuel of the fires, and generally brought everything up to a higher pitch of perfection, they have



Duplex Burner.

not had to alter, or even found it necessary to alter, any part of the general features of the series. Now this may to the lay mind suggest non-progress. But it is nothing of the kind. When a level of perfection has been reached co-equal with contemporary ideas and knowledge, there must come a pause; and headway can only be made in detail. Except, therefore, in respect of details, to-day finds the "A," "B," "C" series intact as introduced three years ago.



"Egyptian," Copper Sheathed.

"Egyptian," Brass Sheathed.

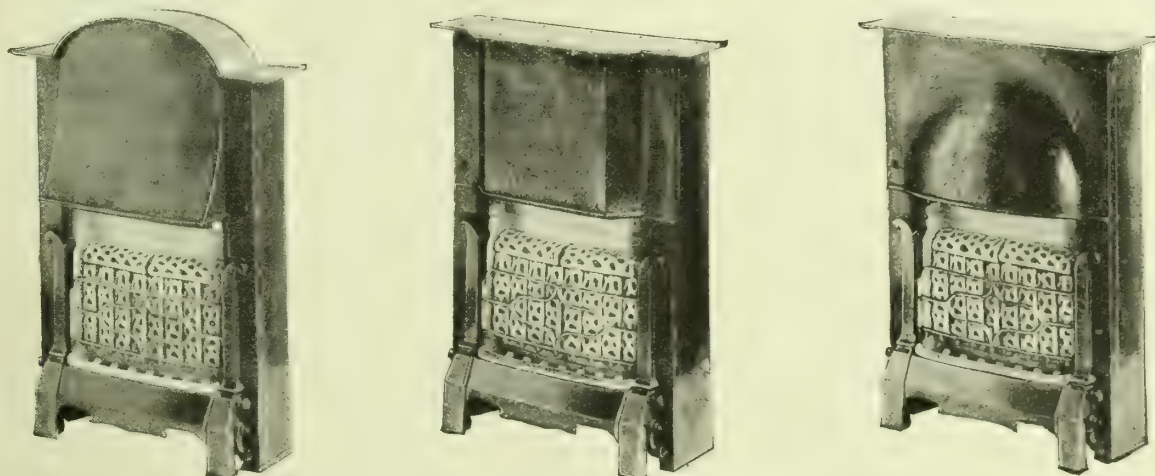
But there are new points to notice. New sizes in the series have been found necessary to meet the growing demand for gas-fires for the heating of larger rooms and for their quicker heating. This is a point that is coming very much to the front. The efficiency and conveniences of gas heating are attracting more and more public attention; and there is not an inconsiderable class of gas consumers who do not mind paying for what they want if only they can get it. They are generally the occupiers of

houses containing large apartments. And if they can have gas-fires that will rapidly heat those apartments, they thereby derive greater satisfaction; and do not cavil at all at paying for the luxury, which, of course, involves a heavier consumption of gas. The previous three designs of the series (the special feature of which is—supplementing high efficiency—the interchangeability and facility of maintenance) comprised twelve sizes. Now the designs of the series have been brought up to five; and the sizes to eighteen. This has been done by the addition of a fire with a 16-inch fire opening of the "Arabian," "Bavarian," and "Castilian" types, and of a high-class gas-fire named the "Egyptian," in the 13 and 16 inch sizes. In these new types, as in all the others, every fire is interchangeable one with the other; this being a feature with which popularity, convenience, and economy to gas suppliers, will not allow the firm to dispense. Its value, in short, is such that it cannot be over-estimated from the maintenance standpoint. Upon the enlargement of this series, the Richmond Company are to be congratulated.

An improvement and extension of convenience in connection with this larger series of fires is the adaptation to all patterns, without affecting their interchangeability, of a new duplex burner, which allows the user to have half the fire (the central half) on, or the whole fire on, just as the prevailing temperature dictates. Now an important point about this is that no user of any of the existing types of this series of fires need be without the convenience of the new duplex tap, because it is quite an easy matter to *in situ* depose the old burner and tap and insert the duplex tap and burner. The same applies to any of these fires that may be in stock. It will also be seen that from now onwards any new fires ordered with duplex burners can be converted into fires with a single burner without any new part being needed other than the burner and the necessary brass fitting. These are the only parts required in either case; and, in conversion from the single to the duplex burner, all that has to be done is for the brass duplex tap fitting (in one piece) to be placed in the old screw holes, and the double burner slid into the place formerly occupied by the single burner. In this new duplex fitting, a single tap controls the two burners. Previously two taps have been used for the purpose; and obviously this made a most unsightly fitting. The new tap is anything but unsightly; and it is not complicated. By it, the movements are successive in obtaining the gas half on or full on; and the gas and air adjustments are combined in the one fitting. It is a distinct advance.

Then another improvement conducive to greater radiating efficiency, and to a lessened loss of heat at the back of the fires, has been applied. This is easily explained. The porous slip brick ordinarily used at the back of the fuel has been remodelled with a cavity at the back, so that it forms a non-conducting air-pocket between it and the brick back of the casing of the fire. Such a cavity was not specially provided in the original form of brick; and its ability, by the provision of the air pad, to prevent the rear escape of heat, is noteworthy. And talking of efficiency, the firm have attained to a high point in this regard. Recent independent tests (particulars of which the firm are willing to submit) show that the "A," "B," "C" series of fires has attained a radiation efficiency of nearly 50 per cent.; and the actual percentage of waste—the heat not actually utilized other than for creating a chimney draught—has been reduced to a remarkable degree.

Having now described the extension of, and the improvements in, the "A," "B," "C" series of gas-fires, there are a few other points to be dealt with. The Richmond Company have felt the demand for a higher class finished fire than the art-black finish which has long prevailed for ordinary use; and for this reason: Some three or four years ago, they introduced the porcellanite colour enamel process, which has been popular for decorative effect, and for harmonizing with the general appointments of any room. But there is a large vogue now for oak panelling and oak parquet flooring in high-class dwelling-houses (in certain rooms) and in others for copper fittings—such as fire curbs, pendants, and so forth. In rooms of this consistency in character, a gas-fire finished in coloured enamel would not be appropriate, and one



Richmond's "A," "B," "C" Gas-Fires in Solid Hand-Wrought Copper and Brass.

finished black would be out of harmony with the surroundings. To meet the requirements produced by such circumstances, the firm have introduced fires completely sheathed in copper, relief stamped or *repoussé* work; and a handsome Adam designed dog grate which, with the other sheath hand-wrought copper and brass fires, can be supplied in any design to suit the periods in which rooms of the present day are furnished. The illustrations are only intended as examples to give a general idea. Further, to meet the request for a fire of less cost than the copper sheathed types, a new finish has now been introduced in the "A," "B," "C" series—called the "A.B.C." finishes, signifying "art, bronze, copper."

These finishes are generous in the handsome character that is thus imparted to the fires; and while being a considerable advance on the art-black fires for the purposes referred to, the life is quite equal to the black finish. But should it be required at any time to renew the finish, it is easily and economically accomplished. The extra cost of these finishes is so small that we feel sure they will be of considerable use in the endeavour to combine with the utility of the gas-fire consistency of external appearance with environment. These fires, copper sheathed and with the "A.B.C." finish, are quite a new departure; and we illustrate some of the types to show how, apart from efficiency, the art of the gas-fire maker is being exercised in keeping pace with modern ideas in the matter of general furnishing and decoration. There is an excellence about the designs and general appearance that cannot fail to appeal to all who take an interest in the "home beautiful," and in artistic appointments.

From among much else that is new in design, a high-grade fire suitable for tiled recesses, and to replace the coal dog grate, arrests attention. Of coal dog grates there are so many in use at the present time, that they offer a good field on which to make a special raid. Two types of these gas dog grates are seen; and what is of importance, we learn that the decorative design can be in character with the periods of design extant in the particular rooms for the heating of which they are required. The design may be Adam, Georgian, or anything else; the framework of the fires being so prepared that it is quite a simple matter to work in different ornament and suggestion.

One other point. The Richmond Company again draw attention to the fact that their fires can be fitted with the boiling-burners at the sides instead of on top, as is commonly the case. The small extra cost is well worth consideration by gas-supply authorities, as there is no doubt that an unostentatious boiling at the side of a gas-fire is a convenience to the consumer, it allows of a fire that is suitable, in regard to shape and design, for the position in which it is intended to be fixed, and (what the gas supplier will not fail to fully appreciate) it means extra gas consumption.

Leaving interior gas heating, there is a field for the consumption of gas in out-buildings. For such purposes, the "Daisy" heater appeals favourably. This has a cast-iron boiler fitted with studded interior base, heated by a single oblong burner, which swings out for lighting, &c. The heater is particularly suitable for warming garages, either by hot-water pipes or connected to a radiator. An open flue end disposes satisfactorily of draughts.

It will be seen that there is ample reason for congratulating the firm upon keeping in line with scientific knowledge in the matter of gas heating, and upon keeping an eye on general tendencies in furnishing and house design, so that their goods shall have compatibility with current ideas.

The second annual general meeting of the Institution of Municipal Engineers will be held at Eastbourne on Friday and Saturday, the 7th and 8th prox. The programme is one which should prove of interest to the members. The first day will complete the business proceedings; Saturday being devoted to a visit to the Newhaven works of the Sussex Portland Cement Company, Limited, the Directors of which will afterwards entertain the party at lunch.

The Gas Engineering Classes at the Manchester School of Technology will open on the 26th inst. Mr. C. E. Teasdale, of Salford, is again lecturer for the engineering portion. Mr. F. S. Sinnatt and Mr. W. Buckley are the lecturers in the chemistry section of the syllabus, in honours and ordinary respectively. Mr. Garlick is the lecturer in gas supply. This school claims to be the most successful in the country in the City and Guilds Examinations—obtaining last year two medals in "Gas Engineering" and one medal in "Gas Supply."

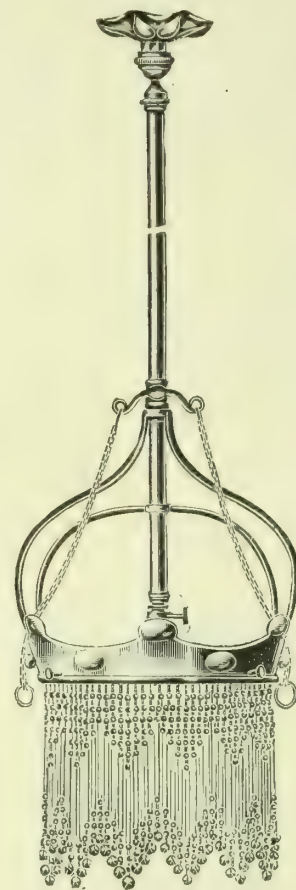
About thirty members of the Association of Yorkshire Students of the Institution of Civil Engineers paid a visit recently to the water undertaking which is being carried out in the Derwent Valley, some 12 miles from Sheffield. Ultimately in the two valleys of the Derwent and Ashop there will be a chain of five large reservoirs; but at the present time two of the dams only are in process of construction. The scheme is promoted jointly by Sheffield, Nottingham, Leicester, and Derby; and the work is being carried out under the control of a Joint Board. Originally it was estimated that £7,000,000 would be expended before the whole of the reservoirs were completed; but as some unexpected engineering difficulties had to be surmounted in the earlier stages of the work, it is considered probable that the total cost will be greater than this.

SOME GAS LAMPS AND FITTINGS.

THE evidence already gathered of extensive preparations for the coming season's trade by the suppliers of gas lamps and fittings, is added to by a visit paid to the Farringdon Road show-rooms of Messrs. J. & W. B. Smith. Nowadays the gas consumer is well catered for in all departments; and in the lighting branch, there

are endless varieties to choose from—in the way of lights and of accessories. In the cheaper as well as the more expensive types, attractiveness is everywhere a feature. With the inverted burner, it seems, all things are possible, alike in the matter of appearance, as in that of lighting effect.

There are in Messrs. Smith's show-rooms many hundreds of patterns of fittings on view—pendants, brackets, &c., in all shapes and sizes—and it is difficult to single out from them special ones for notice. Suffice it, therefore, to say that the stock is wide enough in range to accommodate any taste, and that a special feature is made of goods that are well within the means of the vast majority (if not all) of the people who employ gas. Glancing round, a thing that strikes one is the number of beaded shades that are shown attached to inverted fittings. These are made by Messrs. Smith on the premises; and it is unnecessary to remark that there is no end to the combinations of colours that can be obtained in this way. They are in both large and small sizes, as required for attachment to pendants or brackets; and they are most pleasing in appearance, both when the gas is lighted and when it is not. That is to say, the beaded fringe is an ornament by itself; and one is not surprised to learn that it is "going well." Seeking information as to new points for the lighting season, we were informed that Messrs. Smith are supplying a new mantle—the

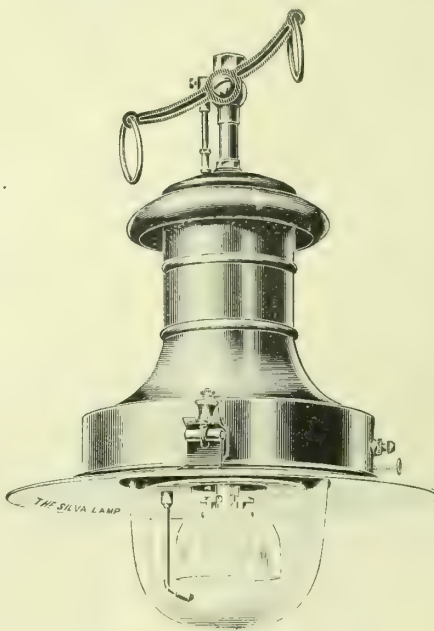


Fitting with Beaded Shade.

"Glasmi Extra," an upright type which is made specially for street lighting, &c. It is a first-class three-ply mantle, made of carefully selected ramie silk thread, heavily impregnated with lighting fluid, and specially seasoned, so as to render it exceptionally strong and brilliant.

The new pattern "Shell" inverted burner the firm supply

is a British made article, fitted with china shell heat deflector, gas-adjuster, air-regulator, and a magnesia mantle nozzle. It is nicely finished in polished brass, steel bronzed, or copper bronzed. Anti-vibrating pendants are shown, in which the weight of the fitting is entirely carried by a spring near the top end—no undue stress being laid on the inner tube. This dispenses with a ball-joint, while allowing the burner end of the fitting to be hooked up to the ceiling, when it is desired to get it out of the way. Coming to outdoor lighting, we hear the "Silva" lamp is still in good demand. For this a lighting efficiency



One-Light Improved "Silva" Lamp.

is claimed of 125-candle power per burner for a consumption of about 4 cubic feet per hour. The air and gas adjusters are fitted outside the casing; and by simply removing the gas-adjuster, any foreign substance that may have found its way into the injector can be removed without disturbing any other part of the lamp. It is a substantial, British made lamp; and it can be supplied in one to four light sizes, with steel or copper casing and ordinary or parabolic reflector.

SIMPLICITY IN GAS-FIRES.

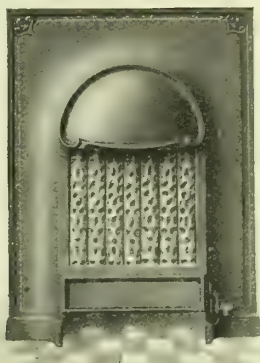
SINCE the introduction of electricity, both for lighting and heating, it is significant that gas companies and corporations have realized their opportunities more strongly than ever before, and are now beginning to assert themselves in many directions. In no sphere of the gas industry has this been more exemplified than in domestic gas heating; and year by year the number of heating appliances manufactured and sold to the consumer has steadily increased. In this respect, the past twelve months have been no exception; and it is an undoubted fact that a larger number were disposed of than ever before.

There are, no doubt, many reasons that may be assigned as the cause of the ever-increasing popularity of gas-fires; but among them are to be reckoned the following: Appliances have become cheaper for gas companies and corporations to purchase; fewer loose parts are now employed, and consequently maintain-

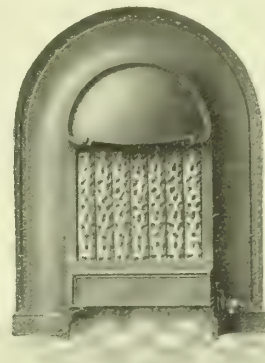
ance has been reduced to a minimum; while from the design and efficiency point of view, considerable advance has been attained. In considering the first point, there is no doubt that fires as made at the present day can be manufactured and sold at prices which are only a fraction of those which obtained with the old-pattern deep fire, which, as a rule, when once fitted together, could hardly be taken down, nor even the burners removed for cleaning purposes in a consumer's sitting-room. To-day it is different; for, with the simplified designs and the irreducible number of loose parts, the capital cost and the maintenance expenses have been reduced to their lowest level—thus enabling gas companies and corporations to seek and to obtain an ever-extending demand. Naturally the consumer reaps the ultimate benefit from the reduced capital expenditure necessary, and also by the continuous reductions in the price of gas announced so regularly, and now rendered possible by improved methods of manufacture. Again, from the consumers' point of view, the reduction in the quantity of gas necessary to keep a modern fire as a reasonably efficient



The D.S.O. "Original" Fire.



The D.S.O. "Dependable" Fire.



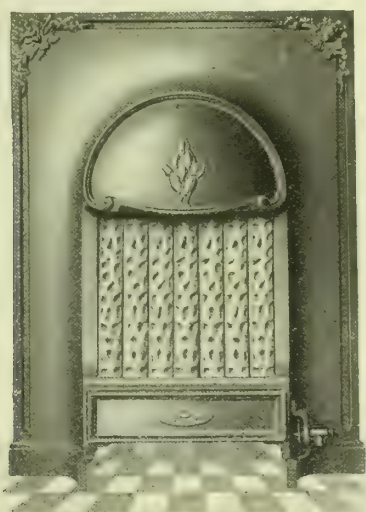
The D.S.O. "Symmetrical" Fire.

heating unit, and also to keep the appearance of the fire sufficiently attractive, enables them to make more use of the apparatus placed at their disposal. As to efficiency, this is a subject in which ever-increasing interest is being taken; and it is submitted by the firm of manufacturers mentioned below that it is a moot point whether fires as designed and made under present-day conditions, with equally satisfactory burners and means of regulating gas and air, are any more efficient in the shallow style with the long single column of fuel than in the deep style with ball fuel or than the still older type of fire with iron frets. Undoubtedly, the present type of gas-fire is used not so much on account of its efficiency as because of the need for cheapening the cost and improving the appearance. The amount of heat radiated is only

ment was correct. They have now been experimenting for over three years, and claim to have arrived at a stage when they feel justified in putting forward their new series of "D.S.O." gas-fires. Of the many original features embodied, the construction of the fire itself is unique. There are only two castings; the fire being in one casting, with the addition of a flue-chamber at the back. The burner is detachable, and is fitted with both gas and air regulators; while the adjustment of neither can be moved accidentally. Another novel feature in this series will be found in the construction of the fire-brick back. This is in two pieces; the top half keeping the lower half of the brick in position, and being itself kept in by the canopy of the fire.

The front brick is made so that it will fall slightly by its own weight, and in it is formed a chamber for the flue gases, in order that any useful heat remaining after the flame has passed up the fuel may be utilized; while the slot which is cut in the lower side of the brick is so formed as to engage the top end of the fuel and lock it in position. By this means, the necessity for fire-bars is done away with. This is a new feature which has been the subject of exhaustive experiments; and though the fires might have been marketed last year, Messrs. Main preferred to make quite certain of their ground. The only loose parts in these fires—viz., the fuel, the burner, and the bricks—are all removable without having to undo any screw or fastening whatever. The fuel is laid with a slight slope backwards, so that the maximum amount of heat is obtained, which is radiated at a slight angle from the horizontal. In addition, the fuel is locked top and bottom, and, being tapered on the front, should it accidentally get broken, it cannot fall out of the fire. With Messrs. Main's new fuel [provisional patent No. 11,357 of 1910], the back of the fuel is so constructed that, for all effective purposes, it takes the place of the brick. It can therefore be made heavier, and consequently much stronger. In addition, tits or projections are formed on the back, so as to obstruct the otherwise free passage of flame. By this means, the maximum heat is extracted by the fuel. The fires are made in two sizes and in three styles; and Messrs. Main are making various ornaments for corners, canopy, and fender on a scale which, they claim, has never before been attempted.

In addition to this entirely new type of fire, Messrs. Main are still continuing to supply their "Gainsborough" and "Dundee" fires, both of which are too well known to need further comment, as well as the "St. Nicholas," which is a very satisfactory way of turning a coal-fire into a gas-fire. By the way, the firm are also making a special feature of the patent regulating valve to their radiators.



A "D.S.O." Fire, with Brass Ornaments.

one of the many points which have to be watched; and there is no doubt that, when the subject ceases to be treated only superficially, it will be realized that the only useful measurement of the heat from a gas-fire is its capacity for raising the heat of a given sized room in a reasonable time. It is the total heat obtained that has to be taken into consideration, "as most, if not all, of the radiated heat can only do useful work when the energy emitted acts by convection."

So say Messrs. R. & A. Main, Limited, the pioneers of the shallow fire, introduced by them over ten years ago in their "Melrose" and "Canterbury" series. They had the question of cost and design in mind when putting these on the market; and successful as they have been, it becomes increasingly evident that their judg-

The London and Southern District Junior Gas Association have forwarded a copy of their "Transactions" for the 1909-10 session, which have been reprinted from the "JOURNAL" reports of the proceedings. As a frontispiece there is a portrait of Mr. W. J. Liberty, who was President during the period covered by the volume. It says much for the energy with which the affairs of the Association are carried on, that the matter and illustrations cover about 130 pages.

PARKINSON STOVE COMPANY'S NEW PATTERNS.

At the High Holborn show-rooms of the Parkinson Stove Company there are now to be seen the new goods which the firm are introducing for the coming heating season; and inspection shows that there are various improvements worthy of note.

Much time and thought have been devoted to the question of fuel; for though it had been found that the "Intense" pillar fuel which was introduced last season gave highly satisfactory results, this did not deter the Company from continuing experiments with a view to the securing of still further improvement. The upshot has been a slight strengthening of the fuel, to overcome any tendency to fragility; and a more important improvement in the shape of the head of the pillar. The tops are now bevelled off, with the idea of giving a finish to the heating surface, while at the same time securing a completely incandescent pillar with a minimum gas consumption. Hitherto the fuel has been made with a lot of rough projections inside; but the conclusion has now been arrived at that these are just as well done without. A freer passage is thus provided for the gas. The new fires, it will be noticed, are still provided with the oval guard, which, while neat and artistic in design, accomplishes its purpose with the very smallest amount of obstruction to the radiant heat. One of the illustrations indicates, however, that a step in advance has

been made by the pivoting of the base of the guard. This renders the removal and replacement of the fuel a matter of the utmost simplicity. The grip is disengaged by a slight upward movement, which allows the guard to fall sufficiently forward for getting at the fuel. Just as easily is the front restored to its proper position, in which it holds the fuel firmly until the necessity arises for again releasing it. The improved gas and air adjuster,

allowing of a separate adjustment of both gas and air while the stove is burning, has this season been retained, and is fitted on all the firm's fires. Another matter that may here be mentioned



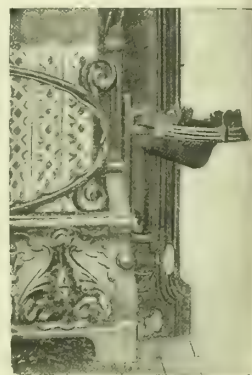
Safety Gas-Fire Tap.

is a patent safety-tap for use on fires, which has been designed for the purpose of preventing accidental turning during domestic operations—sweeping, dusting, &c. The tap is provided with an ordinary plug, having a loose key fitting on a shank with a spring attached. Before it can be turned, this key has to be lifted up so that the pin fixed to it comes out of a groove; and thus the movement can only be a deliberate one. A tap on

the same principle is also available for cookers. A side-boiling burner is added when required to any round type fire.

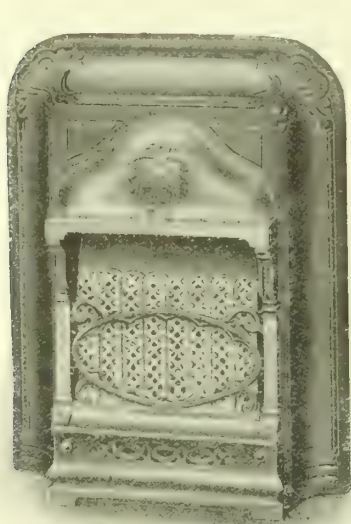


Pivoted Oval Fire-Front.

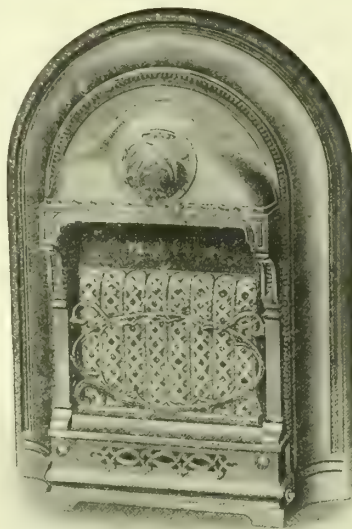


Boiling-Burner Attachment.

Now a word as to the patterns of the fires themselves. The "Agate," the "Basil," and the "Crystal" fires, which are illustrated, exhibit a great variety of design that should meet most requirements; and they are, in different sizes, finished in art black enamel, porcelain enamel, or armour bright. The "Agate" pattern was introduced last season, but only in the 15-inch size.



The "Agate" Fire.



The "Basil" Fire.



The "Crystal" Fire.

As, however, there was discovered to be a demand for smaller sizes of this type (the bold artistic design and simplicity of which had found much favour), two additional sizes have now been added—namely, 10-inch and 8½-inch. Uniform with this is the "Basil"—an entirely new round-top fire, which is made in 8½-inch and 10-inch sizes. The "Crystal" is an attractive fire of the nursery type, fitted with a boiling-burner and cap on top. Here, again, combined with a pleasing outline is the utmost simplicity as far as ornament is concerned. The "Onyx" 13-inch fire, which was so successful last year, has been retained without alteration, for those who are on the look out for a fairly large heating surface. The wearing parts of all these fires are absolutely interchangeable, size for size, which is a decided convenience in connection with the stocking of replacements; and any fire, from 10-inch upwards, may be fitted with a duplex burner, if desired. The new "Panel" fire is a useful addition to the inset type. It is made in two sizes, fitted with a duplex burner, and affords an exceptionally wide heating surface of "Intense" pillar fuel.

In another branch of heating, the "Comet" luminous-flame radiator is a new pattern of neat design and substantial make. It is arranged on the sectional principle, each column having its own burner controlled by a separate tap. In cookers and hot-plates, too, the Company are showing a wide range, which includes some types that are not familiar to the gas consumers of

this country. These are made by the firm on the Continental pattern, and are intended for the foreign market—a branch of the business which the Parkinson Stove Company have lately been developing considerably.

Scottish Junior Gas Association (Western District).

We are informed by the Hon. Secretary and Treasurer of the Western District of the Scottish Junior Gas Association (Mr. David Fulton) that the syllabus for the seventh session, 1910-11, is now complete, and is as follows: Oct. 8, Presidential Address of Mr. John Fraser, of Provan. Oct. 22, visit to the Atlas Locomotive Works at Springburn. Nov. 5, paper on the "Repair of Meters," by Mr. George Scott, of Glasgow. Nov. 19, visit to the Cadzow Colliery. Dec. 3, paper on the "Calorimetry of Gas," by Mr. George Braidwood, of Dawsholm. Dec. 17, annual social gathering. Jan. 14, 1911, paper on "Gasholder Construction," by Mr. J. Taylor, of Glasgow. Jan. 28, visit to Messrs. R. Laidlaw and Son's Edinburgh Meter-Works. Feb. 11, paper on "Retort-Settings," by Mr. J. Murray, of Glasgow. Feb. 25, joint visit with the Eastern District of the Association to the Airdrie Gas-Works. March 11, annual general meeting, and paper on "Coal: Its Formation and Variations," by Mr. John Gillespie, of Glasgow.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to Messrs. J. & J. Braddock's Works at Oldham—Details of the University Scheme.

Over sixty members of the Manchester and District Junior Gas Association took advantage of the opportunity afforded them of visiting the works of Messrs. J. & J. Braddock (Branch of Meters Limited) at Oldham last Saturday afternoon. On arrival, the party were welcomed by Mr. G. H. Braddock, Managing-Director of the firm, Mr. R. E. Braddock, his brother, Mr. J. Hawkyard, the Works Manager, and Mr. J. Berry, Assistant Works' Manager. These gentlemen, along with Messrs. J. Taylor, R. Fowler, W. T. Glover, J. A. Maylor, A. Todd, and H. Fletcher, acted as guides through the different departments. Added interest was given to the inspection by reason of the fact that the 400 employees of the firm were at work, owing to pressure of orders.

For a start a visit was paid to the foundry, where was seen in operation the casting and moulding of the various brass parts required in the construction of the meters. Passing on to the stamping-room, interest was taken in the process of stamping from the tin plates; and in the adjoining department for brass finishing, the latest types of automatic tools were seen in use. In the station-meter erecting shop, the visitors were shown, and had described to them, the various station-meters in course of construction—one being for 60,000 cubic feet per hour. There were also on exhibit station-governors, one of which was seen in action; and likewise retort-house governors. From these works, a station-meter designed for 250,000 cubic feet per hour has been recently turned out. A good deal of time was spent in the test-room, and other departments came in for much attention; the afternoon being well advanced before the inspection was finished.

RETORT-HOUSE GOVERNORS.

Before the party left the works, the following paper was read by Mr. J. BERRY, on "Retort-House Governors."

So far as can be ascertained, it is perhaps about forty years since governors were first used in this country to control gas in the hydraulic mains; and they are stated to have been installed in the gas-works at Preston, Stalybridge, and, later, at Salford and elsewhere. It would not appear, however, that they met with any great degree of success, judging by their limited adoption; for it was not till about nine years ago (when Mr. Charles Carpenter, of the South Metropolitan Gas Company, installed them in his works) that retort-house governors again came into prominence. The innovation at that time was, like all revivals, looked upon with a certain amount of scepticism. Many were the arguments used for and against their adoption; but I think you will agree with me when I say that at the present time most of the prejudices have been broken down, and there are comparatively few works of any importance now in the country that have not installed one or more of these governors, with beneficial results.

The first question to ask oneself, before advocating the use of retort-house governors, would be: What are the advantages to be obtained from them? These I should sum up as follows: (1) That the most desirable conditions could be maintained in the hydraulic mains. (2) That the candle power of the gas would be steadied. (3) That the maximum yield of gas per ton of coal carbonized would be realized. Why do these results accrue from the adoption of a retort-house governor? Because the governor, by reason of its sensitiveness, creates a condition of steadiness in the foul main, and consequently the liquor in the hydraulic main will not be subjected to the same violent oscillations—thus allowing the distillation of coal to be carried on under less varying conditions of pressure and vacuum.

In selecting a retort-house governor, special attention should be paid to the following important points:

- (1) The governor should be simple in design, and have no complicated parts or delicate adjustments.
- (2) The governor should be so constructed that all deposits of tar which may accumulate in the tank will be reduced to a minimum; so that the periods between cleaning will be as long as possible.
- (3) The flow of gas through the governor should be as free as possible. Hence the governor should have no more deviations in the gas-ways than absolutely necessary.
- (4) Ample provision should be made for cleaning whenever this is required.

I will now endeavour to explain, as briefly as possible, how the Braddock enclosed retort-house governor fulfils the conditions set forth.

The valve box is of special design, and in it a very important improvement has recently been made, which we claim has placed the governor in the front rank for efficiency. In our latest design of valve box, the flow of gas has only one deviation; but in our older pattern the gas made three deviations. Hence the great advantage of our latest improvement over our earlier patterns and many other makes. It must be admitted that, having only one deviation from a straight flow, the travel of the gas will not be as much restricted, owing to frictional resistances being reduced to a minimum; and therefore condensation at this point becomes practically *nil*.

The valve has also received special attention, and possesses certain advantages. Our valve is an open-ended cylinder with

parabolical slots cast in the lower half. By means of the parabolical slots (instead of parallel or conical slots) the travel of the valve is reduced by one-half, and therefore the governor responds more promptly to any increase or decrease in volume that occurs. This is noticeable in charts obtained from Braddock retort-house governors, which have shown the charging of every retort; and where a recorder is used together with the governor, it gives a check upon the time of charging the retorts.

The governor tank and bell are so designed that tar deposits are not likely to be troublesome. A centre sealing tube seals an upright pipe through which passes the valve rod; and the condensation in this small tube (only a few inches in diameter) is practically *nil*. The retort-house governors have worked from six to twelve months or more without attention in the way of cleaning; but, of course, much depends on local circumstances.

The method of controlling or actuating the governor is by means of a tube or pipe coupled to the inlet side of the governor upon the foul main, and any increase or decrease in pressure or vacuum in the foul main is communicated through this tube to the bell, causing it to rise or fall and open or close the valve. The Braddock governors first introduced this method of control.

With respect to cleaning, the governors are fitted with large sheet-iron plates on each side of the valve-box; so that the valve is at all times easy of access.

The Braddock retort-house governors are made in both float and counterbalance type, and are exactly alike in the principal external dimensions. With the counterbalance type, all repairs are reduced to a minimum, as there is no float, and a greater range of "pull" or "vacuum" may be obtained by means of the weights. The beam pin and seatings used are entirely enclosed, so that they require the minimum of attention and cleaning. In working, we find the action of a retort-house governor to be the exact opposite of a station governor, for it controls the inlet and not the outlet as in a station governor; also the valve is opened by any increase in pressure, and not closed as is the case in a station governor. With regard to fixing and working the governor, I think most engineers are agreed that the ideal position is on the foul main at the end of the retort-benches, and to work with as light a seal as possible—say, $\frac{1}{4}$ -inch—and to set the governor to 2-10ths pull or vacuum. But, of course, this question must be settled according to existing conditions of the hydraulic main; and as these vary considerably, no hard-and-fast rule can be laid down upon the point.

Turning, now, to the attention required by a retort-house governor, I am afraid that, owing to its somewhat isolated and not easily accessible position, it is apt to be deprived of that little attention which is necessary for its efficient working. Many engineers now put oil in the governor tank to a depth of about 2 or 3 inches, causing the bell (during its travel) to work through oil, which preserves the bell and considerably lengthens its life. The bell itself should be cleaned and painted with a good paint or rust preventative about every six months; and the water-level in the governor tank should be maintained by constant drip, or attended to at least twice a week. When we consider that this is all the attention necessary, I think we cannot but agree that it is very little that is asked, and certainly ought not to be neglected when we sum up the beneficial effects which are brought about.

A cordial vote of thanks was accorded to Mr. Berry for his paper, on the motion of the President. Subsequently members adjourned to the Union Club, where "High Tea" had been provided for them by the Directors of the firm. Mr. F. Thorp, the President, was in the chair, and was supported by Messrs. G. H. & R. E. Braddock. There was a little speech-making after the menu had been got through.

The PRESIDENT said that, when the suggestion was made for a visit to the works of Messrs. J. & J. Braddock, it was hailed as an admirable one. The visit had been extremely interesting; and the pleasure had been added to by the generous treatment they had received at the hands of the firm. The name of Braddock was known the world over; and they had a reputation for good workmanship which was not by any means local. The inspection of the works had given the members a better idea of how this reputation had been gained.

Mr. J. H. MASSEY (Oldham) moved a hearty vote of thanks to the Directors for giving the Association an opportunity of inspecting the works, and also for their hospitality. With the vote he coupled the name of Mr. A. Manning, of Meters Limited, and the gentlemen who had shown the party round the works—adding that the interest of the inspection had been enhanced by the fact that they had seen the men at work.

Mr. J. BRIDGE (Stretford), in seconding, observed that the Association had been highly favoured by the invitation extended by Messrs. Braddock to be shown how meters, large and small, were constructed. In passing from room to room in the works, the members had seen many things which would be of advantage to them in their work.

The motion having been carried with applause,

Mr. G. H. BRADDOCK responded. He said they had only been too pleased to show the members over the works; and he hoped that what they had seen had been of interest and of benefit to them. Generally, they found that people visiting the works were interested with what they were shown, mainly because of the great variety of work carried on by Meters Limited. It was ever

the aim of his firm to turn out a really first-class article; and the visit had no doubt impressed the members with the great care which was exercised in the manufacture of gas-meters. He pointed out that, as a rule, meters tended to register on the slow side; and it meant a great deal to a gas department if the utmost care was not taken in their construction. A gas-meter could not be too well made, especially seeing that it was the practice to put them in cellars and out-of-way places, and expect them to have as good a life as if housed in a better place. They at the Globe Meter Works were proud of their management, and of their staff, who rendered excellent service; and all of them were pleased to meet the members of the Association.

Mr. R. E. BRADDOCK also spoke in response to the vote, as did Mr. BERRY and Mr. TAYLOR.

THE GENERAL MEETING.

A general meeting of members was held subsequently—Mr. F. THORP in the chair. The chief business had relation to the University Scheme, which had its origin in a suggestion made at the annual meeting by the President in the course of an address he delivered upon taking the chair. Since then, a small Sub-Committee has been at work; and the Council now submitted details of the scheme for the approval of the members.

The PRESIDENT, having explained that it had been found impossible to complete the scheme for submission to the members before, in consequence of the many details which had to be dealt with, said that everything was now in order, and the Council took the present opportunity of letting the members know what had been arrived at. It was his hope that what had been done would meet with the unanimous approval of the members, so that a step forward would be made towards placing their profession on a higher level, and enabling it to take its stand among the other professions. For some reason or other, the gas engineering profession had not been looked up to as it ought to be from the importance of the work done; and the Manchester and District Junior Gas Association considered that, in arranging for a closer connection between the University and themselves, they had taken a step in the right direction for obtaining proper recognition of the profession. In his opinion, the "bill of fare" submitted was an excellent one. From the particulars supplied, it would be seen that it was proposed that two courses should be given during the next session. There would be a course of six lectures on the science of gas manufacture and combustion. Up to the present time, the following lectures had been provisionally arranged for: "Combustion of Gases," by Professor Harold B. Dixon, F.R.S. "Internal Combustion Engines," by Mr. Dugald Clerk, M.Inst.C.E. "Carbonizing," by Dr. H. G. Colman. "Construction as applied to Gas-Works," by Mr. Charles Hunt. "Chemical Control of Gas-Works," by Mr. J. T. Sheard. "Photometry or Pyrometry," by Dr. J. A. Harker, F.R.S. The lectures would be given in the Chemistry Theatre of the Manchester Victoria University, commencing at 3 o'clock in the afternoon of the first Saturday in each month from October to March. Admission would be free to all those interested in the gas industry. The members of the Sub-Committee appointed by the Association were interested more particularly in the syllabus of Scheme II., which included a course of twelve lectures and demonstrations on the chemistry of gaseous fuel and flame, designed for those who have already acquired a knowledge of gas manufacture. The suggested syllabus was as follows: "Kinetic Theory of Gases." "Pressure of Condensable Vapours." "Nature of Chemical Change." "Flame and Its Structure." "Theory of Luminous and Non-Luminous Flame." "The Ignition-Points and Specific Heats of Gases." "Temperature of Flames." "Phenomena of Explosion in Gases." "Pyrometry." "Standardization of Thermo-Junction Pyrometers." "Constant Temperature Furnaces." "Calorimetry." "Preparation of Pure Gases." "Manipulation and Analysis of Gases." "Theory of Fractional Distillation and Condensation." These lectures would be given by Professors Dixon and Carpenter and Dr. Norman Smith, or other members of the staff; the suggested times being from 5 to 7 p.m. or 7 to 9 p.m. on Mondays. The fee for the whole course was £1 1s. Each subject would be treated from a gas engineer's point of view; and it was hoped that those attending this course might afterwards undertake some research work in connection with gas problems. The University lectures would supply the need of the general body of members, while the evening classes would meet the requirements of special students, without in any way interfering with the work done by the technical classes, or with the Leeds University course. The Sub-Committee felt sure Scheme II. would not be considered too academic—especially seeing, as he had indicated before, that the lecturers would so prepare the lectures and demonstrations that the direct bearing upon the gas industry would be seen. In this, the lecturers would be assisted by students preparing a list of the practical problems to be elucidated. He desired to express his thanks—and those of the Sub-Committee—to Professor Dixon, for the assistance he had given in these matters, and for the way he had met them in the drafting of the scheme. They had also to acknowledge the aid given by the Senior Association; and he ought to add that their scheme had the approval and good wishes of the Council of the Institution of Gas Engineers. With regard to the financial question, matters had been so arranged that there

would be no need to touch the funds of the Association. They had therefore everything to gain, and nothing to lose; and he ventured to hope that the scheme as now outlined would meet with approval, and that the lectures and classes would be an unqualified success.

Mr. A. L. HOLTON moved the adoption of a resolution endorsing the action of the Sub-Committee and the Council in regard to the University scheme. In the course of his remarks, he said that it was his pleasure at the annual meeting of the Association to move the appointment of the Sub-Committee to consider this University scheme—expressing the hope that they would do their work thoroughly. He now had to move the confirmation of what they had done. He did not anticipate, when he proposed the resolution at the annual meeting, that the Sub-Committee would have gone into the matter so thoroughly as they had done; and it was his hope that other Associations would make a move in the same direction. In his opinion, the syllabus arranged touched high-water mark; and he trusted members of the Association would take full advantage of the facilities offered by it.

Mr. J. M. M'NICOL (Warrington) seconded the resolution. The Sub-Committee, he said, were to be congratulated by the members of the Association on the excellent way they had gone through with the scheme propounded at the annual meeting. It only now remained for the members to back-up the Council and attend the meetings in larger numbers.

The resolution was carried unanimously.

Mr. HOLTON then moved that the thanks of the Association be tendered to the following gentlemen for their assistance given in formulating the scheme: Professor H. B. Dixon, of the Manchester Victoria University; Messrs. H. Kendrick, T. Duxbury, and S. Meunier, of the Manchester District Institution of Gas Engineers; the members of the Sub-Committee of the Junior Association, Messrs. Thorp, Hollingworth, and Alsop, together with Mr. J. Taylor (Mossley); and the Council of the Institution of Gas Engineers.

Mr. C. E. WOODHEAD (Manchester) seconded. He said that the Sub-Committee had done their work well. Undoubtedly, they had been fortunate in having the assistance of Professor Dixon and the support of the Institution of Gas Engineers and the Manchester District Institution in this matter.

The resolution was carried.

Mr. J. ALSOP (Hon. Secretary) then gave an outline of the Association's syllabus for the ensuing session. After the lecture at the University on Nov. 5, there is to be a whist-drive. On Dec. 17, the members go to Southport, on a visit to the gas-works there. The annual meeting takes place on April 1. The third Saturday in May is marked off for a joint meeting in Birmingham of the Junior Associations; and on June 3 a visit will be paid to the Blackpool Gas-Works. Mr. Alsop added that it was intended to hold a meeting of their own after each lecture at the University, when they could discuss among themselves the points which had been dealt with by the lecturer for the day. In this way, they could clear up any matters not understood at the lecture.

PRACTICAL ILLUMINATION.

At the Congress of the Royal Sanitary Institute held last week at Brighton, Mr. JOHN DARCH read a paper on "The Eye as It Affects Practical Illumination."

The author said the conditions—at once those of daylight, and those essential to good artificial illumination—are: (a) A sufficiency of light; (b), perfect steadiness; (c), effective diffusion and freedom from violent contrasts; (d), a downward direction and preferably oblique; (e), the colour to be as white as possible. However readily these conditions might commend themselves, it was not too much to say that they were violated in nearly every lighting installation in the kingdom—whether of gas, electricity, or what not. That nature's conditions of lighting were the best was shown by the fact that myopia is unknown in savage life, and extremely rare among seamen and farmers, more particularly in the case of those whose childhood was spent in the open. Defective vision is the outcome of an ill-regulated civilization; and it was estimated that about half the studious and close working classes were sufferers therefrom in one way or another. Insufficient lighting in schools, offices, and workshops was largely responsible for the increase of myopia, astigmatism and many attendant nerve troubles; but, so far as artificial lighting was concerned, the ever-increasing brilliancy and cheapening of light, properly applied, made the remedy easy. For reading and ordinary work, there should be an illumination of 0.8 to 1.5 foot-candles; for drawing and fine work, 3 to 10 foot-candles.

High brilliancy in lighting did not, in itself, deserve the hard words which some had applied to it. Like all other forms of energy, light was a good servant but a bad master; it was a source of health and pleasure, and the more they had of it under control the greater the possibilities of good results. But glare from ill-placed and ill-tempered lighting was responsible for much suffering. The dazzling effect of a source of light might be due to (1) its intensity, (2) its composition, (3) its contrasts. A question still open for settlement was the maximum intrinsic brilliancy from any point or surface (and it was the intrinsic brightness and not the total flux of light that counted physiologically) that might be continuously and safely gazed upon. Dr. Louis Bell gives

5-candle power, and Dr. Stockhausen 4-candle power per square inch as the maximum permissible brightness from a hygienic point of view; but Woodwell (U.S.A.) gives 0.2 to 0.1. The author was still of opinion that 0.05-candle power per square inch was the maximum intrinsic brightness that one might gaze on continuously. For short periods, however, 0.1 might be comfortable. All lights should be rigorously precluded from the field of vision, or, if translucent screens be used, these should not transmit more than 0.05-candle power per square inch.

Bad lighting was invariably due to the absence of suitable and sufficient reflecting surfaces. If the whole expanse of the sky was needed for the diffusion of sunlight, surely every inch of the ceilings and walls should be made to do similar duty and to yield at least 50 per cent. of its incident light. This would give the greatest amount of the most agreeable and serviceable of all light—diffused. The eye, alone, was incapable of judging actual intensity in lighting, and some reliable means of ascertaining such intensity was essential to the most elementary proceedings.

The need for legislation in respect of adequate lighting had long been felt. Something had been done in the Factory Act Regulations of 1908—requiring that certain rooms shall be “efficiently lighted.” Such an expression was, however, indefinite and difficult to enforce, and, until the amount of light to be supplied could be stated in terms of standard units, such legal enactments offered little hope of success. This should present no difficulty, as we now had convenient and portable instruments, known as illuminometers, for measuring and indicating in foot-candles the amount of light falling on a desk, bench, or other surface. They were at present mostly in use by street-lighting engineers; but one should be in the hands of every factory and school inspector, and every architect desiring good natural and artificial lighting in his buildings.

There were many ways in which the rules he had laid down might be applied, the choice of which would be guided by taste and circumstances. In this short paper, he could but indicate certain useful arrangements—viz., let the engineer remember the simple axiom: “The purpose and object of artificial lighting is to make properly visible the things required to be seen.” This really covered the whole case, but might be interpreted in the following rules: (1) The lamps or other sources of light should be so arranged that they are not visible from the more frequented or ordinary points of view. (2) The illumination should be sufficient to cause the objects to appeal at once to the eye, but should be free from glare. (3) For general illumination, the light should have a preponderating downward direction, freely flooding ceilings and walls, uniformly distributed, and fully diffused. (4) Special work at desks, benches, &c., should have special lighting, adjustable in position and power, with opaque shades. (5) The colour of the light should be as pure and white as possible. All monochromatic light should, as a rule, be avoided.

The stages of theatres were about the only places that were always well illuminated; the scenery and the lighting were each the complement of the other, with the most natural and agreeable results. Now, if architecture had any power to charm, that power could only take effect when it was subjected to suitable lighting. It was curious that this truism was so completely overlooked, as one might see in any public building, sacred or secular. The architects of Ancient Rome well knew that it was upon the lights and shadows that their superb art depended. With regard to the disputed question of direct *v.* indirect lighting, he advised them to always prefer direct lighting in so far as it would accord with the above rules; indirect lighting where specially suitable or inevitable; and for the rest, an arrangement of limited obscuration of lights which combined the advantages of the other two.

Street lighting was at present extremely unsatisfactory. There was no diffusion, no reflection, nothing but a blinding display of lights in a background of darkness, that, amid motor-cars and the like, only served to bewilder the bravest. Why should not these intense lights be shaded, the exteriors of the buildings as well as the pavements illuminated, and, by the encouragement of diffused light, the citizen be able to see what manner of place he was in, and to walk or drive comfortably and safely through it? It would have to come by and by.

Scottish Smokeless Coal Syndicate.

In view of the publicity which has been given to the use of smokeless fuel by the Coalite Company and to the various exhibitions which have been held throughout Britain—the latest, that now open in Glasgow—it is of interest to know that similar fuel is being manufactured and put on the market by the Glasgow Company named above. Why more has not been heard of the Company is due to the fact that they have been somewhat hampered, owing to opposition by the Coalite Company. The latter have, however, we are informed, failed in their proceedings, and the Glasgow Company are now prepared to grant licences, both at home and abroad, to parties wishing to manufacture such a product. There seems to be no doubt whatever that if the manufacture of this type of fuel were undertaken by a gas company or corporation, who could themselves find a ready sale for the smokeless fuel, and also for the various and valuable by-products resulting therefrom, the fuel could be sold at remunerative prices; and if a sufficient and constant supply of it was constantly available, the community would not likely be slow to adopt it for general use.

DESSAU VERTICAL RETORTS AT MAGDEBURG.

The eight benches of Dessau vertical retorts (ten in a bench) put into operation at Magdeburg in the autumn of 1908 have been working uninterruptedly up till now, and will be kept working until next year, in order to be then put in proper condition again after two-and-a-half years' working. Their structural condition, it is reported, continues excellent, and is far superior to that of the horizontal benches after the like working time.

From the eight vertical benches (including some horizontal benches) at Magdeburg there were obtained, from 100 kilos. of coal, an average of 34.4 cubic metres of gas, as against 31.10 in 1907 when the vertical retorts had not yet been built. The saving amounted to 569 double truckloads of coal or (at 50 marks per load) 28,450 marks (£1422). In wages, there were spent: 1907, for oven working, 103,451.93 marks; for cleaning, 11,402.49 marks. In 1909, for oven working, 68,123.78 marks; for cleaning, 9725.25 marks. That is, there was a reduction for oven working of 35,328.15 marks, and for cleaning of 1677.24 marks—total, £1848. The yield of ammonia was: In 1907, pure ammonia, 0.17 per cent. of the coal; 1909, pure ammonia, 0.217 per cent. of the coal. The extra profit in pure ammonia is (23,340 kilos. at 1 mark) 23,340 marks (£1167). For naphthalene washing oil, there was expended 5296.48 marks, as against 13,158.44 marks the previous year—a saving of 7861.96 marks (£393).

The total saving from the year's work of the eight vertical benches is therefore 96,651 marks (£4832). No account has been taken of the partial use of Westphalian coal, with a smaller yield of gas, as compared with the best English coal, nor of the better quality of coke (which produces less breeze) and the lower cost of keeping the benches in condition. The vertical benches, therefore, it is claimed, perform what they promised; and “it may be expected that the working of the ovens at present being erected will give rise to further savings.”

WATER-TOWER IN REINFORCED CONCRETE.

A conspicuous feature at the Brussels International Exhibition is an elevated reservoir situated near the electric power house.



Fig. 1.—Water Tower at Brussels. Height, 150 feet.
Capacity of Tank, 180,000 gallons.

The tower rises to the height of 150 feet, and is surmounted by a circular reservoir having a capacity of 180,000 gallons. It is shown in the accompanying illustrations. Fig. 1 is a general view of the completed structure (which, in addition to the temporary purpose of supplying water to the exhibition, also forms part of the system serving the suburban district of Ixelles). Fig. 2 is a vertical section, showing the general character of the design and internal arrangement. Fig. 3 is a sectional plan of the foundations.

The base of the structure, providing accommodation for pumping machinery, valve chambers, and pipes, has the interior diameter of 47 ft. 6 in., and is built of brickwork faced above ground with granite blocks, and supported on a reinforced concrete foundation comprising two concentric ring beams with a

connecting slab by which the weight is distributed at the rate of about $2\frac{1}{2}$ tons per square foot. Two entrance doors at the ground-floor level give access to the pump-room and main staircase respectively; the latter communicating with suites of rooms on the first and second floors for workmen in charge of the machinery and apparatus. There are four other floors, all connected by a winding stairway, which is continued by a spiral staircase through

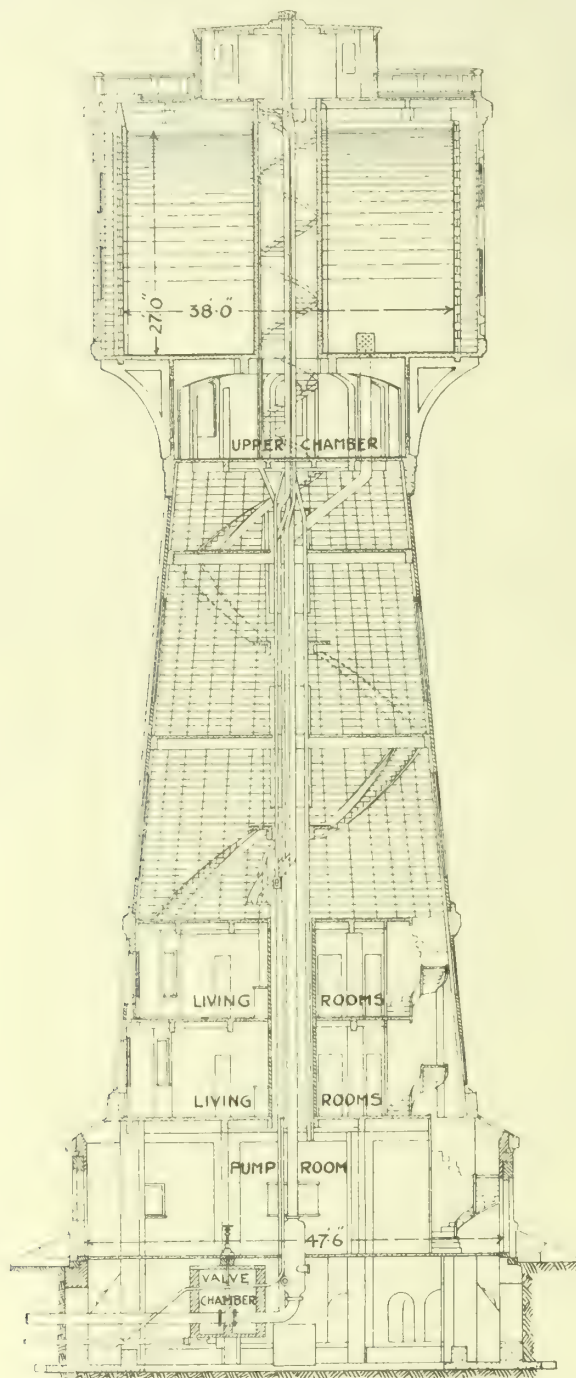


Fig. 2.

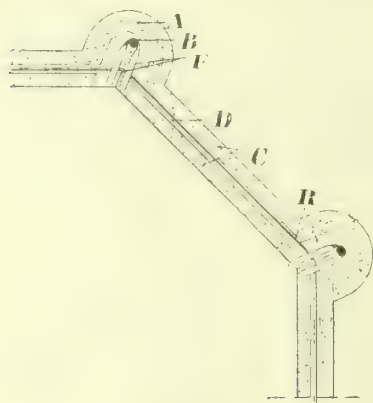


Fig. 3.

the centre of the reservoir, giving access to the flat roof. Three of these upper floors are merely landings, while the fourth floor forms a room immediately beneath the reservoir. The water supply and delivery pipes are carried up to the reservoir inside a cylindrical casing of reinforced concrete passing through the centre of the tower.

Having briefly indicated the main features of the tower, attention may be directed to the method of construction, for which it is particularly remarkable. Instead of being built in monolithic reinforced concrete as usual, the shaft and reservoir are formed of reinforced concrete blocks of special form applied in accordance with the system devised by M. Dumas, a Belgian architect and engineer. It has already been adopted on a fairly extensive scale for the construction of boiler chimneys; but the present example is the first application made in the form of a water-tower. It consists in the employment of blocks, as illustrated in fig. 3, for building up the successive courses; the blocks being jointed by reinforced concrete filling, and tied together by a horizontal rod laid and embedded in grooves, and connected at its ends so as to bind each course securely, and make it a unit capable of withstanding any required amount of outward pressure. Alternate courses are laid in reverse directions, with the object of increasing the bond, which is further aided by longitudinal steel bars in the projecting end of each block—these bars extending throughout the entire structure.

Referring to fig. 3, the reinforcement A of the block is inserted so as to facilitate handling without risk of fracture; the vertical bars B uniting all the courses of blocks. The body of the block C is moulded with a groove for receiving the horizontal tie connecting all the blocks of the same course. The stirrups E form a connecting-link between the vertical bars and the body of the blocks; and the cement mortar filling R completes the work. The rounded head at one end of each block serves the important purpose of a socket, permitting the diameter of successive courses to be slightly reduced as work progresses; thereby imparting the requisite taper to the shaft. It should be noted that the projecting ends of the blocks, as reinforced by the longitudinal bars and mortar filling, constitute vertical ribs which, besides imparting a pleasing appearance to the exterior, act as efficient counterforts to the shaft. As an additional precaution, the tower is braced internally by the reinforced concrete beams of the four upper floors; these members being about $5\frac{1}{2}$ inches wide by $10\frac{5}{8}$ inches deep, reinforced with steel bars in the customary manner.

At the upper end of the shaft, the bottom of the reservoir is supported by the aid of radial cantilevers and arched beams, the whole in monolithic reinforced concrete. The reservoir floor supports two circular concentric partitions, 27 feet high. The inner one, 7 ft. 9 in. diameter and 6 inches thick, is of reinforced concrete, moulded in shuttering as usual, and affords accommodation for the spiral stairway leading to the flat roof of the reservoir. The outer partition, with the diameter of 38 feet and the thickness of 7 inches, is built in courses of curved blocks similar to those employed in the construction of the tower, but without the projecting heads as fig. 3. To ensure perfect water-tightness of the reservoir, its outer surface is covered by cement mortar, 1 inch thick, plastered upon a layer of expanded metal.

The reservoir proper is surrounded by a third concentric wall built up of blocks of the same type as those in the shaft of the tower. This outer wall, being pierced by windows and situated at the distance of about 18 inches from the exterior of the reservoir, forms a narrow passage permitting the service of the latter to be inspected as often as may be thought necessary. It is surmounted by a cornice, carrying a balustrade around the terrace roof of the reservoir. The outer wall serves another useful purpose, in protecting the reservoir from extremes of temperature; the annular space enclosing an air cushion which acts as an efficient insulating medium. The tower is completed by a roof lantern, 20 feet in diameter and 8 feet high, giving light to the spiral staircase, and providing sheltered means of access to the interior of the reservoir. Above the roof of the lantern projects the chimney from the fireplaces in the workmen's living-rooms.

Owing to the saving of labour and material effected by the Monnier system, the construction of the tower was exceptionally rapid and economical. It was built for the Compagnie Internationale des Eaux de l'Agglomération—the operations having been commenced in February, 1909, and completed in the early part of the following September.

THE PREPARATION OF TAR-MACADAM.

In the course of the proceedings at the recent meeting, at Paignton, of the Institution of Municipal Engineers, the Surveyor of the Warminster Rural District Council (Mr. P. W. Harrison) read a paper, on the "Kentish Ragstone Quarries," in which he said that the "rag" makes excellent tar-macadam; being, by the nature of its composition, able to absorb an appreciable quantity of tar. Ragstone differs in this respect from most igneous rocks, which, by reason of their too compact or crystalline nature, are able to absorb only a very small proportion of tar, which in many cases is little more than a surface coating that soon wears off. The following are, he mentioned, the general methods adopted for the preparation of tar-macadam.

The ragstone, having been broken either by hand or mechanical breakers, is taken (after screening) to the drying floors, which are constructed of large metal plates under which flues from large furnaces run up and down, and laid to a thickness of 5 or 6 inches. It is allowed to remain spread for twelve to fourteen hours—generally through the night—by which time it is found to be thoroughly dried and the whole of the natural moisture evaporated. This renders it in a better condition to absorb the tar.

Water Absorbed, Expressed as Percentage of Volume of Stone.

Granite	0.5 to 3
Basalt	0.1 to 0.2
Sandstone	8.0 to 20
Portland stone	13.5
Bath stone	17.0
Ketton	15.1
Chilmark	8.6
Kentish rag	1.5

It is then mechanically mixed with boiling tar, at a temperature of about 180° Fahr., in revolving cylinders fitted with a continuous screw, and fixed at such an angle and in such a way that the stone is propelled forward and the superfluous tar is able to run back to the mouth of the cylinder. By this means, it is found that the stone on being discharged has absorbed sufficient tar not only to render it waterproof, but eventually, when pressure is applied, to form a homogeneous and concrete mass. On an average, 13 to 16 gallons of tar are used to every cubic yard of stone—varying according to the coarseness or fineness of the material to be treated.

A LONG AMERICAN GAS-PIPE LINE.

The Arkansas Natural Gas Company have commenced work on the construction of one of the largest pipe-lines ever attempted in America. The line, which is 235 miles in length, extends from the Company's holdings in the Caddo (La.) gas-fields to Little Rock (Ark.), with several branches to supply cities on the way. The following particulars are taken from "Progressive Age."

Sixteen miles of 12-inch pipe are laid in the Caddo field; and from Vivian (La.) to Hope (Ark.), a stretch of 61 miles, 16-inch pipe is used. From Hope to Gum Springs (Ark.), a distance of 50 miles, the pipe is 18-inch; while the 20 miles to Malvern is connected with a double line of 12-inch pipe. The remaining 38 miles to Little Rock is covered with 16-inch pipe; but before that place is reached, two branches shoot off, one to Hot Springs, a distance of 22 miles, in which 10-inch pipe is laid, and the other a 42-mile stretch to Pine Bluff, passing through Sheridan; the pipe in the last run being 12 inches diameter.

The contract for laying the pipe-line has been awarded to a Pittsburg firm; and they have 200 men on the work. The line is to be constructed of plain-end pipe, with the sections connected by rubber-packed couplings, with the exception of one stretch of five miles, which will be of screw-end pipe, as it will serve the point selected for a gas-compressing station, consisting of three 1200-H.-P. units. Up to this point, a distance of 127 miles, the gas will be sent forward by the pressure at the wells, which varies from 465 lbs. in the upper sands to 1000 lbs. in the lower ones; or possibly two compressors may be installed near Vivian. The main line will have from 24 to 30 inches of covering. In order to supply enough gas to consumers on the coldest day, a maximum delivery of 40 million cubic feet will be required and provided for. The capacity of the pipe-line system is approximately this quantity per day, or 14,000 millions per annum, with an approximate earning capacity of \$2,100,000. The plant is expected to be in operation by Jan. 1, 1911.

Gas v. Electricity at East Stonehouse.

A test of the comparative merits of gas and electricity for street lighting is to be made on a small scale at East Stonehouse. The township is peculiarly situated; for while it is supplied by gas by the Plymouth and Stonehouse Company, it is within the area of the Devonport Corporation for the supply of electricity, and the Corporation's generating station is actually in Stonehouse. Hitherto the streets have been lighted by gas; but at the request of the Devonport Corporation (who, as owners of the electricity works, are large rate-payers), a number of electric lamps are to be installed in the streets. On being informed of this, the Plymouth and Stonehouse Gas Company asked for permission to place some modern incandescent gas-lamps in prominent positions in the principal thoroughfares, in order that a fair comparison might be made between them and the electric lights. The Urban District Council have acceded to the request, and preparations are being made for the erection of the lamps. If it should be decided to continue the use of gas for street lighting, the Council state that they will require the Gas Company to establish and maintain a testing-station at the Town Hall. When the competing lamps are erected, the people of Stonehouse will have abundant opportunity of comparing the merits of the two forms of lighting. On one side of them is Plymouth, where the Corporation own the electricity undertaking and light the main thoroughfare up to the boundary of Stonehouse with electric arc lamps; on the other is Devonport, whose Corporation own both the gas and electricity undertakings, and where gas has quite held its own as a public illuminant. The gas lighting in Devonport and Stonehouse has been markedly superior to the electric lighting of Plymouth, and with greater rivalry better results may be anticipated in the future.

Cost of the Opposition to the Standard Burner Bill.—In the course of a statement on the finances of the city, at a meeting of the Exeter City Council last week, Mr. Loram mentioned that £150 had been spent in the opposition to the Gas Companies' Standard Burner Bill. Alderman Templer Depree asked if this was the whole amount of the cost, and was informed that it might not be all.

REGISTER OF PATENTS.

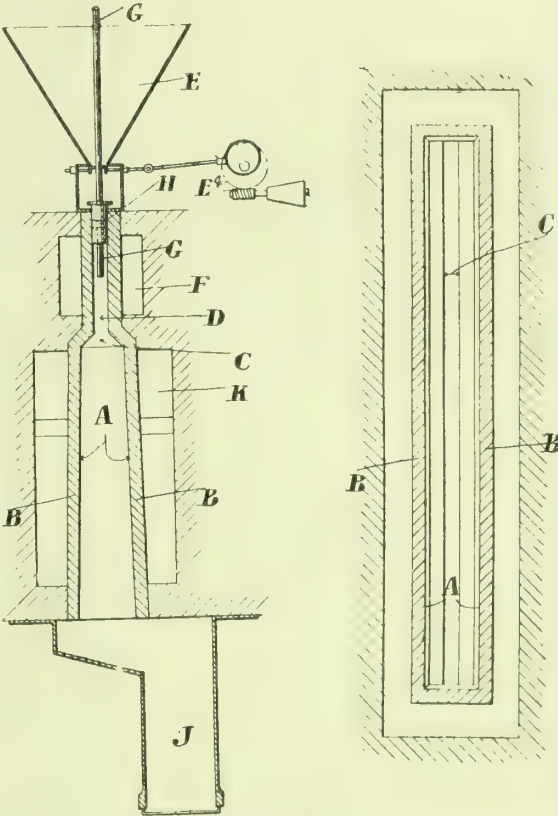
Vertical Retorts.

JOHNSTON, A. A., of Ealing, W., and CLARK, F. W., of Greenwich, S.E.
No. 19,196; Aug. 20, 1909.

This invention relates to continuous vertical retorts of the gravitation type where the coal is delivered into, and the major part of the gas generated at, the upper and most strongly heated zone, and then withdrawn from contact with the coal, "whether or not the withdrawn gas be afterwards subjected to controlled heat treatment."

According to the inventors' statement, "a comparatively large but (to ensure adequate heating throughout) a narrow body of coal—greater in horizontal length than vertical height—is heated so that the generation of the major and richest portion of the gas occurs at its upper portion. This gas, with gas generated in other parts of the body, is substantially vertically rapidly removed at or through and simultaneously over the major part of the upper surface of the mass; the treatment being rendered continuous by practically constantly feeding fresh coal to the upper portion of the body and correspondingly withdrawing carbonized residue at the bottom. The generated gas can be heated in a controlled and independent manner under such conditions that the non-gaseous matter falls vertically back to the coal being carbonized. Gas generated as described can be heated in regulatable manner in a superheater through which the coal from the source of supply falls to the main body of coal being carbonized."

They employ a vertical retort relatively narrow, open top and bottom, and of greater horizontal length than vertical height, and having, at or near the top, an outlet extending practically continuously over the major part of its length; the retort being continuously fed at its upper end with fresh coal, and the carbonized coal correspondingly withdrawn at the lower end. Preferably, the retort is of downwardly increasing cross section, and is used in conjunction with a chamber, adapted to be separately heated (termed a superheater), vertically arranged directly above the retort mouth, and into the upper end of which the coal can be delivered so as to pass through it by gravity to the retort. The means for heating the superheater and for otherwise regulating heat treatment of the generated gas are under separate control.



Johnston and Clark's Vertical Retort.

The superheater chamber is conveniently of the same length as the retort, but of less width. Suitable dimensions for a continuous retort according to this invention are (say) 5 feet high, 20 feet in horizontal length, and with a mouth width of (say) 4 or 5 inches—instead of, as is usual in such retorts, being (say) from 13 to 20 feet high and 10 to 12 inches wide at the mouth.

A "diagrammatic embodiment" of the invention is shown in vertical section and sectional plan as seen from below.

The retort A has confining side walls B connected (or not) by cross stays and of greater length than the vertical height, and which for the most part taper uniformly, but curve inwards or taper more quickly at the upper portion and terminate in an aperture C that forms the lower end of a rectangular vertical extension D, also provided with stays, if desired, which encloses a space that is relatively long in one direction and narrow in the other—constituting the superheater. The retort is heated most strongly at its upper portion by delivering a combustible mixture of gaseous fuel and air to, and effecting combustion within, the uppermost part of the flue K. The coal is delivered to the retort from a hopper E connected to the top of the superheater—through which the coal falls in its passage to the retort. The supply of coal from the hopper is controlled by a reciprocating valve constantly driven by

gearing that enables the speed to be controlled at will—for example, by worm gear and a conical belt pulley. Carbonized coal falls into the chamber J, whence it is withdrawn after removing the outlet cover below. The superheater is provided with adjustable pipes G (water or otherwise cooled, if desired) that pass through glands H at the upper end of the superheater, and facilitate the pipes being held in position after adjustment. The pipes can be caused to project any desired distance into the superheater—such distance of projection being capable of variation at will.

Gas entering the superheater from the retort can be subjected within wide limits to any desired degree of temperature for periods also capable of variation by altering the number and adjustment of the pipes G. For example, if it is desired to submit gas to a small degree of superheating, these pipes can be lowered so that the distance from the coal to the outlet is short. The size of the retort being used, together with the amount of superheating given to the gas (which varies with the description of the gas required), will control the number and area of the outlet pipes employed; such number and area being sufficient to adequately and rapidly carry away the evolved gas. Thus the gas passing away from the apparatus may be subjected to a small amount of superheating; while the full depth of the superheater is employed to heat the coal falling to the main body being carbonized. The space in the superheater above the lower ends of the outlet pipes is at the start filled with gas, which does not pass out of the superheater.

When it is desired to simultaneously produce a relatively rich gas and also utilize the superheater for preliminary heating and, it may be, partially gasifying the coal delivered through it, this can be accomplished by maintaining the superheater at a high temperature and only subjecting the gas from the retort to brief treatment in the superheater before removing it; the coal being thus subjected during the whole of its travel through the superheater to the high temperature prevailing, and "the relatively rich gas quickly removed from temperature conditions liable to become injurious."

Gas-Heated Radiators.

CANNON IRON FOUNDRIES, LIMITED, and HAWTHORNE, H. S., of Deepfields, near Bilston.

No. 21,688; Sept. 23, 1909.

This invention has for its object to provide a radiator or heating appliance for use in motor-car houses, laboratories, and works where explosive or combustible fumes or gases may be present, and where appliances with open burners cannot be used. The burners are enclosed within a fume or gas tight chamber having provision for the admission of a supply of air for supporting combustion at the burners within the chamber, while at the same time preventing the lighting-back from the burner chamber into the outside atmosphere of any fumes or gases that may be present in such atmosphere, or that may be carried into the chamber with the air.

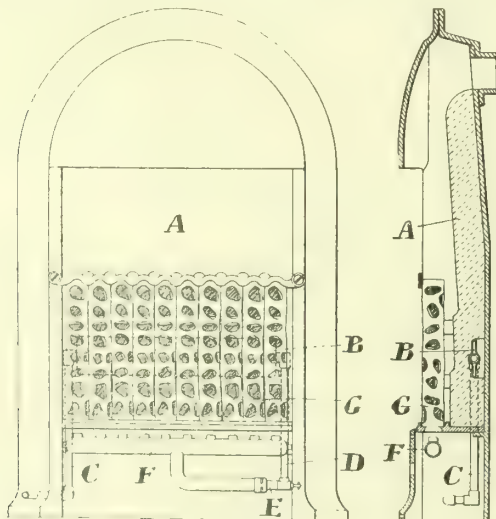
This result it is proposed to attain by forming in the walls of the enclosed burner chamber suitable air-admission openings, ports, or apertures which are completely filled with sheets of fine wire gauze which admit air for supporting combustion to pass through the reticulations or mesh and carry with it any combustible or explosive fumes or gases that may be present in the atmosphere, and which fumes or gases burn on the inner side of the gauze and within the enclosed burner chamber, while the flames caused thereby cannot strike back through the gauze or ignite any fumes that exist on the outside of the chamber.

Gas-Fires.

YATES, H. J., of Birmingham.

No. 23,082; Oct. 9, 1909.

To preheat the gas by waste heat from the fire, the patentee proposes to provide a flat or other tube or chamber (having a passage through it) at the rear of, or within, the usual fire-brick back, where it would not be exposed to the direct action of the hot gases. At its opposite ends, the tube is connected to the gas supply pipe and the



Yates's Gas-Fire.

burner respectively. By the action of the heat transmitted through the fire-brick back, the stream of gas flowing through the tube is heated before entering the burner. "Some of the heat which would otherwise be wasted is, therefore, returned to the apparatus, and, in consequence, a greater heating effect can be obtained than ordinarily

from the combustion of a given quantity of gas, or a particular heating effect can be provided with less gas than is usually required." The invention may be applied to various forms of gas-fires, and may be embodied in a variety of different means.

In the arrangement shown—a front elevation, with the cover plate at the front of the burners removed, and a vertical section—there is arranged behind or within the fire-brick back A, out of the path of the hot gases, a flat tube B, having attached to its ends pipes C D respectively connected to the main gas supply pipe and the regulating tap E—the latter being in conjunction with the burner F. The back becomes heated by the fuel G and communicates some of its heat to the tube B, which is utilized for heating the gas flowing through the tube to the burner.

Continuous Distillation of Tar.

HUGENDICK, W., of Essen-Rüttenscheid (Ruhr), Germany.

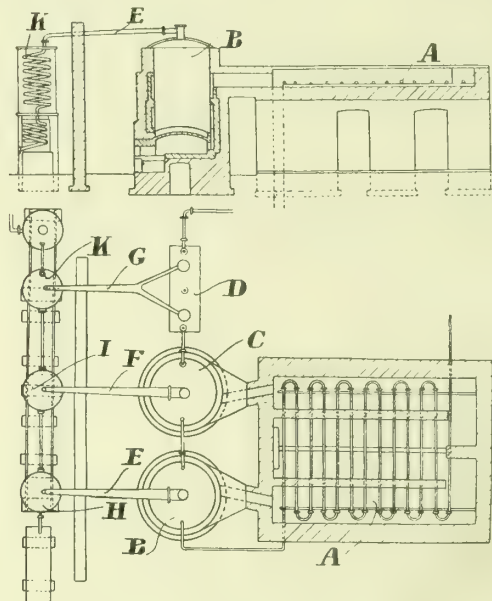
No. 23,766; Oct. 16, 1909. Date claimed under International Convention, Oct. 17, 1908.

This invention relates to a process for the continuous distillation of tar, which, the patentee remarks, has hitherto been generally carried out in stages, though there "have been processes according to which the distillation is carried on in a continuous manner." Thus, for instance, according to a well-known process, the tar is carried through a system of piping, in which it is raised by outer heating to a temperature of about 300° C. In the opposite direction to the heated tar, there is then introduced in a separate apparatus a jet of steam, which withdraws from it the volatile ingredients; so that the finished pitch is removed from the apparatus. The volatile substances are conveyed into condensers, in which the single compounds are separated.

According to another process, the continuous distillation takes place in several (for instance, three) stills arranged in series. In the first still, the separation from the untreated tar of the light and medium oils, together with ammoniacal liquor, takes place; in the second, the separation of the heavy or naphthalene oils; and, finally, in the third, the separation of the anthracene oils, so that pitch is obtained from the last still—the tar being heated by passage through a system of piping outside each still.

Both processes have considerable disadvantages. The first process necessitates the consumption of great quantities of heat, as the whole quantity of tar undesirably has to be brought to the highest temperature of distilling. Moreover, the separation of the volatile ingredients by condensation does not give pure products.

The separation of the different ingredients is effected according to the present invention, as in the case of the second process mentioned, during the distillation—namely, in several stills through which the tar passes successively; but in the present process, the tar is first deprived of water and light oils.



Hugendick's Tar-Still.

The tar in the plant shown is first carried through the condensers for the purpose of preliminary heating. After having been deprived of water, it is conveyed into the system of piping A enclosed in brickwork, in which it is heated by gases escaping from the furnaces of the stills B C, so that it enters the former at a temperature of about 350° C., and gives off in it the medium and naphthalene oils. The tar then flows into the still C; gives off therein the heavy oils; and passes into the boiler D, in which the ingredients, which are volatile with difficulty, are withdrawn from it, so that pure pitch is discharged from the boiler. The volatile ingredients are conveyed from the stills B C and boiler D, through the pipes E F G, into the condensers H I K. The light oils are distilled before the commencement of the process according to this invention.

Incandescent Gas-Lamps.

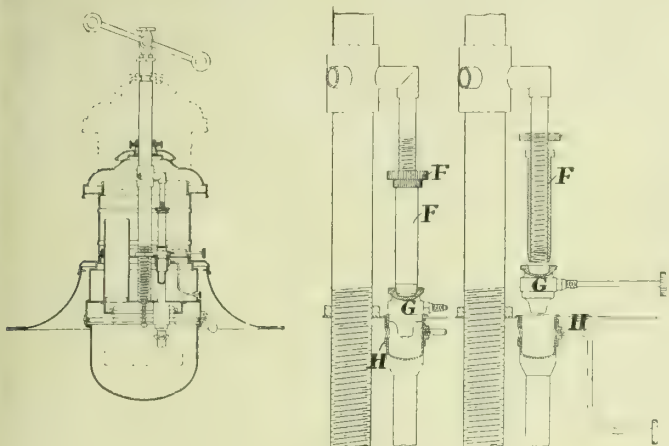
BIHELLER, S., of Chiswell Street, E.C.

No. 7178; March 22, 1910.

This is a modification of patent No. 8331 of 1907 so as to permit of the removal of the regulator for cleaning, adjustment, or renewal.

The illustration shows a sectional elevation of the lamp, and a sectional elevation of the regulator as it appears when the lamp is in use and in the position necessary for the removal of the regulator.

In order to permit inspection of the regulator, the pipe leading to the burner is divided into two parts. On the upper part, a sleeve F screws up or down; and this may be fixed in position by a locknut if desired. The lower end of the sleeve is tapered, so as to fit into a socket on the regulator G, the underside of which (formed as shown) fits into the upper part of the lower part of the burner pipe, so as to serve as, or lead into, the mixing-chamber. H is a hit-and-miss valve of usual



Biheller's Incandescent Gas-Burner Lamp.

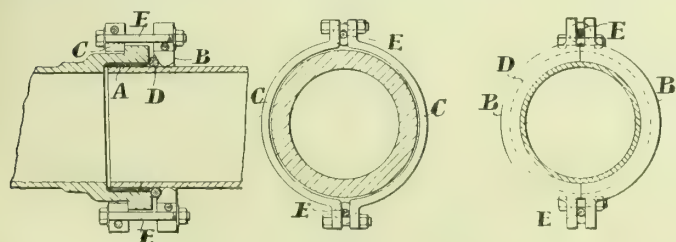
construction, with a handle for regulating it. When the lamp is in use, the parts are in the position indicated in full lines. If it is desired to have access to the interior, the lamp is raised and fixed as indicated by the dotted lines. If it is desired for any purpose to take out the regulator G, the top part of the lamp being raised, the sleeve F is screwed up, and the regulator may then be lifted out.

Joists for Gas and Water Mains.

FRANKS, E. A., of Ferndale, Glamorganshire.

No. 7717; March 30, 1910.

This invention consists of auxiliary jointing means which can be readily applied to a leaky main or to a main after the spigot-and-socket joints of it have been made or packed in any ordinary manner, and before the trench containing the main is filled up. The ring which surrounds the spigot is made interiorly of V-shape in cross section and of such size that when its two parts are bolted to the two-part ring which bears against the rear of the flange of the socket of the joint, the edge of the V-shaped ring will bear against the periphery of the spigot of the joint. Further, a packing-ring of circular shape in cross-section is used, and the front face of the V-shaped ring is made of such inclination that it will effectually force the packing-ring against the exterior of the spigot and the inner edge of the socket of the joint.



Franks's Joint for Gas and Water Mains.

The spigot and socket has an ordinary packing A of lead wool or other material, forced into the annular space obtaining between the spigot and socket. B C are the two divided rings, and D is the india-rubber or like packing-ring, made of circular cross section. The ring B is of V-shape in cross section, and of such size that its inner periphery will, when it is in use, bear against the exterior of the spigot. The rings B and C (provided with lugs) are secured in position round the spigot and socket by bolts passing through holes formed in the lugs and nuts. Bolts E pass between the lugs and serve, in conjunction with nuts, as a means for drawing the divided ring C against the rear face of the flange formed on the socket, and for drawing the front face of the ring B against the packing-ring D, and the latter against the exterior of the spigot. The front face of the ring B has such inclination as to ensure that the packing-ring D shall be spread in the proper directions when the nuts are tightened—that is to say, that the ring shall be forced against the edge of the socket and the exterior of the spigot. The innermost part of the V-shaped ring B serves as a fulcrum on which the spigot portion of the main is free to move when there is any subsidence of the soil in which the main is laid without impairing the efficiency of the joint effected by the compression of the packing-ring D.

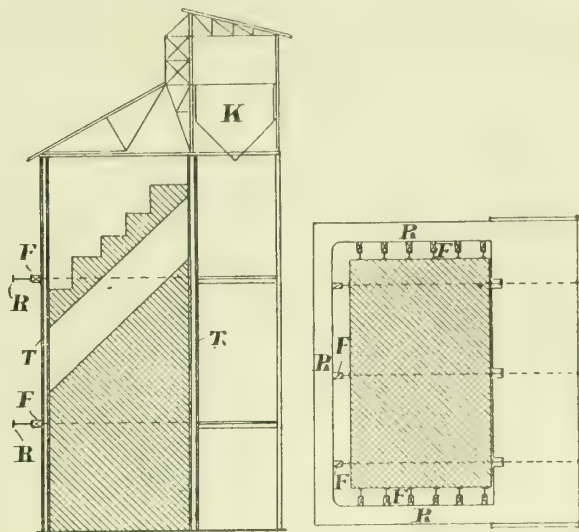
Gas-Retort Furnaces.

BENNINGHOFF, O., and KLÖNNE, A., of Dortmund, Germany.

No. 8369; April 7, 1910.

This invention relates especially to furnaces of considerable height arranged to contain inclined retorts or chambers. In such furnaces, the patentees point out, the front and rear vertical supporting bars, being of great length, have had to be made correspondingly heavy, as they could be anchored only top and bottom. Proposals have been made to secure them at their centres; but this plan has involved the passing of two anchoring devices through portions of the brickwork,

where they very rapidly become burnt up. To obviate this defect, the inventors arrange, at suitable heights around the furnace, supporting frames, which enclose the vertical supporting bars; and between these frames and the vertical bars are springs, which allow for the expansion and contraction of the furnace.



Benninghoff and Klönne's Gas-Retort Furnaces.

T are the vertical supporting bars; R, the frames surrounding them and keeping them in position; and F, the springs arranged between the frames and the bars. The arrangement is such that the furnace can expand and contract both laterally and towards the front; the rear supporting framework serving at the same time for the support of the coal-hopper K. The frames R may be arranged at such short intervals apart that the bars T may be of comparatively light sections; their weight being by means of this invention considerably reduced."

APPLICATIONS FOR LETTERS PATENT.

- 20,617.—CLARKE, R., "Rotary blowers and pumps." Sept. 5.
- 20,645.—GREER, D., "Reducing valve." Sept. 5.
- 20,668.—WINTER, W., "Continuous generation of combustible gas from hydrocarbons having high boiling-points." Sept. 5.
- 20,680.—ROWLEY, W., and CHAMPNESS, H. H., "Adjustable valve." Sept. 5.
- 20,700.—SOLARI, J., "Gas-main cocks." Sept. 6.
- 20,735.—SEARLE, W. S., "Lighting and extinguishing gas-burners." Sept. 6.
- 20,789.—PATERSON, R. H., and JENKINS, A. D., "Cocks and valves." Sept. 6.
- 20,794.—BAYER, C., "Purifying and cooling gases." Sept. 6.
- 20,804.—ANDERSON, D., "Street-lamps." Sept. 6.
- 20,805.—ANDERSON, D., "Starting or stopping clockwork movements for gas-controllers." Sept. 6.
- 20,811.—COLE, W., "Water-taps." Sept. 7.
- 20,813.—THORP, T. W., ALEXANDER, J., and RILEY, J. F., "Gas-engines." Sept. 7.
- 20,873.—BOULT, A. J., "Acetylene generators." A communication from Les Phares Willocq Bottin, Société Anonyme. Sept. 7.
- 20,875.—HENSSE, E., "Manufacture of sulphate of ammonia." Sept. 7.
- 20,923.—COVENTRY, W., "Inverted burners." Sept. 8.
- 20,965.—MEIJER, A., "Cocks or valves." Sept. 8.
- 20,967.—CORTHÉSY, J. H. & J. H., JUN., "Gas-turbines." Sept. 8.
- 21,008.—BROUSSEAU, G., "Measuring and distributing fluids under pressure." Sept. 9.
- 21,023.—KROGMANN, C., "Pipe-joints." Sept. 9.
- 21,048.—SOCIÉTÉ BARBIER, BENARD, and TURENNE, "Illuminating apparatus." Sept. 9.
- 21,058.—SIMMANCE, J. F., and ABADY, J., "Torch for lighting gas-burners." Sept. 9.
- 21,125.—BOHN, E., "Imitation candles for illumination by gas." Sept. 10.

Gas Matters in Sheffield.—In their report to the City Council, the Corporation Nominee Directors of the Sheffield Gas Company stated that the number of tests of gas made during the year was 2308, and the average illuminating power of the gas was 17.35 candles. The plant had been well maintained, and renewals and improvements of an important character effected, so that the Company were prepared to meet all the possible requirements of the city and district. The Company and the city generally had sustained a great loss through the death of the late Sir Frederick Thorpe Mappin, to whose energy and great business ability the success of the undertaking was largely attributable.

Municipal Profits and Income-Tax.—In submitting the Electricity Committee's minutes to the Mansfield Town Council, the Mayor (Mr. J. H. Collins) referred to a letter from the Ratepayers' Association which urged that the payment of income-tax should be avoided by reducing the price of current. He said that no doubt the writers thought it was wicker to go on paying £700 a year income-tax when they might save it by reducing the price of their commodities. On going into the matter, however, the Committee found it was not in their power to do away with the income-tax, because nearly nine-tenths of the amount paid was not on the net profit of the undertakings, but on the gross profits. They had to pay income-tax on the sinking fund, whether any profit was made or not.

MISCELLANEOUS NEWS.

BELFAST GAS-WORKS EXTENSION.

The Twin Island Site Abandoned.

A Special Meeting of the Belfast County Borough Council, convened in pursuance of a requisition signed by 34 members, was held on Monday of last week, for the purpose of considering the advisability of rescinding a resolution passed last March selecting the Twin Island site for the proposed auxiliary gas-works. At the outset of the proceedings, a deputation waited upon the Council, to protest against an extension of the gas-works being made in the Ormeau Road—as they had heard might be done.

Alderman Sir JAMES HENDERSON, in moving the rescinding of the resolution adopting the Twin Island site, said he wanted this course to be adopted in order to make room for the introduction of proper arrangements for the continuance of gas manufacture in the city. The shipbuilding industry was one of the most important in the city; and the West Twin Island was to be removed, as it was thought it might interfere with the successful launching of certain large ships. In the course of a few years, the East Twin Island might also have to be removed to provide for future developments; and they should be careful to avoid pursuing any course calculated to interfere with the shipbuilding interests. Much expenditure was contemplated by the Council in other directions; and he therefore thought that this was not a time when they, as a body representing the ratepayers, and responsible for the outlay of the latter's money, should be thinking of such an enormous scheme as the removal of the gas-works to the Twin Island site. It meant, he believed, the sinking of a huge sum of money, which would never be seen again. By the exercise of common-sense, led, he hoped, by the Chairman of the Gas Committee, and members of that body, this expenditure might be obviated. He thought that the opinion of the new Gas Manager on the question should not be taken until the Corporation had decided upon the subject. Certainly, his opinion would have no weight with him (Sir James); for he had already made up his mind on the question.

Mr. CURLEY seconded the proposition; remarking that it was not his intention to enter into details as to the relative merits of the site as compared with others. He preferred to confine his remarks to the general aspect of the question, and to avoid trenching on debatable ground. It could not be denied that the somewhat congested condition of the present works must be relieved. He maintained from the first that two gasholders on the old abattoir site, with its area of 4 acres, would be ample to meet the case, and he had voted accordingly. He believed firmly that, when the matter became clear to the minds of the Council, a more economical view would force itself to the front, and relief for congestion would be found nearer home than the Twin Island. He approached the consideration of the matter with a perfectly open mind, but was not able to shake himself clear of the ever-present fact that, with 432 retorts lying idle, it was not so much a question of production as of additional storage, with purifying plant and ground for coke. In order to find out the time at their disposal for considering the means of relief, he communicated with the late Manager, Mr. R. Sharpe, and in that gentleman's amended reply to his queries, he learned that the present plant was ample to meet all their requirements for 7½ years. There was, therefore, ample breathing time to approach the solution of this great question without undue haste. On carefully examining Messrs. Hunt and Herring's report, the first thing that struck him with amazement, and influenced his vote, was that the Twin Island scheme was called an "auxiliary gas-works." A more misleading title could not have been applied. Let them consider for a moment the fact that their total production of coal gas in this age of electricity was met by the carbonization of 103,000 tons of coal last year, and let them bear in mind also that this was the year of their gas exhibition. When this was compared with the proposed carbonization of 130,000 tons of coal on the Twin Island, as set forth in the report—and that only for the first section of the new works—it would at once become apparent that there would be no further need for the Ormeau Road works. This in itself was quite sufficient to topple over the present works into the scrap heap. But in order that there should be no doubt as to the ultimate fate of the present works, the second section of the new works on the Twin Island came in with its quota of another 130,000 tons; and over and above all this came in the Committee's decision for duplication. Let them think for a moment what the carbonization of 260,000 tons meant. It was more than two-and-a-half times their present requirements; and at the present rate of consumption per head would mean a population of close upon a million. Those who were acquainted with the city and its possibilities of future development would readily agree that history furnished no parallel of a prophecy so absurd. Recent newspaper correspondence had thrown much additional light on the question, and had shown clearly the possibility of utilizing ground adjoining the present works for all necessary extension and modernization; and if this suggestion should commend itself to the wisdom of the Corporation, he had no doubt whatever that they might reckon on the hearty support of the ratepayers. It had advantages that were not obtainable in the Twin Island site; and if the extension he had indicated came up for consideration later on, he, for one, would give it his most hearty support. In conclusion, he wished to point out to those members of the Corporation who in their haste would rush to the Twin Island, that the history of the Edinburgh new gas-works formed a useful object-lesson that should be kept before their minds. A few years ago, the people of Edinburgh believed their old works to be like Belfast's—that was, in a congested condition—and their experts pointed out a remedy disastrous in its results. One hundred and twenty acres of land were purchased, and new works were erected thereon, costing over £1,000,000. Their Edinburgh friends had now the luxury of new works; and though in the very centre of the coalfields of Scotland, their gas cost consumers something like 3s. per 1000 cubic feet. He had no hesitation in saying that, if they

allowed themselves to be led to the Twin Island, they would be sure to arrive at a similar disastrous experience. There they were, on the Ormeau Road, far away from all coalfields, paying sea freights and railway rates for coal and every other requisite, and yet their net price for gas did not exceed 1s. 6d. per 1000 feet; and at this exceedingly low figure, their present works contributed about £30,000 a year in relief of rates. The idea of "scrapping" such works was outrageous, and would be resented by the ratepayers of the city. He appealed to the members of the Corporation with all the energy he possessed to disabuse their minds of the fallacy that 8½d. per ton saved in the transit of coal to the Twin Islands outweighed all the advantages of extension of the present works. This was only an item, and when compared with the disadvantages of foundations and the enormous expenditure connected with preparation of the site before building operations could be started, it fell into utter insignificance, and should never be considered as the deciding factor in the matter of selection. Reckon it as they would, their escape from the Twin Island site, as compared with the Ormeau Road site, meant a saving to their already heavily taxed city of an enormous sum—certainly over £500,000.

Mr. ROBERT JOHNSON expressed the opinion that to "scrap" the present gas-works and build another at a cost of about £1,000,000 would be a really tremendous jump to take.

Alderman FINNIGAN said he thoroughly believed that they should consult the best men available on the important subject before them. It was true that they had a number of retorts idle; but this was because of an action in the Chancery Division.

Mr. CURLEY: Is there an injunction against 432 retorts?

Mr. J. A. DORAN (the Chairman of the Gas Committee) replied that there was an injunction in regard to something like £60,000 worth of property.

Alderman FINNIGAN (continuing) pointed out that it was idle for Mr. Curley and other members of the Corporation in favour of extinguishing the idea of using the Twin Island site to attempt to blind others to outstanding facts. The Corporation dared not extend the Ormeau Park site, because of the residents in the neighbourhood. While it was interesting to learn the extent of their liabilities, it should not be forgotten that financiers were always glad to advance any sums that the city required. He agreed with Alderman Sir James Henderson that the proximity of the shipbuilding works constituted an insuperable objection to the adoption of the Twin Island site. Why should they set down a gas-works in juxtaposition to great firms, when there was danger from effluvia and gases, and thus jeopardize and perhaps destroy the fine paint work and fittings of these great steamers? Their new Gas Manager (Mr. J. D. Smith) was a man of the highest capacity, and possessed of the best credentials; but he had not been consulted in any way in regard to the question which they were debating. He (the speaker) was altogether opposed to any extension at Ormeau Road; and he would do his level-best to prevent anything of the kind in that vicinity.

Mr. HENRY JOHNSTON said he had a strong conviction on the subject; and he would rather resign his position on the Corporation than give a vote in favour of the rescinding of the resolution. The matter was thrashed out for many months in committee with their Engineer; and they came before the Council unable to give a recommendation as to the site, because they did not consider themselves sufficiently well-informed on the subject. It was, therefore, decided that the very best information possible should be secured; and they selected experts, who submitted an exhaustive report. After taking these steps and receiving the report, were they now going to take the responsibility, as laymen, of departing from the recommendation of the experts, or were they going to have further experts, who would, perhaps, report in accordance with the wishes of some members of the Corporation? They would make themselves a laughing-stock throughout the kingdom, if they cast aside the report of the experts and tried to act for themselves. Was it a fact, as stated in the report of the experts, that, in the first year of the working of the Twin Island auxiliary works, they would effect a saving of £4500 in the transit of coal alone? If it was a fact, then they would stultify themselves if they threw away this amount by bringing coal up to Ormeau Road. If they dispensed with the large amount of water gas that they were making at the present time, they would double their saving on coal. Some very ridiculous things had been said there that day. He did not think there was a city in the United Kingdom that had more available ground for shipbuilding purposes than they had in Belfast; so that the taking of the Twin Island site would not interfere with possible developments in this direction. It was also unfair to suggest that those who advocated the Twin Island site had any intention of "scrapping" the present gas-works. He felt that, in face of the existing congestion, it was serious for them to postpone the settlement of the matter any longer; and if any accident occurred, they would find themselves in a bad position. They were spending as much money—nearly £6000—in shifting material from place to place in the present works, as would pay for the site they had determined upon.

Mr. SQUIRE said the Gas and Law Committees had, as instructed, gone to the Harbour Commissioners to take the necessary steps for the acquiring of the Twin Island site; and they would be placed in a very unfair and invidious position if they had now to go back to the Board. They were distinctly asked by the latter if they had power to deal with them; and they replied that they had perfect power, and that the Council had definitely settled that the Twin Island was the place for the auxiliary gas-works. Now it was proposed that they should tell the Harbour Board that they had made a mistake. Mr. Sharpe, in a report in 1907, said the site of the existing works was so overcrowded that there was not room to carry on operations in an economic manner, and suggested that they should make provision ample for the next 20 years. Mr. Curley took the question of the 130,000 tons of coal; but he did not take into account that the water gas did not require coal; that the manufacture of that gas was going to be reduced; and that the 100,000 tons they were using at present was going to be increased to about 130,000 tons. What was the good of rescinding the resolution unless something else was to be brought forward? He thought they knew what was underlying it. Down by the side of the river were 24 acres of land, which he (the speaker) had been inquisitive enough to visit; and he would like to know if the writer of certain letters in the papers was the agent for any of that property. If so, he was not surprised that he

wanted the Corporation to rescind the resolution. It was monstrous for an enlightened city like Belfast to go back a hundred years and put gas-works in the best part of the city, in preference to placing them right away. Though it might seem a startling statement, he did not think the present gas-works were a good paying concern. The capital amounted to £700,000, and they had £26,000 profit; but if they took off £8000 or £10,000 for depreciation, the profit would only represent something like 2½ per cent.

Mr. M'CLURE suggested that, by removing a lot of slum property, they could consolidate the gas-works on the present site; and they would not have to touch the Ormeau Park site, which would mean indefinite delay and serious trouble with the ratepayers. Now that they had got a new Manager, who was acknowledged to be an expert, they should instruct him to bring up a plan on the lines indicated—straightening the river and taking in the slum property right and left of the present gas-works site, and, of course, the site of the old abattoir. If they could make on the present congested site gas enough for nearly 400,000 people, he maintained that, with new appliances and up-to-date knowledge, an addition of some 11 or 12 acres should be ample for extension purposes.

Mr. RIDDELL voiced the opinion that the talk about the immense expenditure which the Twin Island site would involve was a mere myth. To carry out the work indicated on a plan which had been presented to the members of the Committee, though it had not been before them at any of their meetings, an expenditure of from £130,000 to £150,000 would be necessary, exclusive of the cost of the land. And this was in respect of a comparatively small scheme. A great difficulty arose in regard to the storage of coke. It was necessary to store winter coke for consumption in the summer; and there was no doubt that the space available for this purpose was exceedingly small. More room was required; but the Corporation had pledged themselves to increase the proportion of coal gas from 50 to 75 per cent. And he might say that, in doing this, they were not even approaching what had been done by municipalities on the other side of the Channel. In order that they might extend the life of their present works for a period of about five years, it was suggested that they should at once spend from £130,000 to £150,000, and also buy the ground which was valued at another £20,000. The Corporation had to take into account the increasing consumption, which during the five months of the present municipal year amounted to about 5 per cent. Reference had been made to the gas undertaking at Edinburgh; and he thought they should remember the difference in illuminating power between Edinburgh gas and Belfast gas. Threepence per 1000 cubic feet was the legitimate difference in the cost for candle power alone. There was also the difference between English and Scottish coal to be taken into consideration.

Dr. TRIMBLE said it was an extraordinary thing that people who had nothing to do with the Gas Committee should bring this matter forward. It had already been deliberated upon; but the resolution was introduced without any alternative. This was absurd, and would not be heard of in any business place. "Cutting the painter" and "scuttling the boat" at the same time were acts of foolhardiness.

Mr. DORAN remarked that he never was in favour of the Twin Island site; but when two eminent experts were brought in and gave an opinion, he was bound to go by their decision. He himself had been accused of self-interest in connection with the negotiations; but his only desire was the acquisition of the cheapest site. Sentiment overcame the Corporation in regard to the Ormeau Park site; and it was thrown out. Who was to say that the Ormeau Road was not the proper place for the extensions? It was convenient; and they would not have to separate their works. Gas was now being manufactured by vertical retorts, by the use of which they could produce 2½ million cubic feet per day, or sufficient for five years to come; so that they need not talk about a gasholder, which would cost from £60,000 to £70,000, since they would have to put one up no matter where they went, and at the Twin Island they would require two or three. There was an increase each successive month in the demand of some 5 per cent.; and some steps would have to be taken. Something had been said about an alternative scheme. This, he thought, should be the Ormeau Road—vertical retorts replacing the horizontal type. This would meet their requirements for fifteen or twenty years.

Mr. PHILLIPS suggested that, before any further steps were taken in the matter, the new Manager should be requested to report upon the whole subject. When the Chairman of the Gas Committee circulated information showing additional areas which could be had to the south of the old gas-works, and in close proximity to it, he (the speaker) was naturally startled, and made a personal investigation; and his partiality for the Twin Island site sustained a rude shock when he heard Mr. DORAN observe that a gas-works on the Twin Island would soon lead to the "scrapping" of the old gas-works. On mature consideration of the subject in all its bearings, he (Mr. Phillips) had come to the conclusion that they should not rashly decide to go to the Twin Island if they could get about 10 acres, as an immediate instalment of a further 20 acres or more, available for a possible development. This was not likely to come, considering the strides which the science of gas engineering had made, was making, and would likely make in the immediate future.

Mr. SHAW thought it was a great matter for the ratepayers that the Harbour Commissioners had not closed the negotiations, and the difficulties had been raised by their Solicitor that would enable the Corporation to retire from a bad bargain with grace and dignity. Personally, he never was in favour of the Twin Island site; and he thought the arguments used that day by Alderman Sir James Henderson were proof positive that at least the thoughtful and the large ratepayers of the city were prepared to endorse the contention that it would not be in the best interests of the city or of the Harbour Commissioners' property, in view of probable extensions in shipbuilding, that the gas-works should be erected on the Twin Island site. The argument as to the saving on the transit of coal if the latter site were adopted had again been trotted out; but not a word had been said as to the loss entailed in the handling of cinders or coke from the gas-works. However, the real question with him was: "Does Belfast need new gas-works?" Outside the Council Chamber a feeling existed that they could very well afford, with slight developments, and with the introduction of some new retorts of an up-to-date character into the existing works, to go on

for many years to come, without rushing into what might cost from £700,000 to £1,000,000.

Several other members spoke on the question; and then the discussion was wound up with some remarks by

The LORD MAYOR (Mr. R. J. M'Mordie), who pointed out that if the Council adopted some other site than that already approved of, they would most probably experience some difficulty when they went to the House of Commons. If, for instance, they proposed to utilize the Ormeau Park site, they might find that Parliament took a keen interest in the preservation of spaces for the recreation of the public. Then, again, they had obtained a report from experts, acting upon which they arrived at a certain decision; and though they probably knew a good deal more about the question in the Council Chamber than was known in the House of Commons, still, if the matter was raised in Parliament on the consideration of a Bill, he did not believe that a single remark made there that day would have a particle of weight. They would be referred back to their decision on the report of their experts—a decision which, as some members apparently overlooked, was unanimously arrived at. They might say they wanted another site; but the answer would be that the Twin Island site was described as the best possible one, situated where it would not inconvenience anybody. This was the view of the question that appealed to him; and he thought the best thing would be to adjourn the matter. If they passed the resolution that day, the Harbour Commissioners would be in a position to stop negotiations; and he believed they would like to do so, judging from a conversation he had had with one of the members. If negotiations were broken off, the Corporation might come back to the same position twelve months hence, and want to re-open the question, when they would probably find a site suggested half-a-mile further down the river, and perhaps at a higher rent. He was afraid if they came to negotiate again they would find themselves in an embarrassing position.

Mr. CURLEY said the Lord Mayor had referred to the previous resolution as having been carried unanimously. He thought when the vote was taken in March the numbers were 14 to 23.

The LORD MAYOR agreed that there was a division of opinion; but when the matter finally came up, he said, it was passed unanimously.

Alderman Sir JAMES HENDERSON: I am afraid there is some lapse of memory there.

The resolution was then put to the meeting, and declared carried. A poll was demanded, and taken, with the following result: For the resolution, 25; against, 7.

It was subsequently unanimously agreed—"That the whole question of the extension of the gas-works be referred back to the Gas Committee, with instructions to confer with Mr. J. D. Smith, the new Gas Manager, as to the possibility, with the adoption of modern machinery, of utilizing the present gas-works for some years to come."

THE DEATH OF MR. STELFOX.

A Vote of Condolence.

At the opening of the proceedings when the Belfast County Borough Council met on Monday of last week to discuss the question of the proposed gas-works extensions (as reported in the opposite page), feeling reference was made to the late Mr. James Stelfox, whose death it is our regret to have in this issue to record.

The LORD MAYOR (Mr. R. J. M'Mordie) said he was sure they all deeply regretted to hear of the death of Mr. James Stelfox, who was so long and honourably associated with the Corporation. He thought a formal resolution on the subject should be moved; and he would ask the Chairman of the Gas Committee to do this.

Mr. J. A. DORAN said he could assure the Council that, on taking up his paper that morning, he was greatly surprised to read of the death of Mr. Stelfox, who had been one of the bulwarks of the Corporation. In fact, he made the gas-works what they now were; and if it had not been for him, the ratepayers would not have gained to such an extent as they had done from this department of municipal enterprise. He moved—"That the Corporation have heard with feelings of the deepest regret of the death of Mr. James Stelfox, M.Inst.C.E., who for over thirty years acted as Manager of the gas-works, with credit to himself and profit to the community. His wide knowledge, his unfailing courtesy, and his unswerving probity combined to make him an ideal official; and it is to be regretted that he enjoyed his well-earned rest for so short a period. To the members of his sorrowing family the Corporation desire to tender their sincere and heartfelt sympathy."

Alderman Sir JAMES HENDERSON, in seconding the motion, said he was pleased that the note of sympathy with the family of the late Mr. Stelfox had been struck by the Lord Mayor from the chair. If ever there was an official who had deserved the esteem of the Corporation, it was Mr. James Stelfox. He (the speaker) had had the pleasure of intimately knowing Mr. Stelfox for many years—ever since he came into the Corporation—and he could say that they had never had an official in an important position who more faithfully performed his duties. He was a man who thoroughly understood the details of the business which he had to control. He started with the benefit of the training he had received from his father, who preceded him in the management of the gas-works, and, added to this, he was possessed of great ability. He was therefore in every way well qualified for the position which he was called upon to fill; and he (the speaker) believed it would be a long time before they looked upon his like again.

Mr. CURLEY said he had known the late Mr. Stelfox for many years, and had always found him a thoroughly upright man, and one who honestly tried to do his duty to the ratepayers. He could only hope that the Manager who was recently appointed would succeed as well as Mr. Stelfox did.

The motion was carried in silence; the members and officials of the Council standing.

Some original "A" shares of £5 in the Littlehampton Gas Company have just realized from £11 13s. to £11 15s. each. The dividend on the shares has been 1½ per cent.

MELBOURNE METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices in Melbourne on the 28th of July—Mr. JOHN GRICE, the CHAIRMAN, presiding.

The Directors reported that, as the result of the recent coal strike at Newcastle, which terminated in March last, it would be seen that the items in the revenue account representing the cost of coal and the returns from coke were considerably higher than in past half years. The net profits for the six months, including a balance of £2210 brought forward, amounted to £84,166. They recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,865. A sum of £25,000 had been transferred to the reserve fund, £2500 to the meter renewal fund, £10,000 to part meet the extra cost of coal during strike, and £1500 to the gas-stoves, &c., account; leaving a balance of £2306 to be carried forward.

The CHAIRMAN, in moving the adoption of the report and accounts, said the past half year had in two ways been eventful in the history of the Company. First, they suffered severely by the strike of coal miners at Newcastle and Maitland, which terminated in March last. All must feel the miners were ill-advised in striking; and they returned to work after five months' idleness, having gained nothing, not only with their own resources greatly depleted, but having impoverished many other workers not so well off as themselves, and having caused great loss to almost every manufacturer in Australia, and especially to those engaged in the gas industry. Provision had been made in the last and present balance-sheet for the loss sustained; the reserve fund being debited with the portion unable to be met out of revenue and expenditure account. While regretting the loss to the Company of a large amount of money, the Board might legitimately congratulate the shareholders that they had established large reserves of coal prior to the strike, and that by the immediate order of additional supplies from England and elsewhere, they were enabled to pull through this protracted period without interruption to the maintenance of a full supply of gas; and, further, that this was accomplished without having raised the price to the public during the most lengthened strike they had yet experienced, or ever anticipated experiencing. The second way in which the half year had been eventful was that probably never had a journal been so bitter and persistent in its attacks on any gas company as had one of the leading morning papers latterly been on their Company. For some years the "Age" had, in the opinion of the Directors, shown by its articles that the Company could not hope for any friendly feeling, or fair treatment at its hands. Since, however, what might be called the infatuation for electricity—whether in the form of traction, lighting, or heating—seized upon it, it had, as far as one could judge, done, and was continuing to do, all in its power to injure the Gas Company's business and reputation. At previous half-yearly meetings, and in other ways, the Directors had endeavoured to counteract somewhat similar but milder treatment, by placing the truth before the public, but not directly referring to that journal. In view, however, of these latest virulent attacks—always brought under the notice of the public by being placed in the most prominent part of the paper—and notwithstanding the Board's recognition of the powerful source from which they emanated, it seemed the duty of the Board of Directors to come out in the open, and unhesitatingly and publicly assert that many of the statements were contrary to fact, and, furthermore, that, as they were persisted in and reiterated time after time, notwithstanding their having been often refuted, it seemed there was no desire on the part of the "Age" to know the truth. The Company had no quarrel with their friends of the electrical industry, who could only be congratulated on getting such splendid advertisements free of cost to themselves. The Company had no monopoly for lighting the city or suburbs, and were willing, as they felt sure the suppliers of electricity were, to take the risks of competition—being satisfied that, with fair play, they could more than hold their own, as almost every gas company in the world had done, and was doing. They knew, comparing gas and electricity, that for lighting gas was by far the cheapest and, in their opinion, the best illuminant—even compared with the fragile metallic filament—provided the consumers would use the class of burners most suited to their requirements. As for heating, no serious comparison could be made. But were the Company getting fair play? Every thinking person must know and feel they were not; for the "Age" apparently relied on the old, but vulgar proverb, "Trow enough mud, and some of it will stick." Some of the earlier articles were commented upon in a letter to the Editor by the Secretary; and though this was courteously published, it was not given in so prominent part of that journal's columns as the statements to which it was a reply. In order to show those who had not read the articles the shape which this misrepresentation had taken, he would give a few extracts from them.

On Aug. 6, 1909, the following appeared—

The more, therefore, that the Company extorts, the greater becomes its power of extortion. Under this arrangement, the Company whose capital is £857,000, could be forced to sell only at a price of £2,541,000.

On Feb. 26, 1910—

But anyone who reads the electrical journals, marks the progress and cheapness of electric lighting, and makes practical comparison of the cost of both services, will arrive at the conclusion that the days of gas are numbered, that the time is not far distant when every new house, no matter how small, if it be within the area of an electric supply, will be installed with electrical fittings; that worn-out gas equipments in houses where electricity is available will be supplanted by electric wires and lamps, and unless a large reduction in the price of gas, that it will even pay the householder to scrap his chandeliers and gas-brackets, or tolerate them as a harmless encumbrance, and substitute or duplicate them with electric lamps. The revolution in electric lighting, which has eclipsed gas both literally and commercially, has been brought about by the introduction of the wire lamp. At any rate, the public should know that electricity is cheaper than gas; and when this is clearly proved, as it has been in England, electric lighting will soon come into general use.

On March 3—

This is the condition of the city electric lighting supply; and while it is maintained, the gas monopoly will continue to squeeze enormous profits out of the public. Great influence is exercised by the Gas Company. Has

it caught the City Council in its paralyzing grip? We know that it has blocked in every way the extension of electric lighting in Melbourne. The Company cannot surely have the power to induce the City Council to go slow, so that the gas monopoly may be maintained. It might be an ugly, unhealthy, uncomfortable light; but it was cheap. The wire lamp has deprived gas of its last claim to toleration. The incandescent gas-burner may achieve good results under test conditions in the laboratory; but illumination in the home is a very different thing. The metallic filament gives as good results outside the laboratory as inside. From whatever point of view electric lighting may be regarded, its superiority to gas is justified.

On March 7—

The City Council is in a position to supply electric lighting for domestic purposes at 5d. per unit—a price equivalent to about half the cost of gas as supplied by the Metropolitan Gas Company at 5s. per 1000 cubic feet; and the quality of the light, moreover, is in every way superior to gas.

And on the same day—

It has been repeatedly demonstrated that the Gas Company squeezes enormously inordinate profits out of the people. It could supply Melbourne with gas at 2s. 6d. per 1000 cubic feet and still pay its shareholders handsome dividends. As it is, the Company charges twice this figure; and so prodigious are its surplus earnings, that it is obliged each year to divert a large proportion from the ordinary course of distribution to be employed in the building up of great unnecessary sinking funds in order to keep within the terms of its Charter. The City Council is well aware of this. It knows that the Gas Company is a monopoly in the worst sense of the expression, and that it is waxing rich by grinding the faces of the public. It is no exaggeration to say that not one householder in ten is yet aware that by purchasing electric light from the City Council he can obtain a far better light at half the cost of gas.

On March 10—

The day is not far distant when gas as an illuminant will be as antiquated and as despised as the cable tram.

I quote now from the "Age" of May 13—

It is glaringly obvious that the Melbourne Gas Company has been charging its customers an extortionate price, and that it has been piling up unconscionable profits. Its profits, as we have indicated in former articles, are not revealed in dramatically large dividends, but are hidden away in the shape of reserves, in order to evade the provision of the Statute of its constitution. Clearly, then, the people of Melbourne are being despoiled in the most flagrant and barefaced way. Their quarrel, nevertheless, is not so much with the Gas Company as with the City Council.

On June 25 this appeared—

Clean and convenient electrical illumination in comparison with expensive, dangerous, inefficient, and obnoxious gas.

Again, referring to our Secretary's letter—

Numerous householders will examine their gas bills to realize whether the Company is carrying out its contract. It was a most foolish boast to make, for a moment's thought on the part of anybody who read the statement would have shown its glaring absurdity.

Again, on June 25—

In fact, this is a universal experience, and unless Mr. Hinde has in mind some phenomenal kind of burner that has never been heard of in Melbourne, he grossly exaggerated the capacity of the incandescent mantle.

On July 9—

Practical experience proves almost daily the superiority and greater cheapness of electric lighting as compared with gas.

And, finally, on July 16—

How long are we going to be exploited by the Gas Company by paying for gas for cooking at the rate of 5s. per 1000 cubic feet? On the contrary, the Gas Company has held the public by the throat and kept its hand there, until compelled to relax, not by decency and fair play, but by the cold, callous consideration of business and self-preservation. The Company has paid enormous dividends; piled up magnificent reserve funds; has squeezed the public almost to the final limits of tolerance and submission.

These were some of the assertions that had been placed before the public, and, referring to these extracts, it would have been noted that they were generally to the effect that gas lighting had been superseded by electricity, both literally and commercially, and deprived of its last claim to toleration by the electric metal filament lamp; that the public should know that electricity was cheaper than gas; and that, by purchasing electricity from the City Council, the householder could obtain a better light at half the cost of gas. It would be further observed that these statements were made, not as matters of opinion, but as absolutely definite conclusions of fact. The newspaper in question also stated that the Company was a monopoly, building up great unnecessary sinking funds, that it was squeezing enormous profits out of the public, piling up unconscionable profits in the shape of reserves, and despoiling the people of Melbourne in the most flagrant and barefaced way. Very bold statements, were they not? As regarded the days of gas being numbered, and gas lighting being superseded by electricity, he (the Chairman) might mention that in Paris in 1908 it was decided to erect additions to the gas-works at a cost of £1,880,000 to satisfy immediate requirements; and the Prefect of the Seine, about three months ago, recommended to the Paris Municipal Council to go to an additional expenditure of £6,400,000 net, to meet the future demands of gas consumers. Neither did it look like gas being superseded, when the Lighting Committee of the City of London, after visiting the chief cities of the Continent, unanimously decided to recommend the Corporation to adopt for street lighting compressed inverted incandescent gas, instead of electricity; and within the last two months what would appear to Australians (who were more accustomed to the West-End than to the City of London) a greater victory, had been gained—the Westminster Corporation having decided to do away with the electric street lighting—which had been installed for years—in Regent Street, Piccadilly, Piccadilly Circus, St. James' Street, Pall Mall, and Waterloo Place, and to substitute compressed gas, to be supplied by the Gaslight and Coke Company. The Chairman of this Lighting Committee had recommended that the tender of the Gas Company should be accepted, and said that they would get 50 per cent. more light for the same price; that, as regarded advantages in the matter of colour, it was all on the side of gas, for flame arc lights gave a yellow light, prejudicial to goods displayed in the windows; and that, as business men, they had no choice but to accept gas. He also stated that many of the modern cities were abandoning electricity for gas because it was cheaper. The

City of Berlin was an even more striking instance of the tendency towards adopting gas for streetlighting. The authorities there decided upon an expenditure of £350,000 (which was being spent at the rate of £50,000 per annum) in installing the latest patterns of high-pressure gas-lamps, with inverted burners, in lieu of the existing gas and electric lamps. This was to be completed in four years' time; and in future incandescent gas lighting only would be used in Berlin. This was sufficient as regarded public lighting; and it clearly proved that gas was gaining on electricity, so far as street lighting was concerned, instead of the reverse being the case. In the matter of private lighting, the Board of Trade returns showed that in the year 1908 the number of gas consumers in the United Kingdom was 5,900,000, as compared with 3,250,000 ten years previously. In Sydney, gas was making great strides; and locally the shareholders knew that their sales of gas rose from 983 million feet in 1898 to 1694 millions in 1909, and the meters in use in the same period from 51,929 to 93,457. In Greater Berlin, it was said that there were 618,000 gas-meters, and only 49,000 electric meters. This, in view of Germany being the most scientific nation of the world, was incontrovertible evidence in favour of gas. But if the "Age" was serious in its remarks as to gas being superseded, it was strangely inconsistent; for the proprietors had noted that it strongly condemned the City Council for their neglect in not having taken the gas-works over during the last decade.

They now came to the reiterated assertion that electricity as an illuminant was cheaper than gas. On this point, the Board were prepared to substantiate the comparison of cost they set out in a pamphlet recently issued by the Company. He would restate the comparison, so that there might be no mistake as to their position.

With gas-burners of the modern type, 1 cubic foot of gas can maintain 25-candle power for one hour. At 5s. per 1000 feet, the cost of this amount of light is 0.06d.—in vulgar fractions, one-sixteenth of a penny. A metallic filament electric lamp for every single candle power requires at least 13 electric watts per hour. To maintain 25-candle power for one hour requires 32.5 watts; and this at 4½d. per unit (1000 watts) would cost 0.146d. The cost of the same light, therefore, in electric current, is almost two-and-a-half times its cost in gas.

Much criticism had been directed to the claim made by the Secretary, that a cubic foot of gas could maintain 25-candle power for one hour. This, however, had been vouched for in the published correspondence of Mr. J. McConnell, the Manager of the Welsbach Light Company of Australia, Limited, who was connected both with gas and electricity, and Mr. J. S. Weir, the Melbourne Manager of Messrs. Thomas Glover and Co., Limited, meter makers, and was well recognized by all acquainted with modern systems of artificial illumination. It would be noted from the extracts he had read, that it had been suggested that the Secretary, in his letter, based his calculation on some phenomenal kind of burner never heard of in Melbourne, and that every attempt had been made to throw doubt upon his statement. Inverted incandescent burners had long been upon the market, and were being sold daily in the show-rooms of the Gas Company and elsewhere, giving an efficiency of over 100-candle power for a consumption of 3½ cubic feet of gas per hour; burners of 50-candle power for a consumption of 2 cubic feet; and burners of 25-candle power for a consumption of 1 cubic foot. Their critic had evidently been too busy in posing himself in the wonderful possible results of the metallic filament electric lamp to become acquainted with the merits and efficiency of the modern inverted gas-burner; and these burners they were prepared to supply to any of the public who desired to have them. The Company's claim was that, light for light, candle-power for candle-power, gas at 5s. per 1000 cubic feet was more than 50 per cent. cheaper than electricity at present prices. A 60-candle power gas-lamp should not be pitted against a 16 or 25 candle power electric lamp; and when the lesser unit of light was adopted as a standard, the Company were in the same position as the electric undertakers, and could supply the necessary lamp to place the comparison upon equal terms. The "Age" in its attack on what it erroneously called a "monopoly" (inasmuch as this Company had not the sole right to supply light and heat in Melbourne and suburbs), seemed utterly regardless of the harm which would be done to wage-earners of the community if they succeeded in their efforts to materially damage it, as there was distributed among their 1400 employees, including meter-makers and stove workmen, £160,000 per annum in salaries and wages; and surely such action was inconsistent with their policy of befriending and helping local industries.

At times stress had been laid on their large dividends, and as his explanation on this matter made twelve months ago had been ignored, he was compelled to repeat himself by pointing out what was patent to everyone making even a casual examination of the balance-sheet.

The paid-up capital of the shareholders is £857,210
The premium on the capital, paid in cash by the shareholders for their shares, is 466,535

Making a total amount of £1,323,745

The amount per annum received in dividends by the shareholders was £85,721, or 6½ per cent. on the capital found by them, and this with a debenture debt nearly equal to the amount of the paid-up capital. As regards the Company's grasping nature, shareholders were receiving 10 per cent. on their paid-up capital, though under their Act they were entitled, should profits allow of it, to 19 per cent. with gas at its present price. This was surely sufficient answer to the reflection. In regard to unnecessary sinking funds that they were building up, this was a pure invention; for with the exception of a small sinking fund of £550 per annum, set aside to provide at the end of the lease the original cost of the offices, they had not one penny to the credit of a sinking fund. He could only regret the "Age" was not correct in this statement; for, in his opinion, the Company's competitors, the City Council, were wise in having one. As to hiding their profits away and despoiling the people in the most flagrant and barefaced manner, and piling up magnificent reserve funds, the proprietors would see, by turning to the balance-sheet, that, after payment of the dividend, they would have no cash in hand, that they had no investments outside the Company, and therefore that their reserve fund of £81,382 (a small one compared with their debenture and share capital of £2,121,745) must be all in the business. Referring to this large capital of £2,121,745, it would have

been noted that the first extract quoted from the "Age" stated that "under this arrangement, the Company, whose capital is £857,000, could be forced to sell only at a price of £2,541,000," which was an utterly misleading statement as to the Company's capital, inasmuch as it left out of account the debentures and the premium capital, totalling £1,264,535. The Directors regretted that a newspaper of such standing should have gone out of its way to attack the Company. Seemingly, any company or person that stood in the way of electrical progress ought to be annihilated. Their Company proved an obstruction; and the battering ram had consequently been brought into play. This being the case, they must do their best to repel the attacks, however vigorous and persistent they might be, and to not only do this, but carry on an active campaign of their own. That the proprietors of the "Age" should differ with the Board in the policy which, with fuller and more accurate knowledge of the circumstances, the Directors deemed to be best in the management of the Company, was, of course, the prerogative of any newspaper; but they had difficulty in arriving at the underlying motive for this very determined effort to injure the interests and hamper the business of the Metropolitan Gas Company, by statements which were, as had already been clearly shown, untrue. Whether any harm was being done to the Company by this unfair treatment, they were not yet prepared to say. It had, however, been largely discounted by the general body of consumers, who recognized that they were doing all they could to serve them faithfully; and this was clearly proved by the fact that the Company had during the past half year made progress which he was about to place before the shareholders, and which would, he thought, be satisfactory to them.

Turning to the operations of the Company for the past half year, he said he did not propose to enter upon any lengthy comparison of the figures with previous corresponding periods. This they usually reserved for the end of each year, and, furthermore, on the present occasion the effect on the balance-sheet of the recent strike had been to very largely destroy the value of any comparison which might be instituted. He would, however, supply a few figures in order to advise them of the present satisfactory condition of affairs. The number of meters standing fixed at June 30, 1910, as compared with the same date last year, was—

	1910.		1909.	Increase.
Ordinary	80,298	..	75,313	.. 4,985
Slots	16,788	..	13,406	.. 3,382
Totals	97,086	..	88,719	.. 8,367

It would be seen that slot meters were being installed at about the same rate as previously; and as more cookers were being taken by these consumers, the average of their consumption was increasing. The total quantity of gas sold was 881,468,000 cubic feet—an increase of 7½ per cent. over the June half of 1909; but as no doubt during the strike period, when coal was dear, more use was made of gas-cookers, he did not wish to lay stress on this comparison. Gas-stoves continued in great demand. There had been an increase in the number in use since June, 1908, of 5299; and the staff were endeavouring to see that proprietors of the stoves were made familiar with the most economical method of using them. The Company did not wish to encourage extravagant consumption of gas in either lighting or cooking, trusting rather to the legitimate extension of their business with the greater number of satisfied clients. Owing to the very large increase of those using gas-stoves, they had, in addition to seven men who visited houses and kept stoves in good order, recently engaged the services of three specially qualified lady demonstrators, whose duty it was to visit the homes in which stoves were fixed—especially in the case of new users—and show householders how to get the best value for their money. This innovation had met with much appreciation, and would have the effect of still further popularizing cooking by gas. The Company had had an exceptionally heavy task during the six months in endeavouring to meet the demands for new mains and services in various districts included in the area of supply. Some 17,778 yards of new mains had been laid, at a total cost of £7167; and a large number of new services were put in, at a cost of £6641. They had still a large number of applications for extensions of mains; and these they were proceeding to deal with as opportunity offered. At several meetings, he had alluded to the necessity of the Company at an early date entering upon the construction of an additional retort-house to cope with the increasing output of gas. They had yet, however, to decide the particular system to adopt in extending the carbonizing plant; and to this point the Board were giving most careful consideration, so that when they did build the additional retort-house, they might be quite sure that they were adopting the best and most efficient plant that modern methods of gas manufacture could offer. In order to ensure that the Directors in arriving at a decision might be in possession of the latest information available, it had been deemed advisable that the Engineer (Mr. P. C. Holmes Hunt) should visit England and the Continent, and make himself personally acquainted with the work done by the vertical, horizontal, and chamber systems of carbonizing, which was being carried out by experts in the gas industry, with some of whom he was in direct consultation on the subject. Mr. Hunt was now in England on this mission; and they expected him to be with them again before the end of the year, with a full report to guide the Board in dealing with this important matter in the shareholders' best interests and with the fullest advantage to the Company.

The Hon. THOMAS LUXTON seconded the motion; and it was carried.

The dividend recommended was then declared; and the proceedings concluded with a vote of thanks to the Chairman, Directors, and staff.

Bridgwater Gas Company.—The net profit of the Company for the year ending June 30 amounted to £4409, to which has to be added the sum brought forward from the previous accounts and interest received from bankers, making a total of £5704. After payment of dividends of 10 per cent. for the year on the "A" stock, and 5 per cent. on the "B" and "C" stocks, there will, the report says, be a balance of £2454, out of which the Directors propose to carry £487 to the reserve fund and £250 to the insurance fund—leaving a credit of £1717 to the next accounts.

MANCHESTER GAS DEPARTMENT SALARIES.

Committee's Recommendations as to Increases Approved.

A Special Meeting of the Manchester City Council was held last Wednesday, when the recommendations of the various Committees as to advances of salaries to officials in their respective departments were considered. All the increases were approved; but in regard to some considerable discussion arose—the proceedings extending from 10.30 in the forenoon until 4 in the afternoon, with a short interval for lunch. At the outset, an amendment was proposed that all the recommendations be deferred for six weeks, until the Conditions of Service Committee had reported; but this was defeated by 51 votes to 45.

The following increases were among those put forward by the Gas Committee: Mr. J. G. Newbigging, M.Inst.C.E., the Chief Engineer, from £1100 to £1200. Mr. J. R. Hill, Manager at the Bradford Road Station, from £450 to £475; with a maximum of £500. Mr. F. P. Smith, Accountant, from £400 to £425; with a maximum of £500. Mr. G. W. Tooley, Manager at the Rochdale Road Station, from £375 to £400, with a maximum of £450. Mr. T. Williams, Chief Cashier, from £375 to £400, with a maximum of £500. Mr. F. J. Caldecott, Chief Rental Clerk, from £350 to £375, with a maximum of £400. There were also increases to other officials holding less responsible positions, the total for the department being £517.

Alderman Gibson (the Chairman of the Gas Committee) moved the adoption of the Gas Committee's list *en bloc*; but an amendment was moved and carried, that the recommendations of the Committee be taken separately. In the case of Mr. Newbigging, an amendment that the advance be £50 instead of £100 was defeated, and the Committee's recommendation was adopted. Alderman Gibson pointed out that, in connection with the new gasholder at the Bradford Road works, Mr. Newbigging had saved the department some hundreds of pounds on an expert; and this was the man they would insult by offering him an advance of £50. Alderman Bowes went further. He said he was sure that Mr. Newbigging would not accept an increase of £50, but that he would sooner leave the service of the Corporation, whom he had already saved thousands of pounds. Opposition was also offered to the advance recommended to Mr. Hill; but an amendment that the rise be to £462 10s. moved by Mr. Ross Clyne, found no seconder. The Committee's recommendation was then confirmed, as were all the others, with little or no serious opposition.

Alderman Gibson had earlier reminded the Council that the Gas Committee were the first to fix a maximum for their employees—about six years ago; and he went on to demonstrate that the question of salaries never affected the rates, as argued by some people. Indeed, the turnover of the trading committees in 1896 was £2,791,000, and the wages paid £241,986. Taking this with a turnover of £4,900,000 in 1908 and wages of £330,000, it would be found, he said, that the percentage of wages to turnover had changed from 7.4 to 3.6. It was his opinion that the two chief causes of the increases in the rates were the cost of education and the fact that they could not borrow money at the same rate of interest, &c., as thirty years ago.

DOVER GAS COMPANY.

Addressing the shareholders at the half-yearly meeting of the Dover Gas Company, the Chairman (Mr. Willsher Mannering) said that, although there had been a decrease of 1½ per cent. in the output of gas, he might congratulate the proprietors upon the successful financial result of the half-year's work. The accounts showed a balance in favour of the Company of £4823, to which was added £143 received for interest and rent, giving a total of £4966. After charging interest on loans, income-tax, placing £250 to the suspense account, and writing off a similar amount for depreciation of sundry stores, there was sufficient to pay the usual dividend and leave £313 to be added to the surplus profit balance of former years—carrying forward £5653 to the current half year. As compared with the corresponding half of 1909, the revenue from sales of gas showed a decrease of £247. On the other hand, meter and stove rentals were more by £14, and residuals also yielded more by £109; thus making a total reduced revenue of £123 only. A comparison of the other side showed a reduced expenditure on coal of £272. A smaller quantity by 92 tons was used; and the cost was less by 4½d. per ton. Other items made a decreased total expenditure of £674. The increased balance carried to profit and loss was £551. During the half year, there had been no expenditure on capital account. At the end of June, the number of ordinary consumers was 2558, against 2613 a year ago; and the number of automatic consumers was 3826, against 3682—bringing up the total number of consumers to 6384, against 6295. The number of cookers, trivets, and heaters on hire was 5117, against 5112. The immediate prospects might be regarded as very good. The Company had renewed their coal contracts on favourable terms. Since the commencement of the current half year, there had been an increased consumption; and with the greater employment of labour in the town and district, he thought they might reasonably hope the increase would be maintained. The Company had again received very able assistance from the officers and the whole of the staff. One and all, by their united efforts, had largely contributed to the continued success of the business.

The report was adopted, and a dividend for the half year was declared at the rate of 7½ per cent. per annum, less income-tax. A vote of thanks was accorded to the Directors and the staff; and the Chairman, the Secretary (Mr. E. C. Fielding), and the Resident Engineer (Mr. Raphael Herring) replied.

Catalogue No. 10 of Manzel's patent automatic force and sight-feed oil-pumps for cylinder lubrication is to hand from the British Manzel Oil-Pump Company, of Carlisle. The advantages claimed for this pump are concisely set forth; and there are numerous explanatory illustrations.

OTTOMAN GAS COMPANY, LIMITED.

A Sound Position.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting; and the report (noticed in the "JOURNAL" for the 6th inst., p. 671) and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that he thought they were the best he ever remembered the Board having the good fortune to lay before the shareholders. The accounts compared most favourably with those of the corresponding period of the previous year; and sound as the position of the Company had been, in his memory (and he had been a Director for about seventeen years) it had never stood in as sound a position as it did that day. Reference was made at the meeting twelve months ago to the probable, or possible, effect on the Company of the change in the conditions of government in Turkey. He then said that he believed it would make little or no difference to them—at all events, it would have no prejudicial effect; and this opinion, he felt, was confirmed by the operations, and by what they had learnt, during the period now under review. Of course, in a revolution of this kind, when new men who had never previously been in office tried to take up the reins of the old ones, they naturally thought that everything their predecessors had done was wrong. But they had, so far as the Company were concerned, come to their reason. In the negotiations which had been going on (and which he would refer to again presently), they thought they could lay down all sorts of rules and laws at their pleasure; but they found, he supposed, that they could not. For the purpose of these negotiations, the Company could not have had a better man out there than their Engineer and Manager (Mr. John Gandon). The Directors knew how well he stood with the Turks, and how completely they trusted him, and it was only just that his services should be acknowledged. The Board themselves had had some anxiety; but they felt that on Mr. Gandon had devolved a great deal of trouble and worry. However, everything, so far as could be seen, was now practically settled. Referring to the accounts, there were a few items to which he might allude. Sundry creditors showed an increase of £1132. Sundry debtors had increased some £3000; and of this, public lighting was responsible for £2200, and gas consumers for £800. Stocks exhibited a rise of £1540, of which fittings were £668 more, meters £200 more, coke and tar £180 more, and new mains £400 more. In the period under review, coals cost some £317 less, in spite of the fact that 160 tons more were carbonized; the average price having been the very good one of 17s. 3½d. per ton, against 18s. 7½d. in the corresponding period of the previous year. While on this point, he might mention that the Directors had arranged their coal supply for the next two years—that was, up to July, 1912—on terms which compared very favourably with the present conditions. Therefore there would, on this head, be no anxiety for some little time to come. The make of gas per ton had been 10,837 cubic feet. Wages had risen somewhat. The number of public lamps had increased; and under the new contract it would be augmented still further. Rent, interest, office expenses, &c., were less, in consequence of the interest on the debentures having ceased, owing to their having been paid off. On the credit side, the increase in gas-rental was contributed entirely by the private consumers. In May last the Board completed an arrangement with the Municipality—this was one of the things he had had in mind when speaking of Mr. Gandon—for a new public lighting contract to commence next November, on advantageous conditions, involving an extension of the area, and also an increase in the number of lamps and the conversion of all the lamps that had not already been converted. In three months' time there would have been completed another decade in the history of the Company; and without wishing to anticipate the actual results, which they would then be able to calculate exactly, it would be found that in a matter on which the Board, well supported by their officers, had devoted much attention—namely, the cost of production—there had been a very material reduction, and that the number of consumers during the last ten years had been trebled. Therefore, he thought he was fairly justified in making the remarks that he had done as to the position of the Company.

Mr. STEPHENSON R. CLARKE seconded the motion; and it was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. H. WARD ANDREWS, dividends for the half year were declared at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free.

The CHAIRMAN proposed a hearty vote of thanks to the Secretary, the Engineer, and the staff in Smyrna.

Mr. A. M. PADDON, in seconding, remarked that they would all have been able to infer from the Chairman's opening remarks that the duties of those in responsible charge of the Company's affairs in Smyrna were of an unusual character; and, of course, the difficulties and problems *in situ* must be always more acute than those which reached the Board in London. He would like to mention also their Consulting Engineer (Mr. A. F. Phillips). The Company were strong in every department of the executive, but they were peculiarly strong in having the guidance of Mr. Phillips.

The vote was heartily accorded; and Mr. GUYATT and Mr. PHILLIPS returned thanks.

The proceedings concluded with a vote of thanks to the Chairman and Directors, on the proposition of Mr. A. W. COOPER, seconded by Mr. W. H. DAUN.

Accident at the Heckmondwike Gas-Works.—While engaged one morning last week in fixing up some staging, two workmen at the Heckmondwike and Liversedge Gas-Works were thrown to the ground through the scaffolding giving way. One of them, George Harrison, sustained a broken ankle, and was removed to the Dewsbury Infirmary, but the other was fortunately uninjured.

HOLYHEAD WATER COMPANY AND THE COUNCIL.

At a Meeting of the Holyhead Urban District Council last Tuesday, considerable attention was given to the question of the water supply. At the outset of the proceedings,

The CLERK (Mr. T. R. Evans) read the following letter, which had been received by him from Messrs. Simpson, North, and Co., the Solicitors to the Water Company.

We have been consulted by the Holyhead Water-Works Company with reference to the correspondence that has passed between you and them, and the statements from time to time publicly made by members of your Council impugning the quality of the water supplied to Holyhead.

Our clients have recently expended considerable sums in executing additional works authorized by their Acts of Parliament, for the purpose of securing a good and efficient water supply, and have recently had samples of the water supplied sent to the Public Health Laboratories of the London Hospital Medical College, London, and there analyzed by Drs. Thresh and Beale, by whom our clients are advised that "the water is a good sample of moorland water, free from any excess of organic matter, and chemically showing no sign of pollution, and well adapted for all domestic purposes."

Our clients have taken every precaution to ensure a proper supply, and they are satisfied that the water being supplied is pure and wholesome; and we strongly protest against the statements made in your letter of the 4th of August last, imputing neglect of duty on the part of our clients—statements which are devoid of foundation and productive of injury both to the Company and the town of Holyhead, and being made at a time when our clients are seeking additional capital for the development of their undertaking hinder rather than advance the future efficiency of the supply. We must ask your Council in the future to abstain from uttering statements damaging to our clients and their interests, and to give adequate publicity to the fact that the recent allegations as to the impurity of the water supply are unfounded.

Our clients are fully aware of their duty and responsibility to the public; and whilst regretting the hasty and ill-considered action of your Council and the hostile attitude assumed by some of its members against the Company, our clients are nevertheless prepared to welcome your clients' co-operation in assuring to the public the continuance of a pure water supply, and invite a deputation of your Council to meet the Directors of the Company to endeavour if possible to devise a system by mutual arrangement between the Water Company and the Council for the analysis of samples of the water at intervals, with the object of preventing in future all misunderstandings regarding the purity of the supply.

Mr. HUMPHREYS said that the letter might mean anything. The Council were not supposed to take anything for granted. They should be supplied with a full report of the analysis of Dr. Thresh.

Mr. GORDON ROBERTS said he had a copy of a letter the Water Company had sent that day to the Valley Rural Council. It stated that, as the result of the allegations concerning the impurity of the Holyhead water supply recently circulated, the Company had instituted, under the authority of Drs. Thresh and Beale, a thorough examination of the whole system and surroundings of the supply. Extracts as follows from the reports of these gentlemen were enclosed; and the Company offered to supply any further information required.

Report of sample of water taken from tap in yard at No. 43, Vulcan Street, July 23, 1910.—This water contains a little peaty matter in solution. Consequently there are many bacteria also present in it. These, however, are not excessive for a tap-water, and their number really has no significance whatever, since all objectionable bacteria are absent. In the quantities of water examined, the standard of purity, measured by the *B. Coli* standard, is very high. The water is excellent for all domestic purposes.

Mr. HUMPHREYS again urged that the Company should send them a full copy of the analysis.

Captain ROBERTS said he did not think it was their duty to ask for it a second time. The Company had refused once.

Several members, having taken exception to the terms of the Solicitors' letter,

The CLERK remarked that the letter he sent the Company was a very strong one. He threatened proceedings. The Company had found that they had made a mistake in refusing to meet a deputation from the Council; and they now asked the Council to appoint such a deputation. No reply had been received from the Local Government Board with reference to the copy of the analysis sent to them.

The MEDICAL OFFICER (Dr. Clay) expressed the opinion that there was still room for improvement in the filtration; but he said the last samples taken were not dangerous to health.

Eventually the Clerk was instructed to reply to the Company's Solicitors expressing the views of the Council, and pointing out that the filtration was not adequate.

Price of Gas at Shoebury.—The members of the Shoebury Urban District Council were informed by Mr. Bacon at their last meeting that the Gas Committee were of opinion that they were in a position to allow a reduction of 6d. per 1000 cubic feet from Oct. 1; but that the price of gas supplied to the water-works would remain unaltered. He moved a resolution to this effect, and added that the present reduction to large consumers would continue. Mr. Talmage thought that, with the proper working of the undertaking, gas could be taken into the house of every working man, and then show a profit at even a further reduction. Mr. Brooks said the water-works should get the same reduction as other consumers. Why should the works pay 3s. 6d. per 1000 cubic feet when private consumers paid only 3s.? Mr. Bacon remarked that he hoped the time was not far distant when the Council would be able to reduce the price of gas another 6d. The resolution was carried.

AMSTERDAM MUNICIPAL GAS-WORKS.

Report for the Year 1909.

From the report of the working of the Amsterdam Municipal Gas-Works (General Manager, Mr. J. van Rossum du Chattel), we extract the following particulars.

The two existing works of the Municipality—the Eastern and the Western Gas-Works—have been in operation most successfully; and it has now been decided to start at once with the erection of the third (the Southern) works.

The production of gas during the year 1909 was 87,497,100 cubic metres (3,090,098,000 cubic feet), of which 64,048,320 cubic metres (2,261,967,000 cubic feet), or 73.22 per cent., was coal gas, and 23,448,780 cubic metres (828,131,000 cubic feet), or 26.78 per cent., was oil and benzene carburetted water gas. The total amount of gas sold was 5.82 per cent. more than in 1908, and reached 87,462,500 cubic metres (3,088,876,000 cubic feet). The maximum daily delivery to consumers was 387,400 cubic metres (13,681,651 cubic feet); the minimum, 123,080 cubic metres (4,346,767 cubic feet).

To make these quantities of gas, 211,101 tons of gas coals (185,753 tons of Westphalian coals, 25,338 tons of English coals, and 10 tons of Australian cannel) were carbonized.

The length of the mains in the town was 248 English miles; the diameter varying from 47 inches to 4 inches; the capacity amounting to 819,875 cubic feet.

The number of meters in use on Dec. 31, 1909, was 104,198—viz., 44,330 ordinary meters and 59,868 prepayment meters. The average consumption of gas by prepayment meter was 17,660 cubic feet. The average consumption of gas per head, calculated over the entire population of the town, was 5139 cubic feet.

The average calorific power of the gas was 564 B.Th.U. per cubic foot gross, at 30 inches barometer and 60° Fahr. The average specific gravity was .487.

The price of the gas was the same as in past years—viz., 3s. 3d. per 1000 cubic feet for ordinary meters and 3s. 6d. for prepayment meters.

The financial report shows that, for the year 1909, a gross profit of 3,470,608 florins (£289,217) was made, reduced by interest and redemption to a net profit of 1,850,523 florins (£154,210); whereas the net profit in 1908 was 1,362,572 florins (£113,548).

THE FATALITY ON THE MANCHESTER PIPE-LINE.

Coroner's Comments.

The adjourned inquest (see *ante*, p. 667) respecting the death by suffocation in a 44-inch water-main, near Caton, on Aug. 31, of William Micklethwaite, a labourer, was held last Wednesday, by the Lancaster Coroner, at Caton. Mr. W. F. Seymour, of Preston, represented the Board of Trade, and Mr. W. Tilly, jun., the deceased's mother. The deceased was at work varnishing the interior of a portion of the Manchester Corporation pipe-line from Thirlmere to Manchester, and was found suffocated, apparently by the varnish fumes, which temporarily overcame three other men who formed a rescue party.

Alfred Tomlinson, Clerk of the Works, said he received no instructions from his chiefs to see that the pipe was ventilated. Where the man died, there was no outlet for the varnish fumes. John Moffat, Contractor for the Corporation's third pipe-line, produced his specifications. The varnish used was, he stated, manufactured by Messrs. Anderson and Co., and was supplied in March or April, and tested by the Resident-Engineer. He did not know it was dangerous; and they had used a considerable quantity without any complaints from the men. Mr. Lionel Lutyens, Managing-Director of Messrs. Anderson and Sons, Limited, of London and Belfast, said they had manufactured "Siderosthen"—the varnish used—for fourteen years. The fumes given off in evaporation would be petroleum naphtha. Naphtha displaced oxygen in a confined space; and it was not safe to use the varnish in a tunnel 110 yards from ventilation. The man should have left his work when he felt the ill-effects of the fumes. The firm had decided to send out warnings with the casks. The Coroner remarked that they were not trying the varnish; and Mr. Lutyens' firm were not to blame.

Mr. Harry P. Hill, of the firm of Messrs. Hill and Sons, stated that he specified the use of "Siderosthen," which had been applied to 5000 pipe-joints without previous accident. He did not specify that it should be used in a confined space without ventilation, which should not have been done. There was no reason why the pipe-joints could not have been varnished before they were all coupled up. The Coroner: If you specify the use of dangerous materials, you should take precautions. Witness: I was not aware they were dangerous. The Coroner: I take it you knew there would be no ventilation in the place? Witness: No. There is ventilation now.

The Coroner, in summing up, said that it was evident the man died from lack of proper precautions for the ventilation of the pipe when he was at work with the varnish. It was admitted the varnish was not safe to be used in such a place. The Engineer who neglected to see to the ventilation of the pipe was the man to blame; and the neglect of an obvious duty became criminal, and meant a verdict of "Manslaughter." He did not, however, think the evidence justified this verdict, though it was not far away from it. If such a death occurred again, after the circumstances had been made public, there was not the slightest doubt a criminal charge must follow.

The Jury returned a verdict of "Death from misadventure," mentioning the lack of ventilation as being responsible for the fatality.

Messrs. Falk, Stadelmann, and Co., of Farringdon Road, forward a copy of their Gas-Fixtures Supplement No. 306, to be used with General Catalogue No. 296. It contains illustrations and particulars of a large number of gas lamps and fittings.

STARTLING FACTS AND FIGURES AS TO COALITE.

[From the "Daily Chronicle," Sept. 19.]

There have been many fiascoes in the City; but it is doubtful whether an instance can be found to beat the career of the British Coalite Company. We have received many inquiries from shareholders who have asked us to investigate the position. Who can be surprised at the irritation of the public who placed their money in what they regarded as a sound concern, backed by good names, when they find that all promises have been falsified, not a penny has been received in dividend, and the price of their shares has steadily dwindled and looks like approaching vanishing point? If the concern had been an alleged gold-mine or a reputed rubber plantation, the fact that it had passed more than three years in proving that it could do nothing much might not be particularly surprising; but when the prospectus was issued, the process was supposed to be a proved proposition. The only point that has been proved to date is the inability of the concern to pay even the most meagre dividend.

The Directors after three years of failure to justify the existence of the concern, from the point of view of dividend-yield—and this was the object of its promotion—take refuge in pleasantries. "To disappointed shareholders," said Sir William Preece at a recent meeting, "I would say that if anybody could explore the world and find Aladdin's lamp, the Chairman would only have to rub the lamp and say, 'Make me a coalite works at Barking that shall deliver 1000 tons of coalite a day,' and it would be done to-morrow. But there was no Aladdin's lamp for them." We do not know whether the shareholders were amused at this juvenile humour; but without going to the expense of co-opting Aladdin to the Board, they would undoubtedly feel more satisfied if some of the promises made in the prospectus had been fulfilled even without the aid of a lamp.

The prospectus was issued in June, 1907—the capital being £2,000,000; and an issue was made of 1,500,000 ordinary shares of £1 each at par. The proceeds of the issue were to be used for the completion of the purchase of freehold properties and for the construction of coalite works at Barking and elsewhere.

PROSPECTUS PROMISES.

Nothing could be more definite than the statements in the prospectus—except their absence of fulfilment. It was set forth that the Company was formed to purchase patent rights for manufacturing and dealing in coalite; to acquire valuable freehold sites at Barking and Wednesfield, together with a coalite plant capable of an output of about 15,000 tons per annum "now in operation." It was also stated that the manufacture of coalite had been going on at Wednesfield "on a commercial scale," and estimated profits were set forth on the basis that 2,100,000 tons of coalite would produce with the resulting gas, apart from other bye-products of great value, a net profit of over £500,000.

This estimate the Directors observed did not take into account the profits to be derived from the sale of the bye-products, other than gas, or from the further manufacture of coalite in London and in the other large towns and districts throughout the kingdom. After paying 6 per

cent. on the ordinary shares, a balance of £410,000 was apparent, in print, for further dividends and reserve. Not content with this, although the shareholders would be to-day, the Board further anticipated that the sale of the bye-products and the establishment of other coalite works in the Provinces would largely increase the profits.

On the arrangement entered into with Messrs. Cory and Son, Limited, concerning which a great fuss was made in the prospectus, we need not dilate. It was merely a matter of buying coal for the Company and selling coalite. Unfortunately, there does not appear to have been much chance to date of selling sufficient coalite to pay a dividend; and, more unfortunately still, considering the fact that his name undoubtedly attracted many people to the unfortunate venture, Sir Arthur Cory Wright has retired from the Board.

But taking the points set forth in the prospectus, how many who subscribed thought that they were buying something in its experimental stages? "A plant now in operation" and "the manufacture of coalite on a commercial scale has been going on during the past year" give the impression of a sound commercial concern, and not of three years' muddling through to nowhere in particular. Yet, after close on three years, the Chairman calmly observed that two years had been spent in developing the industry and correcting mistakes. What were the mistakes that had to be corrected when "the plant was in operation" and "the manufacture of coalite" was being conducted on "a commercial scale"?

PLENTY OF SMOKELESS PLANTS.

The vendors of the Coalite Limited took payment as to £55,000 in cash for payment of deposits and expenses, and £500,000 in deferred shares; and having regard to the fact that British Coalite has expended three years in tinkering about with the plant, the price was high enough in all conscience.

What did British Coalite buy? The right to make what any gas company in the kingdom can make if it chooses to.

The British Coalite Company put down its money for a name, and has spent the best part of its capital in improving plant supposed to be commercially working when the Company was formed.

Having paid a high price for the privilege of doing what any gas company could do, having bought land at fancy prices, still another indiscretion was committed, and the underwriting of the capital was undertaken by the parent concern, Coalite Limited. It was set forth in the prospectus that 750,000 shares had been underwritten, and as the public subscribed for only about 300,000 shares, Coalite Limited found itself saddled with the difference between that number and the 750,000 on which the Board went to allotment. As the subscribed capital of Coalite Limited was only a little over £50,000, the falseness of the position is obvious at the start. The parent Company became largely indebted to British Coalite for calls on shares; and last December the Chairman deplored the fact that a large amount of the called-up capital had not been received.

This was, of course, the debt of Coalite Limited, the parent Company, to its unfortunate child. Sir William Preece, with the sunny, smokeless optimism which has always characterized the British Coalite administration, observed that the Board was satisfied the remaining

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 767.

Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£.	Stk.		p.c.				£ s. d.	£.	Stk.		p.c.				£ s. d.
1,474,000	Stk.	Apr 1	5	Alliance & Dublin Ord.	81-84	..	5 19 1	4,940,000	Stk.	May 12	9 1	Imperial Continental	186-188	..	4 15 9
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,235,000	Stk.	Aug 12	3 1/2	Do. 3 1/2 p.c. Deb. Red.	12-94	..	3 14 5
200,000	5	May 12	7	Bombay, Ltd.	123-124	..	5 5 8	200,242	Stk.	Aug 31	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
40,000	5		7	Do. New, £4 paid.	5-5 1/2	..	5 6 8	561,000	Stk.		10	Liverpool United A.	218-220	+3	4 10 11
50,000	10	Aug. 31	15	Bourne- 10 p.c.	283-291	..	5 1 8	718,100	"		7	Do. B.	161 1/2-163 1/2	..	4 5 8
311,810	10	"	7	mouth Gas B 7 p.c.	16-16 1/2	..	4 4 10	306,083	"	June 29	4	Do. Deb. Stk.	104-106	..	3 15 6
75,000	10	"	6	and Water Pref. 6 p.c.	14 1/2-15 1/2	..	3 10 8	75,000	5	June 29	6	Malta & Mediterranean.	41 1/2-42 1/2	..	6 4 8
380,000	Stk.	Aug. 12	12 1/2	Brentford Consolidated	246-249	..	5 0 5	560,000	100	Apr. 1	5	Met. of 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9 1/2	Do. New	184-186	..	5 2 2	250,000	100		5	Melbourne 4 1/2 p.c. Deb.	101-103	..	4 7 5
50,000	"	"	5	Do. 5 p.c. Pref.		..	3 19 3	541,920	20	May 27	3 1/2	Monte Video, Ltd.	12 1/2-13	..	5 7 8
206,250	"	June 10	4	Do. 4 p.c. Deb.	99-101	..	5 1 5	1,775,892	Stk.	July 28	4 1/2	Newcastle & Gt. Tesh'd Con	102-103	..	4 5 0
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	211-217	..	5 1 5	529,435	Stk.	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	90-91	..	3 16 11
246,320	"	"	10	Do. A Ord. Stk.	154-157	..	4 12 4	55,940	10	Aug. 31	7	North Middlesex 7 p.c.	13-13 1/2	..	5 3 8
460,000	20	Apr. 1	10	British 1/2	45-46	..	5 0 10	300,000	Stk.	Apr. 29	8	Oriental, Ltd.	138-140	..	5 14 4
109,000	Stk.	Aug. 12	10	Bromley A 5 p.c.	117-119	..	5 0 0	60,000	5	Sept. 15	8	Ottoman, Ltd.	6-6 1/2	..	6 8 0
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	88-90	..	5 1 10	31,800	53	Aug. 31	13	Portsea Island A.	131-133	..	5 3 0
82,278	"	"	3 1/2	Do. C 5 p.c.	106-108	..	4 0 6	60,000	50	"	13	Do. B.	124-126	..	5 3 2
55,000	"	June 29	3 1/2	Do. 3 1/2 p.c. Deb.	85-87	..	4 0 10	100,000	50	"	12	Do. C.	117-119	..	5 0 10
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	97-99	..	4 0 10	114,800	50	"	10	Do. D and E.	99-101	..	4 19 0
100,000	10	"	—	Cape Town & Dis., Ltd.	3-4	..	—	398,490	5	Apr. 29	7	Primitiva Ord.	72-74	..	4 13 4
100,000	10	"	—	Do. 4 1/2 p.c. Pref.	5 1/2-5 1/2	..	—	796,980	5	June 29	5	Do. 5 p.c. Pref.	5 1/2-5 1/2	..	4 13 0
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49-50	..	6 0 0	488,000	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	Stk.	June 29	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	88-90	..	5 0 0	312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97-99	..	4 0 10
157,150	Stk.	Aug. 12	5 1/2	Chester 5 p.c. Ord.	109 1/2-111 1/2	..	4 0 8	250,000	10	Apr. 1	9	San Paulo, Ltd.	153-162	..	5 10 9
1,513,280	"	"	5 1/2	Commercial 4 p.c. Stk.	105-108	..	4 16 3	62,500	10	"	6	Do. 6 p.c. Pref.	118-124	..	4 18 0
560,000	"	"	5	Do. 3 1/2 p.c. do.	101-103	..	4 17 1	125,000	50	July 1	5	Do. 5 p.c. Deb.	51-52	..	4 16 2
475,000	"	June 29	3	Do. 3 p.c. Deb. Stk.	98-100	..	3 13 2	135,000	Stk.	Aug. 31	10	Sheffield A.	229-231	..	4 6 7
800,000	Stk.	June 10	7	Continental Union, Ltd.	98-100	..	5 0 0	269,984	"	"	10	Do. B.	229-231	..	4 6 7
200,000	"	"	5 1/2	Do. 7 p.c. Pref.	137-139	..	5 0 9	523,500	"	"	10	Do. C.	229-231	..	4 6 7
492,270	Stk.	"	5 1/2	Derby Con. Stk.	121-124	..	3 16 2	70,000	10	May 27	7	South African.	11-11 1/2	..	6 1 9
55,000	"	"	4	Do. Deb. Stk.	104-105	..	5 2 0	6,429,895	Stk.	Aug. 12	5 9/4	South Met., 4 p.c. Ord.	121-123	..	4 8 10
145,995	"	Apr. 1	5	East Hull 5 p.c. Ord.	56-58	..	5 0 0	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	79-81	..	3 14 1
480,090	10	July 14	12	European, Ltd.	23 1/2-24	..	5 0 0	209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	153-154	..	5 3 11
351,060	10	"	12	Do. £7 10s. paid.	17 1/2-18 1/2	..	4 18 8	605,000	Stk.	Aug. 12	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 12 9
16,179,445	Stk.	Aug. 12	4 1/2	Gas 4 p.c. Ord.	105-107	..	4 7 2	60,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	87-89	..	3 18 8	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	"	"	4	and 4 p.c. Con. Pref.	103-105	+1	3 16 2	502,310	Stk.	May 12	5	Southampton Ord.	110-112	..	4 9 3
4,531,705	"	June 29	3	Coke 3 p.c. Con. Deb.	80-82	..	3 13 2	120,000	Stk.	Aug. 12	7	Tottenham A 5 p.c.	140-142	..	4 18 7
258,740	Stk.	Sept. 15	6 1/2	Hastings & St. L. 3 1/2 p.c.	92-94	+ 1/2	5 12 1	483,940	"	"	5 1/2	and B 3 1/2 p.c.	111-113	..	4 17 4
85,500	"	"	6 1/2	Do. do. 5 p.c.	114-116	..	5 12 1	149,470	"	June 29	4	Edmonton 4 p.c. Deb.	97-99	..	4 0 10
70,000	10	Apr. 29	11	Hongkong & China, Ltd.	114-116	..	6 5 9	182,310	10	June 10	8	Tuscan, Ltd.	59-61	..	8 8 6
131,070	Stk.	Sept. 15	5 1/2	Ilford A and C	145-148	+1 1/2	4 19 8	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97-99	..	5 1 0
65,782	"	"	5 1/2	Do. B	112-114	+1 1/2	5 3 1	239,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.	111-113	..	4 8 6
65,500	"	June 29	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	255,656	Stk.	Aug. 31	6 1/2	Wands- 5 1/2 p.c.	136-138	..	4 17 10
								85,766	"	June 29	3	worth 3 p.c. Deb. Stk.	73-75	..	4 0 0

Prices marked * are "Ex div."

† Next dividend will be at this rate.

outstanding amount due upon the shares would be liquidated early this year. What possible grounds he could have for this optimism it is impossible to say, unless he was speaking of a share arrangement which was entered into later, which certainly did not bring the solid cash to the British Coalite as must have been expected by those who heard that the debt would be liquidated.

"We have plenty of cash to complete our programme," said Sir William Preece in December, 1909; and yet in July last the Company was forced to make an issue of £300,000 first mortgage debentures. These were made through the Investment Registry; and whether they have been taken up fully or not, we cannot say. But this issue has been placed before the ordinary shareholders' dividend.

PEDDLING DEBENTURES.

The Investment Registry, it may be observed, is an outside stockbroking institution, which directs its attention largely to the purchase of blocks of bonds or debentures which it gradually disposes of to the public—naturally at a considerable profit to itself. The shareholders of British Coalite might well ask the Board why it elected to make an issue in this manner, and upon what terms these debentures were sold to the Investment Registry. If they were worth having, they were worth offering to the shareholders, who should have received the profit. What then was the object of going to an outside stockbroking firm? Moreover, did the Investment Registry put its money down for the debentures, or did it have a call upon the Company to hand over the debentures at the same rate as it could get rid of them?

The facts are that the Board blundered in going to allotment on insufficient capital subscribed by the public; blundered in paying a big price for a word; blundered in having shares underwritten by a parent Syndicate which could not carry out its obligations; and blundered yet again in the release of the parent Company from its debt by share transactions and an issue of first mortgage debentures in front of those who had subscribed for the ordinary shares.

The finance of the Company has been hopelessly muddled, as is evidenced by the prices of the shares. British Coalites stand at a nominal price of 6s. 6d., after having been 22s. at one time. It would be very difficult to sell many at the figure; and Coalite Limited, which at one time were quoted £44, are now £3 5s. So much for Coalite finance. We will deal in another article with the practical position and the hopeless conditions which prevail at the various works of the concern.

The Corporation of Birkenhead have placed an order with Messrs. Ed, Bennis and Co., Limited, of Little Hulton, Bolton, for the supply to their pumping-station of three sets of "Bennis" high-duty smokeless and gritless coking stokers and compressed air furnaces, for Lancashire boilers. Messrs. Brotherton and Co., Limited, of Leeds, have also given the firm an order for two sets of stokers and furnaces, for an 8 ft. 6 in. Lancashire boiler. The latter is a repeat order.

LOAN REPAYMENTS ON WATER

UNDERTAKINGS AND ECONOMY IN SUPPLY.

In the course of his Presidential Address to the Engineering Section at the Royal Sanitary Institute Congress at Brighton, Mr. HENRY ROFE, M.Inst.C.E., referred in the following terms to the question of loan repayments on water undertakings and economy in supply.

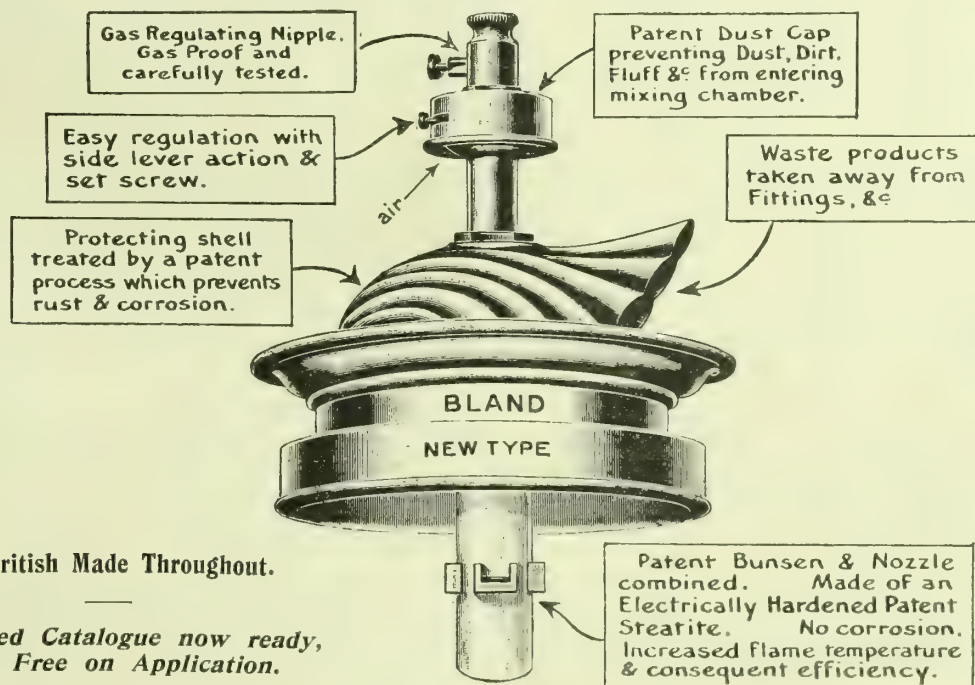
All water-works authorized by Parliament have to be maintained out of revenue in accordance with the provisions of the Water-Works Clauses Act, 1847, which is now incorporated in all Special Water Acts. In the case of gravitation works, so far, at any rate, as impounding reservoirs are concerned, there is practically no depreciation. An earthen embankment fifty years old is probably a stronger structure than one ten years old. In pumping schemes, first-class machinery which was erected seventy or eighty years ago is running and in good condition. Large trunk mains are in existence and in good condition which have been in use for a much longer time than is now generally allowed for the period of repayment. Under these circumstances, it is permissible to doubt whether some of the severe restrictions with regard to repayment of loans now in force are really beneficial either to the consumer or to the ratepayer. They afford, however, a very strong reason for the exercise of the strictest economy in the distribution of the water; so that, if possible, a revenue may be earned sufficient to provide the necessary payments to the sinking fund and to avoid a rate-in-aid.

This question arose during the present session of Parliament in the case of a Bill promoted by an important water board which was formed in the year 1897, when the undertaking of a water company was transferred to four constituent authorities. In 1899, it became apparent that larger works were necessary if the water board were to perform their duties properly; and, accordingly, in that year the construction of an additional storage reservoir was commenced. This reservoir was estimated to cost £157,000; and the Local Government Board, having approved of the scheme, sanctioned the borrowing of this amount of capital, but granted only thirty years for the repayment of the loan.

The water board promoted a Bill to authorize the construction of additional water-works and to sanction sixty years as the period for the repayment of the loan for the works proposed to be authorized by the Bill, and also to sanction a like period for the repayment of the loan for the construction of the works already sanctioned by the Local Government Board. The water board had previously applied for an extension of the time for the repayment of the loan; but this was refused by the Local Government Board, who also opposed the application in Parliament. It was shown that, by reason of the board having to provide the sinking fund in such an abnormally short space of time as thirty years, a rate-in-aid was inevitable. The result was that

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the Committee granted fifty-five years for the repayment of the loan required for the works proposed under the Bill, but refused to interfere with the decision of the Local Government Board with regard to the period of repayment of the existing loan. They, however, expressed the opinion that, on the evidence before them, it was a case in which a more extended period might reasonably have been given by the Local Government Board, and that this was a case in which the Board might review their decision; and they invited the water board to appeal to the Local Government Board for reconsideration of their case. This was done, with the result that the Local Government Board extended the time for repayment to forty years. This, however, is still too short a period in such a case.

With the strictest economy, however, the water authorities must from time to time be faced with the necessity of providing additional supplies of water; and before this becomes urgent, care should be taken to ascertain, by observations extending over as long a period as possible, the rainfall of the district from which the supply is to be obtained, accompanied, in the case of surface supplies, by stream gaugings where possible, and, in the case of pumping schemes, the rest-level of the water in the area in which the well is to be sunk. All these are necessary before a scheme can be properly placed before Parliament for consideration; and generally their ascertainment is a hurried one, leading to possibly unnecessary opposition and expense. The information to be obtained from the British rainfall publications is useful. But, as a rule, it has to be supplemented at the last moment by special observations extending over a short period, whereas if water authorities would co-operate and arrange for rainfall observations to be carried out by, or in conjunction with, the Director of British Rainfall, they would, at comparatively small cost, be in possession of the information whenever required. The geological conditions should also be fully investigated.

Supplies of any magnitude from surface sources are becoming difficult to obtain, except at very great cost; and in many areas dependent upon underground sources, it is becoming difficult to obtain sites for wells, except at the risk of encroaching on existing public or private supplies. Possibly the ultimate solution of these difficulties may come through a combination of authorities, who will be able to afford to go to considerable distances if necessary in order to get supplies for their districts, and to obtain and undertake the preparation of the necessary information with regard to rainfall, geological conditions, and the ascertainment of the level of underground waters over large areas, in a manner that possibly no single authority could afford to do at the present time.

A number of twin-inverted gas-lamps have been fixed as an experiment at Southport; and the result is a great improvement in the gas lighting. "Moreover," says a local paper, "the new experiment being in such close contiguity to the arc lamps, affords an excellent comparison of the merits of gas and electricity for street lighting purposes."

STERILIZATION OF WATER.

In the course of a paper read before the Engineering Section of the Royal Sanitary Institute Congress at Brighton, Mr. H. C. H. SHENTON said a great deal of information had come to hand during the past year with regard to the sterilization of water. There was some difference of opinion among chemists and bacteriologists as to the method of application of a sterilizing agent, especially in the case of hypochlorite of lime; and he urged the necessity of settling, once and for all, whether the sterilizing agent should be added before or after the organic matter has been filtered or settled from the water. He suggested that sterilization should be limited to the removal of harmful organisms; that the removal of organic matters should be effected by other means; and that in no way should sterilization be allowed to take the place of the preliminary processes. It was, however, clear, on the other hand, that if the preliminary processes were used for the physical and chemical purification of the water only, and did not have to deal with bacteria, they might be worked at an increased rate, and, consequently, their area or extent might be reduced. A sand filter, for instance, might deal with the organic matters in suspension satisfactorily, but might fail to remove the bacteria satisfactorily till a thick scum had formed on its surface, causing a very slow rate of filtration. The size of the filter had to be in proportion to the slow rate of the flow. There appeared to be excellent authority for saying that the proportion of chlorine required to remove harmful organisms from water was very small, provided that the water was free from organic matter.

It was clear that the chemist had not always taken into account the possibility of removing the organic matter before sterilization. At Baltimore, the water dealt with was more or less turbid, and had to be treated by coagulation and mechanical filtration; but the chemists appeared to have added the hypochlorite, not, as might have been expected, after filtration, but before filtration with the coagulant, and they found that, by adding the hypochlorite, a reduction in the quantity of coagulant required could be effected. Their conclusions were that hypochlorite of lime was more efficient when used with alum than when employed alone, that the high turbidity in the raw water reduced the bacterial efficiency of the hypochlorite of lime, but that the hypochlorite of lime, even when used in large quantities, caused but a slight reduction in organic matter. He suggested that alum could not increase the efficiency of the hypochlorite, and that the result described was due to the coagulation of the organic matter bringing about a condition favourable to the action of the hypochlorite, even before filtration, which condition would have been still further improved by filtration. It also appeared that the addition of hypochlorite without alum did not produce such a good result as with alum, for the reason that the hypochlorite would be used up in dealing with organic matter which, in the other case, was precipitated by the alum. But if the same quantity of alum had been added to the water before filtration, and the hypochlorite added after coagulation and filtration, as Dr. Rideal was doing at

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Shrewsbury, still better results might have been obtained. The settlement of the point as to the best condition of the water for receiving the sterilizing agent was much to be desired. If it was established that everything should be done which was practically possible to remove the organic matters from water before it was sterilized, the work of the engineer would be much clearer.

Mr. A. J. MARTIN (London) said he took it that the object of the author was to call attention to the divergencies between theory and practice. He held the opinion that when a sterilizing agent was used it should be kept to its own proper work—viz., that of dealing with organisms in the water—and should not be frittered away in oxidizing organic matter.

Mr. SHENTON said that possibly there might be some difficulty in putting the sterilizing agent into the water before it was filtered; for otherwise he could not conceive why various eminent American chemists, and possibly some English chemists, actually added the sterilizing agent to water containing a large amount of organic matter which could be easily excluded. He agreed with the speaker who said that water in a proper condition would not need to be sterilized; but his point was that in many places it was not in this condition. If it were, why was it that they were sterilizing at Shrewsbury, Lincoln, Cambridge, Paris, and in many places in America? And why was it that the London County Council were spending an enormous sum on storage reservoirs, which were not so absolutely certain in their action as sterilization would be? There were many places where the water was not above suspicion; and many chemists and bacteriologists were in favour of adding a very small proportion of chlorine in order to make it absolutely certain that no disease germs remained.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The gas industry is under deep obligation to the Corporation of Glasgow for having organized the exhibition which was opened in the city yesterday. It is not an exhibition of gas appliances only, as was at first intended; but the inclusion of electricity and other forms of smokeless fuel in the list of goods exhibited, so far from detracting from the position of gas in the public mind, has had the effect of enhancing that position. Any person approaching the subject with an open mind, which is what almost the whole of the visitors to the exhibition will do, will find it impossible to resist the conclusion, as they scan the benches, even cursorily, that on the gas side they are confronted with an array of articles every one of which bears testimony, in its outward appearance, to its work-a-day capabilities; whereas, on the electricity side, the conclusion must be equally irresistible—that what is shown there is still in the region of the wonderful mechanical toy. In other words, that gas is a power which is to be employed seriously, but that electricity is only an enter-

tainment. Even in the matter of lighting, although, as a matter of fact, the nominal candle power of the lamps employed by the two systems is, in the aggregate, almost alike, there is no hesitation, in the minds of anyone, in asserting that the side upon which gas is used is by far the better lighted of the two. The object lesson which is given by the exhibition is the unmistakable one that gas as a fuel is, after coal, unapproachable. When the extent of the field which is open to the Corporation of Glasgow is taken into account, it will be apparent to most people that an exhibition so well planned and so admirably placed can have but one effect upon the fortunes of the gas industry, and that effect a favourable one. The exhibition is aimed at the domestic side of fuel consumption. Had it been considered advisable to appeal to manufacturers upon the question of fuel, the collection would have been very different, as other gases than coal gas would have had to be reckoned with; and had it been left open to both domestic and industrial fuel, the dimensions of the exhibition would have been unduly expanded, and the attention of visitors would have been inadvisedly dissipated. With the view restricted to the improvement of fuel for domestic purposes, visitors have a clearer vision of what is shown, and can sooner reach conclusions. The exhibition, which is to run three weeks, was auspiciously and happily opened by Lord Pentland. Perhaps it may be as well to state that the opening ceremony was attended, unofficially, of course, by a large number of gas managers, Scotch brethren of Mr. Alex. Wilson, the Gas Engineer to the Glasgow Corporation, who is President of the Institution of Gas Engineers; also, from England, by Mr. R. G. Shadbolt, of Grantham, the senior Vice-President of the Institution; and from Ireland by Mr. J. Bradie, of Lisburn. Already arrangements are being considered for the bringing of members of corporations to Glasgow to see the exhibition, which brings home quite forcibly that the Corporation of Glasgow have, by their timely action, laid many under obligation to them. Lest the word timely should be misconstrued, I may explain that the chief meaning it bears in the last sentence has reference to the circumstance that the Corporation of Glasgow have it now in their power to throw themselves without reserve into the work of promoting the demand for gas—a power which has hitherto been sadly crippled by Statute.

In the Valuation Appeal Court in Glasgow on Monday, a curious description of appeal was heard; the question involved being the charge for lighting common stairs. It is a practice in poor localities in Glasgow that owners are charged by the Corporation for the lighting of common stairs, and that the owners recover the amount from their tenants. The position of the Burgh Assessor was that anything over 10s. which the owners required their tenants to pay was of the nature of rent. There were appeals on the roll against the decision of the Assessor by 59 proprietors. It was stated for the appellants that the Corporation charge 14s. per lamp for electric lamps, and it was pleaded, as against the view of the Assessor, that whatever was charged over 10s. could not be regarded as being, within the meaning of the Act, consideration other than rent; also that electricity, in respect of which the money was paid, was not land or heritage. The Assessor pointed

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out that all that a proprietor was entitled by Statute to recover from his tenants was 10s. per lamp. If, therefore, the tenants paid more than 10s., they did so voluntarily; and the excess sum could not be regarded as a charge for stair lighting, but fell to be added to the rent. He understood that the argument against including the excess sum in the rent was that owners had agreed with the Corporation to light the common stairs with incandescent gas-burners or electricity. The Act of Parliament did not allow the owner to choose how the stair was to be lighted. The Corporation and their Inspector fixed the standard of lighting. If the stair ought to be lighted by either of the improved methods, the Corporation had power to compel an owner to so light it; but the Corporation had no power to compel an owner to pay more than 10s. per light. An owner had no right to agree to pay more than 10s. per lamp and then place such additional sum on the tenant. He had consulted the minutes of the Corporation. While the Corporation had met with owners, the minutes bore no trace that tenants had ever been consulted on the subject; and it seemed to him that the frequent letters to the Press sufficiently proved that the tenants were not aware that the maximum sum which an owner could compel them to pay for stair lights was 10s. The Court unanimously sustained the appeals; and Mr. Walker asked a case to be stated for the Superior Court.

Something of a rumpus occurred in the Dundee Valuation Appeal Court on Monday in connection with the valuation of the gas and electricity undertakings. In the case of the gas undertaking, the Burgh Assessor has fixed the valuation at £30,000; the Gas Engineer—Mr. A. Yuill—considers that the valuation should be £20,400; and the Parish Council suggest that it should be £31,500. The Assessor's valuation of the electricity undertaking is £18,000. The department consider it should be £12,733, and the Parish Council that it should be £19,500. In both cases appeals were taken by the Corporation. In the Court, the Assessor, Mr. G. C. Brown, protested against the manner in which the appeals had been forced upon him. The Assessor went on to explain that the trouble arose in the fixing of the sum to be allowed for tenants' plant. The Gas Commissioners declined to give him figures which he was entitled to until 14 days after the latest date at which he could make a valuation; then they sprang upon him three or four important points. His view was that the tactics were discreditable and dishonourable. Mr. A. Yuill, in explanation, said they had had to fight all along the line for their rights, and only got from the Assessor to the extent of their knowledge in the matter. The Gas Commissioners wanted no more than they were entitled to by Act of Parliament. They were quite prepared to go into the matter with the Assessor; but he invited them to appeal. It was agreed, in order to give time for adjustment of the subjects in dispute, to adjourn the hearing of the appeals for a fortnight.

The Arbroath Town Council had before them on Monday the public accounts for the year, presented by Mr. Thomson, the Convener of the Finance Committee. Dealing with the accounts of the Gas Department, he said the amount received for gas sold was £13,087, which was £699 less than the previous year, owing to the reduction in the

price. For residual products they received £3422, which was £31 more. Radiator rents, which was a new item, amounted to £30; and interest, rents, &c., to £42. The total revenue was £16,581. The working expenses amounted to £11,597, which left a balance of £4984. To this they added £108; being the balance in hand at the beginning of the year, making a total of £5092. From this had been paid annuities, amounting to £1331; interest, £785; carried to sinking fund, £575; to contingency and depreciation account, £2000; to contingency for extraordinary damage, £100; and the statutory payment to the Arbroath Harbour Trust of £250—making a total of £5041, and leaving a balance on hand of £51. With regard to the sinking fund, during the year they had paid in redeeming annuities £284, they had repaid a loan of £250, and had a balance on hand of £51. Their capital bonded debt for the Gas Department was at the beginning of the year £20,295, and at the close £20,045. They would have £9 16s. less to pay in annuities after this. It was very good indeed to be able to pay off £534 in face of a reduction in price, and to keep the gas-works, if he might say so, not only abreast but ahead of every gas undertaking in Scotland. The Gas Convener and Gas Manager were entitled to their very best thanks for this splendid work. From the contingency fund they had paid for new condensers and the new gasholder £2000, and they had at the end of the year a balance of £700 available for extraordinary damages. The Council resolved, in view of a difference with the Surveyor of Taxes regarding the valuation of the gas-works for inland revenue purposes, to have the works re-valued by Mr. A. Gillespie, of Glasgow, who had previously valued them. The Surveyor of Taxes proposes to fix the valuation of the works at £5213, and the Gas Manager—Mr. A. C. Young—considers that it should not be more than about £4000. The Corporation are also at variance with the Burgh Assessor as to the valuation he has put upon the gas-works for local assessment purposes; and they have appealed—to themselves—against the valuation. The valuation of the Assessor is £4107, which is £214 more than that fixed a year ago, and £757 more than in 1908-9. Bailie Smith, the Convener of the Gas Committee, said that in a few years the valuation of the gas-works had been doubled; there was a mistake somewhere.

The Tayport Town Council about a year ago acquired the gas undertaking, and since then they have effected several improvements and alterations upon the works. On Saturday last, they inaugurated a new gasholder. At the opening ceremony, Mr. J. R. Strachan, the Convener of the Gas Commissioners, said that improvements had been carried out, not only as regarded the works, but in the supply. They had done away with meter-rents, and had reduced the price of gas by 5d. per 1000 cubic feet. A start had been made with the supplying of gas-cookers at a nominal charge; 100 being already in use. Mr. Bruce, the Manager, had turned the place outside in; and his work had culminated in the erection of the new gasholder. Mr. Strachan turned on the gas to the new holder. A silver rose bowl was presented by the Contractors—Messrs. Henry Balfour and Co., Limited, of Leven—to Mr. Strachan as a memento.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, Sept. 17.

Throughout the past week the market has shown great activity, the strength of the position having been accentuated by the presence of a considerable number of fresh orders; and the current production has been readily absorbed at prices continually tending in sellers' favour. The closing quotations are £12 11s. 3d. per ton f.o.b. Hull, £12 12s. 6d. per ton f.o.b. Liverpool, and £12 13s. 9d. per ton f.o.b. Leith. Although buyers refuse to pay a premium for future shipment, more interest has been displayed therein, and several transactions have been reported for delivery f.o.b. at the ports both for this year and the first half of 1911 at prompt values.

Nitrate of Soda.

The price of this article continues unchanged at 9s. 4½d. per cwt. for 95 per cent. quality and 9s. 7½d. for 96 per cent., holders maintaining a very firm attitude.

Tar Products.

The markets for tar products have been steady throughout the past week. There has been little alteration in the market for pitch, and makers are still asking prices which are above those obtainable from buyers. Creosote is very dull, but there appears to be a general impression that prices will improve later on. Benzol, 90 per cent., is quiet, and there is some disposition on the Continent to purchase for delivery all over next year; but the prices are such as offer no inducement to makers. Benzol, 50-90 per cent., is quiet, and the Continent are offering equal to about 5½d. naked for delivery all over next year; but sellers will not accept this price. Toluol is steady without very much demand. Solvent naphtha is quiet, and orders are difficult to obtain. Heavy naphtha is also dull; and up to the present buyers do not appear anxious to cover their requirements for next year's delivery. Carbolic acid is quiet; and Continental consumers report purchasing at 1s. 0½d. f.o.b. east coast ports. Naphthalene is steady; and creosote salts are in good demand. Tar is fetching fair figures.

The average values during the week were: Tar, 18s. 9d. to 22s. 9d. ex works. Pitch, London, 37s. 6d. to 38s.; east coast, 37s. 6d. to 38s.; west coast, 36s. to 37s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7½d. to 7¾d.; North, 6¾d. to 7d.; 50-90 per cent., casks included, London, 7¼d. to 7¾d.; North, 7¼d. Toluol, casks included, London and North, 9d. to 9½d. Crude naphtha, in bulk, London, 3¼d. to 4d.; North, 3¼d. to 3½d.; solvent naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s.; heavy naphtha, London, casks included, 11d. to 11½d.; North, 10¾d. to 11d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d.,

bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been exceedingly firm during the past week. Prices have advanced all round; and it would appear that not only is Germany using more sulphate of ammonia than she can produce, but the make in England has fallen off in certain quarters owing to the rather larger production of water gas. The gas companies have advanced their price to £12 to £12 2s. 6d. Outside makes are selling on the 25½ per cent. basis at about £12. London f.a.s. is probably worth about £12 10s.; and this price has been declined in Hull. In Liverpool, £12 12s. 6d. has been paid; and in Leith, £12 15s.

A Trade correspondent writes: It is evident the higher prices of pitch have come to stay. There are no outside ports quoting less than 40s. per ton, and generally pitch is very firm indeed. Some large orders have been booked for solvent naphtha by merchants, who will have to cover these later on. Creosote and other products remain in about the same position. The average values are: Tar, 20s. to 26s. 6d. per ton. Creosote, 2d. to 2½d. per gallon, in bulk 2¾d. per gallon, according to position. Pitch, 40s. 6d. per ton f.a.s. Liverpool, 39s. 6d. per ton f.a.s. Manchester. Benzol, 50-90 per cent., 7½d., casks free; benzol, 90 per cent., 7d. per gallon, casks free. Toluol, 9¾d. per gallon, casks free. Solvent naphtha, 11¼d. per gallon, naked; heavy naphtha, 10¾d. per gallon, casks free; crude naphtha, 3¼d. per gallon, naked. Light oil, 3¾d. per gallon, naked. Carbolic acid, 60's, 1s. per gallon. Heavy oils, 3¼d. per gallon. Naphthalene salts, 50s. per ton.

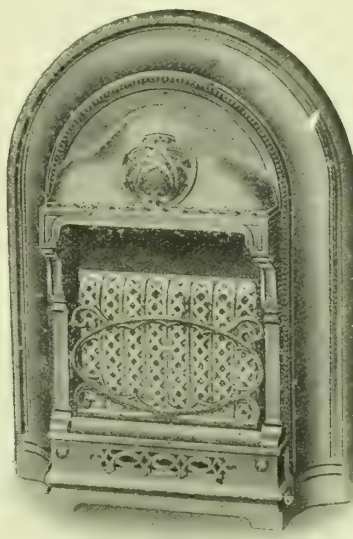
COAL TRADE REPORTS.

Northern Coal Trade.

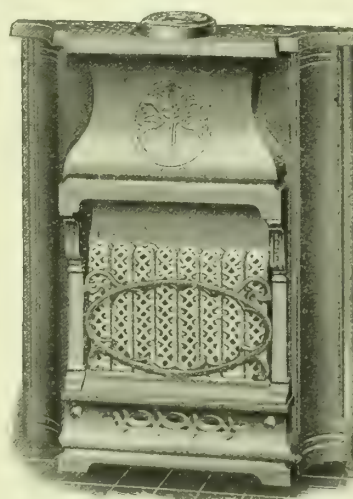
There is a steady, but not very pressing, demand for coal, and the supply is an adequate and ample one. In steam coals, there are rather fuller shipments, though those to the Baltic are falling off, as is usual at this season. Best Northumbrian steams are from 9s. 10½d. to 10s. per ton f.o.b., and second-class steams are 9s. For steam smalls, prices are a little easier—from 5s. 6d. to 6s. 9d. per ton f.o.b. being quoted. In the gas coal trade, there is a steady growth in the consumption, and shipments to the great gas companies are enlarging. Durham gas coals vary in price according to quality. The usual classes are from 9s. to 9s. 10d. per ton f.o.b.; and for "Wear" specials, up to 10s. 6d. is now the current quotation. There are sales of gas coals being made forward; but buyers wish for lower prices. Generally, about 16s. is still the price quoted at Genoa for good Durham gas coals delivered into or over next year, and lower prices are not readily taken; while the fact that current contracts now take up more of the



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output is stiffening prices. Coke is steady; but the larger production of gas coke makes the price a little weaker. Good gas coke is about 14s. to 14s. 3d. per ton f.o.b. in the Tyne or the Wear.

Scotch Coal Trade.

Trade remains quiet and far from satisfactory. It is with difficulty that the prices quoted are being obtained. These are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 383,602 tons—an increase of 59,246 tons upon the preceding week, and of 61,879 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,238,223 tons—an increase of 823,346 tons.

Profit-Sharing with Management and Men.

Mr. Gilbert Little writes as follows: I have been on a business visit to Glasgow and district for a few days, in the towns on the upper and lower reaches of the Clyde, where the streets are crowded with the locked-out workmen; and a profit-sharing scheme that I outlined at Smetwick, after I got my first works there well established as a dividend-paying success, was recalled to my mind vividly, regretfully, and reproachfully. It is a moot point whether the non-adoption of the scheme more than six years ago is responsible or not for the fact that the dividend-paying business has never earned or paid a dividend since, or had any profits to share. I find the employers and the employed put forward many explanations to account for the general unrest prevailing at present, in the ranks of labour; and the constant warfare between Capital and Labour. Many causes suggest themselves to my mind; but the chief one appears to me, at present, to be the publication, during the last few months, of balance-sheets of limited liability companies showing astounding profits. The question arises, Cannot some practical scheme be evolved by the business brains of Britain to kill industrial strife, and obviate wealth-destroying warfare between Capital and Labour? In this connection, let me make one suggestion through the columns of the "JOURNAL"—viz., that after the shareholders of limited liability companies receive a fair dividend on their investment, the remaining profits be apportioned equally—one-third to labour, one-third to management, the remaining third to increase the dividend. My scheme has the merit of simplicity. After the payment of a fair wage to labour, and a fair dividend to capital, it is only "fair" that the management should participate equally in the surplus profits, which are as a rule largely due to management. In municipal works, the profits could be divided in equal thirds—among the men, the management, and the rates.

New Joint-Stock Companies.—The Leiston Gas Company, Limited, has been registered with a capital of £20,000 in £1 shares (700 preferred). The objects are to carry on the business of manufacturers, sellers, and suppliers of gas for light, heat, and motive power in Leiston, and elsewhere in Suffolk; also to acquire from Richard Garrett and Sons, Limited, the whole of the Leiston works gas plant, and from Eleanor M. Carr certain freehold land at Leiston. The Maikop Water-Works has been registered with a capital of £40,000 in £1 shares.

The Water-Slide Chandelier.—The evaporation of the water in a sliding chandelier is the cause assigned for an explosion which wrought serious damage to a house at Chesterfield, and so injured Mrs. Turner, the wife of the occupier, as to necessitate her removal to the hospital. The house had been empty while the tenants were on holiday; and when Mrs. Turner came back, she struck a match in the sitting-room without noticing that there was an escape of gas, which immediately led to the explosion. This is the second accident that has occurred in the immediate neighbourhood during the past three months in consequence of a leaking chandelier.

Sowerby Bridge Gas-Works Extensions.—At a special meeting of the Sowerby Bridge Urban District Council, the Clerk read a letter from the Local Government Board with regard to an application for sanction to borrow the sum of £15,900 for gas-works extensions—stating that it did not appear to the Board that the Council had sufficient margin of borrowing power available under their Local Acts. In view of the fact that further extensions would probably be required, it was resolved that the Clerk at once make application for, and take all necessary steps to obtain, a Provisional Order sanctioning the borrowing of the sum of £20,000 for the proposed scheme. Only one member voted against the motion.

Increased Dividends at High Wycombe.—The report submitted at the half-yearly meeting of the High Wycombe Gas Company stated that the sales of gas showed a steady increase when compared with the corresponding period of 1909. After paying interest on debentures, and providing £200 for the dividends on the preference shares, there remained a sum of £3068 available for dividend; and the Directors recommended that increased dividends should be paid—viz., at the rate of 10 per cent. per annum on the ordinary shares, and 7 per cent. per annum on the additional shares (less income-tax), and that a sum of £50 should be added to the reserve fund—leaving a balance amounting to £2101 to be carried forward.

A Challenge at Canterbury.—Noticing that the Canterbury Board of Guardians were contemplating the installation of the electric light in the workhouse and infirmary in substitution for the existing gas supply, Mr. James Burch, the Secretary to the Gas and Water Company, wrote suggesting a comparison of the two systems under the following conditions: The Gas Company to place an incandescent inverted gas-burner, together with a meter, examined and tested as correct by the London County Council, in the front window of the Company's show-room in St. George's Street. The Electric Light Committee to select one of the latest type metallic filament lamps, together with a meter certified as correct, by the side of the above. Both lamps to be of the same illuminating power, and connected so that both must be turned on at the same time, and allowed to burn for a period to be agreed upon. The result to be judged by an impartial person to be selected before the test takes place. It will be interesting to see whether the challenge is taken up.

ANCIENT & MODERN.

"Who's that, Sam?" inquired Mr. Pickwick.

"Why, I wouldn't ha' believed it, Sir," replied Mr. Weller with astonished eyes, "It's the old 'un."

"Old one," said Mr. Pickwick.

"What old one?"

"My father, Sir," replied Mr. Weller.

"How are you my ancient?"

THE spirit of the foregoing dialogue seems to permeate the gas-fire market at the present time; and, as is not uncommon, ideas that were in vogue years ago, come with a freshness to a generation whose recollection does not hark-back twenty years or so. A certain King once said: "There is no new thing under the sun. Is there anything whereof it may be said, See, this is new? It hath been already of old time, which was before us. There is no remembrance of former things."

So with gas-fires as with other matters, it is not the newness of the principle, but the clothing, as it were, of that principle in a dress, whose adornment and embellishment are more acceptable to the views of the present generation than to those of a past one. To take one instance only—that of single fuel. Many years ago, the late Mr. Thomas Fletcher, wrote:—

"It is evident that the gas-fire (or whatever else it may be called) of the future cannot be a fire in the usual meaning of the term, but must be a single surface at a high temperature, if economy is any consideration."

The single fuel that we (Fletcher, Russell, & Co., Limited), are sending out this season may perhaps not be better than others, but it is quite as good; and although we have no "new" discoveries to report, we are able to offer this season, fires that are neat in appearance, economical in consumption of gas, satisfactory in working, cheap in price, and successful in modernizing the ideas of years ago.

TRY THEM.

See Advertisement, p. VI. centre of "JOURNAL."

FLETCHER, RUSSELL & CO., LIMITED.

Heathfield Natural Gas.

Reverting to the subject of Heathfield Natural Gas in their issue of last Wednesday, the "Daily Mail" said: "'For many years,' writes Mr. Robert Howie, of Dargle, Cambridge Road, Southport, 'the natural gas at Heathfield has interested me; and when the Company came out, I put down ten pounds as my fee for a thorough geological report. What I should like to know is why there is not a sufficient number of people ready to do the same. There at Heathfield is the only natural gas outflow in England; and we do not know what material is in the retort from which the gas comes. I put my money down hoping for nothing but a thorough geological report. If more came of the investigations, well and good; if not, one of the most interesting geological points in England would have been settled. I cannot understand the apathy of the English geologists.' Like our correspondent, we do not even remember seeing any convincing expert report on the flow of natural gas undoubtedly existing at Heathfield. But many a ten pounds has been put down; and quite a sufficient number of people have been involved in the companies which have been exploiting the affair for years past. Probably because of the financing that has been going on, and nothing having yet come of it after all the years of promise, people have come to the conclusion that nothing is ever likely to come of it. There seems enough natural gas there to do a little work; but that is all. It is a natural conclusion that, with the gas flaring there for many years past, quite obvious to all experts, if there were any chance of developments, these would have occurred years ago. In the circumstances, we advise no one to put down another ten pounds."

Accident at the Huddersfield Gas-Works.—At the Huddersfield Gas-Works, about 8 o'clock on Monday morning of last week, when lifting the cover of a purifier, 40 feet long by 30 feet wide by 6 feet in depth, a momentary flame issued from it, and burnt seven of the men engaged upon the work. They went to the local infirmary, and received medical aid at once, but were not detained. It appears that the contents (oxide of iron) of the purifier had become heated. Immediately the cover was raised, and air entered the purifier, a flame issued round the edge; but no damage was done to the apparatus.

Automatic Lighting Experiment at Sheffield.—For the purpose of experimenting in automatic street lighting, the Sheffield Corporation have purchased a number of pressure-actuated lighters from Mr. B. Bonniksen. Of these 327 have already been fixed, and will represent a saving of £80 or £90 a year; and if the experiment is successful there will be a gradual extension of the system, until ultimately a saving of from £2000 to £3000 a year will be effected. There are in Sheffield nearly 10,000 street incandescent lamps controlled by the Watch Committee. It is not the intention of the Committee to discharge any of their employees in consequence of this saving. The number of lamps increases annually; and the men will be employed in other parts of the city to light and extinguish the lamps on which no automatic machines are fixed. There is also a gradual increase in lamp-cleaning work.

Alleged Nuisance at Oldham.—At a meeting of the Oldham Gas Committee, a letter was read from the Clerk to the Royton District Council again drawing the attention of the Committee to the nuisance alleged to arise from the Higginshaw Gas-Works. The writer said the Council would be pleased if they remedied the smoke nuisance; and he referred to the smell emanating from water which was discharged from the works. He suggested that the water should be treated before it was sent away. The Gas Engineer (Mr. T. Duxbury) said that he did not know of any gas-works where the smoke from the retort-houses was in any way prevented. The smell, he thought, was from a small quantity of water which ran down the stream from the new gasholders, and which smelt slightly of gas, though they had not had a single case of complaint from the Royton Dyeworks, who used the water from the stream for dyeing purposes.

Lewes Gas Company.—The report adopted at the meeting of the Lewes Gas Company stated that the revenue account for the half year to June 30 showed a profit of £2131. After providing for interest on mortgages, the balance of net revenue as seen by the profit and loss account was £5478. Dividends were recommended for the six months at the rate of 5 per cent. upon the original capital stock and 3½ per cent. upon the additional capital stock. The Chairman (Mr. M. S. Blaker) said it was one of the most satisfactory reports that had ever been presented to the shareholders. The receipts for gas during the half year were not quite so large as those during the corresponding six months of last year; but this was accounted for in considerable measure by the fact that during a part of the half year in 1909 the price charged for gas was 3s. 10d. per 1000 cubic feet, while during the past six months the price was only 3s. 8d. He thought the mantle of efficiency which characterized their late Manager (Mr. Levi Monk) had fallen on, and adapted itself to, the shoulders of his successor (Mr. E. Jones), whose management would bear comparison with the best traditions of the Company in respect of the expenditure side of the account.

Birmingham Gas-Burner Census.—It seems that a census is now being taken by the Birmingham Gas Committee in regard to the number of burners in use; and information as to its object has been sought by the local "Mail." In the course of an interview, Mr. R. S. Hilton, the Secretary to the Department, explained that he had asked the gas inspectors to ascertain, if they could, the number of burners in use in manufactories and private houses, and also the number of incandescent lights and of old-fashioned burners. The object was merely to see what field there was for improving the quality of the light in so far as the burner was concerned. The desire of the department was to educate persons in the use of the incandescent light, because it was more profitable in that a better light was given at less cost than with the old-fashioned burner. So far, the census showed that the vast majority of private residents used the incandescent burner. The result of the census might also suggest the desirability of making some slight changes in the manufacturing process of gas; and thus it was to the benefit of the public that the department should have the information asked for. The desire of the Committee was simply to ensure satisfaction on the part of those who used the gas.

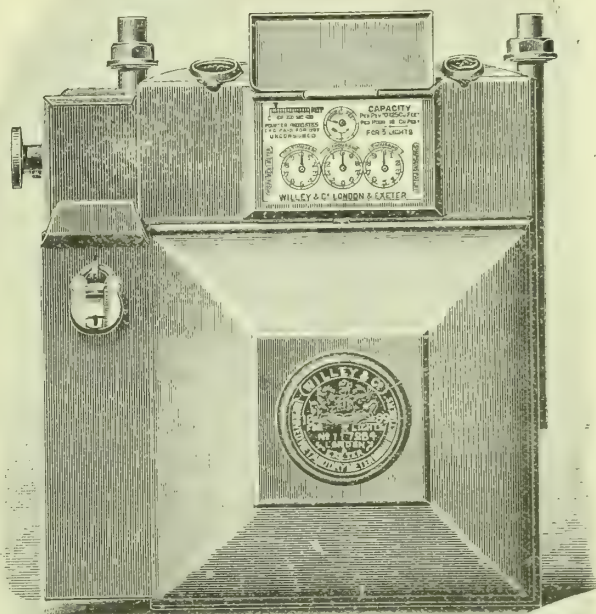
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of advantage from the many found in our Slot Meters are:

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3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



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Mr. William Severs, the Manager to the Wilmslow Gas Company, is a candidate for a seat on the Wilmslow Council—a vacancy having been created by the death of the member for the Dean Row district. His opponents, Messrs. Bilborough and Booth, are both engineers.

The Mansfield Town Council have resolved to make a further contribution of £300 from the profits of the gas undertaking towards the general district rate. It was reported that the question of a reduction in the price of gas is to be considered at the next meeting of the Committee.

A correspondent writes: "I should be much obliged if any of your readers could inform me if my Directors are legally entitled, in the absence of powers granted to the Company in their Special Act, to provide a small gratuity to an old servant of the Company on his retirement owing to ill-health."

The mains of the Burton Corporation gas undertaking are to be extended to the parish of Stretton, at a cost of £450. As the result of an informal canvass, one-third of the inhabitants have agreed to take gas; and the Gas Committee therefore believe that in time Stretton will prove a useful addition to the output of the Burton works.

Messrs. John Wright and Co., of Birmingham, are issuing their new booklets for the coming season. The printing is in two colours, and their excellent "get up" gives them the attractive look which is so well calculated to induce careful perusal. The title of the first, which has a coloured wrapper depicting ease and comfort, is "Wright's Eureka Gas-Fires;" while the other two deal respectively with "Gas Heating for Garage or Greenhouse," and "Warmth at Will" by means of gas-heated radiators.

The British Consul for Westphalia and the Rhenish Provinces writes, in his annual report, that, as regards gas-pipes, sales in the home and foreign markets improved, though most of the factories were unable to work full time throughout the year. The Gas-Pipe Syndicate were forced to reduce their prices. The home market, being protected, was fairly satisfactory; but exports were not remunerative, in consequence of foreign competition. Many foreign contracts were signed at low prices, simply to keep the works occupied, though profits were very small indeed.

In order to meet the water requirements at the Royal Naval College at Osborne, the Newport (Isle of Wight) Town Council last Wednesday assented to an expenditure of £900 for providing larger mains to the boundary of the borough, though fears were expressed that the naval and military authorities were on the *qui vive* to secure their own independent supply. For providing the necessary pipes, a tender of £585 was accepted from Messrs. J. Oakes and Co., of London; and for the carting and the laying of the pipes, an offer of £288 was accepted from Messrs. Smith and Whitehead.

A sensation was caused at the Central Station, Liverpool, last Wednesday evening, by the fusing of part of the electrical equipment of the Mersey Railway. About 8 o'clock, just as a train was entering the station, one of the short-length cables which conduct the electric energy from the main cables traversing the side of the tunnel to the rails fused, and quickly burning through caused an interruption of the current, and plunged the station in darkness. All intending passengers were excluded from the station, which for nearly an hour-and-a-half was closed for traffic purposes.

A HISTORY OF THE INTRODUCTION OF GAS LIGHTING.

BY CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers. Author of "Gas Lighting," which forms the Third Volume of Groves and Thorpe's "Chemical Technology."

As a frontispiece the book has a photographic reproduction of the portrait of William Murdoch in the Edinburgh Art Gallery. There are also portraits of the Hon. Robert Boyle, F.R.S., James Watt, Philippe Lebon, Frederick Albert Winsor, &c.; a reproduction of the picture of "Scientific Celebrities in 1800," in the National Portrait Gallery, in which James Watt, Boulton, and Wm. Murdoch are included; and numerous illustrations of various apparatus used in the early Manufacture of Gas, &c., with three folding plates.

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A Handsome F'Cap Volume giving a complete account of the GRANTON GAS-WORKS

OF THE EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS,
Their DESIGN, CONSTRUCTION, and EQUIPMENT,
with Illustrations, Plates, and Details of Costs,

BY W. R. HERRING, M.Inst.C.E., &c.

The volume consists of 300 pages, embellished with 228 Photographic and other Illustrations, and 28 large folding Plates. In addition, the Appendices give (in full) the Specifications and Detailed Schedule of Quantities of the Brick and Puddle Gasholder Tank and of the Four-Lift Telescopic Holder at Granton.

Bound in Cloth, price 16s., free delivery in United Kingdom.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER (ABROAD). 1047, c/o Sell's Advertising Offices.
GENERAL MANAGER (GAS-STOVE COMPANY). No. 5284.
ASSISTANT-MANAGER. Matlock Gas Company.
DRAUGHTSMAN. No. 5289.
DRAUGHTSMEN. No. 5268.
GAS MAKER AND FITTER. Leyburn Gaslight Company.
REPRESENTATIVE. "Gas Works," c/o Streets.
FOREMAN. Dumfries Gas Department. Applications by Sept. 26.

Situation Wanted.

SUPERINTENDENT OF DISTRIBUTION. No. 5285.

Lectures, &c.

SIR JOHN CASS TECHNICAL INSTITUTE. Fuel, Fuel Analysis, and Gas Analysis. Syllabus from the Principal.

Plant, &c. (Second Hand) for Sale.

EXHAUSTER. T. Duxbury and Co., Manchester.
STREET GAS-LAMPS. Carmarthen Town Council.
Tenders by Oct. 15.

Plant, &c. (Second Hand) Wanted.

PURIFIERS. Woodbridge Gas Company.

Patent, &c., for Disposal.

METERS. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY (BY AUCTION). Oct. 11.
BARNET GAS AND WATER COMPANY (BY AUCTION). Oct. 11.
BRISTOL WATER WORKS COMPANY (BY AUCTION). Oct. 6.
GREAT YARMOUTH WATER COMPANY (BY AUCTION). Oct. 11.
HARROW AND STANMORE GAS COMPANY (BY AUCTION). Oct. 11.

TENDERS FOR

Coal.

SLIGO GAS COMPANY. Tenders by Sept. 26.

Pipes, &c.

CLACTON URBAN DISTRICT COUNCIL. Tenders by Oct. 5.

Sulphuric Acid.

MARKET HARBOROUGH GAS DEPARTMENT. Tenders by Sept. 26.
LEICESTER CORPORATION. Tenders by Sept. 24.

Tar and Liquor.

BLACKPOOL GAS DEPARTMENT. Tenders by Sept. 26.
MARKET HARBOROUGH GAS DEPARTMENT. Tenders by Sept. 26.
CADBURY BROS., BOURNVILLE.

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O'NEILL'S OXIDE

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LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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Resists 4500° Fahr. Best for GAS-WORKS.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSS MOUNT IRON-WORKS, ELLAND.

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MEANS THIS—"On Gas Companies' Service."
AND THAT—J. P. VINALL, Advertising Man, is "At Your Service."

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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Telephone: 841 AVENUE.

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READ HOLLIDAY AND SONS, LTD.,
HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.
ENQUIRIES SOLICITED.

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GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.
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Toluel, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

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MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

BENZOL AND CARBURINE FOR GAS ENRICHING.
ALSO
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For Prices, &c., apply to
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Telegraphic Address: "Carburine, London."

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The Manufacture of
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Results Guaranteed. No Working Costs.
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THE very best Patent Grids for Holding Oxide Lightly.
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M.H. (Methane Hydrogen) GAS PLANT, LTD.,
19, GREAT WINCHESTER STREET, LONDON, E.C.
The M.H. GAS PLANT produces at will:—
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.
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It is also used for the enrichment of Gas.
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FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
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Telegrams: "MOTORPATHY, LONDON," Telephone: 5118 WESTMINSTER.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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SPECIALLY prepared for Sulphate of AMMONIA Makers by
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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
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GAS-WORKS requiring Extensions
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GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
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Telephone: Central Manchester, 7002.
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SATURATORS, Tanks, and Sulphate
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ON the 17th of Sept. 1850, Geo. Bower, of St. Neots, was married in Higham Ferrers Church to Sarah, daughter of Mr. and Mrs. Chas. Spencer, of Higham Ferrers.

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ROYAL COLLEGE OF SCIENCE,
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A SPECIAL Course of Advanced Lectures as follows will begin during October next:—

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Conducted by

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Particulars of this and other Courses to follow free on Application to the Secretary.

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The following Courses of Evening Lectures and Practical Work on

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By C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.

A Course of Laboratory Work, Summer Term, Monday Evenings, 7 to 10 p.m. Commencing **Monday, April 24, 1911.**

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By CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.

A Course of Laboratory Work, Summer Term, Wednesday Evenings, 7 to 10 p.m. Commencing **Wednesday, April 26, 1911.**

The Courses of Instruction are arranged to meet the requirements of those engaged in Chemical and Engineering Works, or who are concerned with the use of Fuel as a Motive Power.

Detailed Syllabus of the Courses may be had upon Application at the Office of the Institute, or by letter to the **Principal.**

SHANGHAI—Applicants for the Position of Assistant Foreman Gas-Fitter are **THANKED AND INFORMED THAT THE VACANCY IS NOW FILLED.**

SUCCESSFUL GAS DISTRIBUTION.

SUPERINTENDENT (Age 30), with thorough knowledge of all technicalities and proved ability to educate consumers privately or by public demonstration. First-hand knowledge of U.S.A., Colonial, and Continental Methods for securing maximum economical consumption; has recently visited leading Metropolitan and Provincial Undertakings and noted latest Revenue Yielding Ideas; unbroken record of successful results; desires scope for energies as above. Salary partly based on results preferred.

Address No. 5285, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, Two or Three DRAUGHTSMEN, fully Experienced in the Design of Modern Gas Plant.

Apply, by letter, Stating Age, Qualifications, and Salary required, to No. 5268, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE required to introduce and push important article used in all Gas-Works. Must have Good Connections and be Good Salesman.

Please write, stating Qualifications, District, and References, to: "GAS-WORKS," care of STREETS, 30, CORNHILL, E.C.

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THE Provost, Magistrates, and Councilors invite APPLICATIONS for the Appointment of a **FOREMAN** at the Gas-Works. Wages, £2 7s. 6d. per week.

Applicants must be Practical Fitters, with a knowledge of Gas-Works Plant and Carbonizing (Brook's Settings). It is desirable that they should have had Experience of Stoking Machinery (Dempster's Machines); and they must be qualified to Superintend Outdoor Work.

Applications, accompanied by Four Testimonials, may be lodged with Messrs. J. & R. A. GRIFFIN, Town Clerks, on or before the 26th of September current.

GAS-STOVE Manufacturing Company

requires a **GENERAL MANAGER** possessing good Commercial Experience, and Technical Knowledge. Salary offered £400 per annum with Commission.

Applications, stating Age, and full Particulars of Qualifications, should be addressed to No. 5284, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED by a Firm of Ironfounders

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Apply No. 5262, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN Wanted in a Gas

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Apply, by letter, stating Age, Experience, and Salary required, to No. 5289, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an Assistant Manager for

the Matlock and District Gas Company, Aged 21 to 25. State Age, Qualifications, and Salary required. Copies of Testimonials must be furnished.

Applications, endorsed "Assistant-Manager," to THE SECRETARY.

Gas-Works, Matlock,
Sept. 17, 1910.

WANTED, by the Leyburn Mutual

Gaslight and Coke Company, a Practical GAS MAKER and FITTER, able to Take Meters if necessary and Capable of Managing Small Works. Annual make, Two to Three Million Cubic Feet. House, Coal, and Light found. Must be a Steady Man. Testimonials wanted from previous situation.

Applications, stating Age, Experience, and Wages required, to the SECRETARY, Leyburn, YORKSHIRE.

WANTED, at once, for a Foreign Ap-

pointment, a thoroughly Well Qualified GAS ENGINEER, about 28 to 35 years of Age. Salary offered, £350 per Annum, with a further sum to be agreed upon for each Works erected or extended. The Gentleman selected must be fully Qualified to Advise as to the Capacity, Design, and Cost of every part of a Modern Gas Plant, and Capable of Superintending, first the Erection and subsequently the Working of the Plant. In the first instance it is not necessary to send any Testimonials; these will be asked for later from Applicants whose Experience seems to render their Appointment suitable. Term of Appointment, Three to Five Years.

Applications to be addressed to No. 1047, SELL'S ADVERTISING OFFICES, Fleet Street, LONDON.

WANTED, Two Second-Hand Purifiers,

10-foot or 12-foot diameter. Offers to the SECRETARY, Gaslight and Coke Company, Limited, Woodbridge, SUFFOLK.

FOR SALE—30,000 Cubic Feet an Hour

EXHAUSTER. Good as New. Done very little work. Maker, Bryan Donkin and Co. Can be seen on Application to THOS. DUXBURY AND Co., 16, Deansgate, MANCHESTER.

TAR FOR SALE—About Two Tons of

GAS PRODUCER TAR per week, containing on an average 20 per cent. of water. Price wanted free on rail Bournville Works in Purchaser's own tank. CADBURY BROS., LIMITED, Bournville, near BIRMINGHAM.

GASHOLDERS—16 ft., 24 ft., 26 ft., and

45 ft. Diameter GASHOLDERS, Cheap for immediate Sale. Re-erected in either Brick or New Steel Tanks Complete to Plan and Specification. Can be seen Temporarily Erected at our Works. FIRTH BLAKELEYS, Thornhill, DEWSBURY.

SALE OF STREET LAMPS, &c., BY PRIVATE TREATY.

THE Carmarthen Town Council have for DISPOSAL about 230 STREET GAS LAMPS, COLUMNS, and BRACKETS, and a Number of INCANDESCENT BURNERS. Offers are invited for the whole or part. All Particulars can be obtained at the Borough Surveyor's Office, John Street.

Tenders, marked "Tenders for Lamp Posts, &c.," to be sent to the undersigned not later than the 15th of October, 1910.

The highest or any Tender not necessarily accepted. JAMES JOHN, Town Clerk.

Town Clerk's Office, Carmarthen,
Aug. 18, 1910.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

SURPLUS TAR AND SULPHURIC ACID.

TENDERS are invited for the Surplus

TAR Produced and SULPHURIC ACID required during the Year ending Sept. 30, 1911.

Particulars may be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Tar" and "Tender for Sulphuric Acid" respectively, must be delivered not later than Noon on Monday, the 26th inst.

ALFRED T. HARRIS,
Manager and Secretary.
Gas Offices, Market Harborough,
Sept. 12, 1910.

THE GASLIGHT COMPANY OF SLIGO.

TENDERS are invited for the Supply of 3000 to 4000 Tons of Best Screened GAS COAL, to be delivered in Cargoes of 500 to 600 Tons as required free on Quay at Sligo.

Tenders to be sent in not later than the 26th of September, 1910.

By order,
R. BROWN,
Secretary.

Sligo, Sept. 13, 1910.

COUNTY BOROUGH OF BLACKPOOL.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Surplus TAR produced during the next Twelve Months from Oct. 1, 1910, to Sept. 30, 1911.

Particulars may be had from the undersigned. Tenders, endorsed, to be sent, addressed to the Chairman, before Monday, Sept. 26, 1910.

By order,
JOHN CHEW,
Engineer and Manager.

Gas Offices, Princess Street,
Blackpool.

CLACTON URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the Supply and Delivery of about 50 Tons of BRITISH CAST-IRON PIPES and CONNECTIONS.

Copy of Specification and Form of Tender may be obtained from the Council's Engineer, Mr. Sydney Francis A.M.I.M.E., Town Hall, Clacton-on-Sea. Sealed Tenders, endorsed "Tender for Pipes," to be delivered to the undersigned not later than Noon on Wednesday, the 5th of October, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, Sept. 12, 1910.

CORPORATION OF LEICESTER.

(GAS AND ELECTRIC LIGHTING DEPARTMENT.)

SULPHURIC ACID.

THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive TENDERS for the Supply of SULPHURIC ACID, made from either native Sicilian Brimstone, recovered Sulphur, or Pyrites. Specific Gravity in each case to be stated. The Price to include Free Delivery by Rail into Elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.

Probable Quantity, about 2000 Tons, to be delivered during the ensuing Twelve Months.

Tenders, addressed to Mr. Alderman T. Smith, J.P., Chairman, and endorsed "Tender for Sulphuric Acid," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Sept. 24, 1910.

The Committee do not bind themselves to accept the lowest or any Tender.

WORTLEY S. LOVELL,
Chief Clerk.

Gas Offices, Millstone Lane,
Leicester, Sept. 14, 1910.

THE Proprietor of the Patent No. 19,479

of 1905, for "Improvements in or relating to Meters," is desirous of entering into Arrangements by way of License and otherwise, on Reasonable Terms, for the purpose of Exploiting the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASSETTINE, LAKE, and Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF £00 £10 "C" SHARES.

MESSRS. A. & W. RICHARDS will **SELL THE ABOVE** BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

NEW ISSUE OF £3500 "C" CONSOLIDATED STOCK, AND

£3500 FOUR PER CENT. CONSOLIDATED PREFERENCE STOCK.

MESSRS. A. & W. RICHARDS will **SELL THE ABOVE** BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in
Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY
CIRCUS, E.C.

y order of the Directors of the
GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £4000 NEW ORDINARY STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the
Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in
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Particulars of the AUCTIONEERS, 18, FINSBURY
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MESSRS. JOHN E. PRITCHARD & CO.,
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BRISTOL WATER-WORKS SEVEN PER CENT.
MAXIMUM CONSOLIDATED ORDINARY STOCK,
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£100 Stock.

The above £15,000 Stock is part of the Seven per
cent. Maximum Consolidated Ordinary Stock, amount-
ing to £970,000, created under the powers of the Bristol
Water-Works Acts, 1888, 1889, 1895, and 1902.
The Dividend is subject to proportionate diminution
whenever the maximum dividend to which each class
of Ordinary Shares or Ordinary Stock of the Company
is entitled shall not be paid in full, but such diminution
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ALFRED J. ALEXANDER,
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Best Gas Coal and Cannel, giving High Illu-
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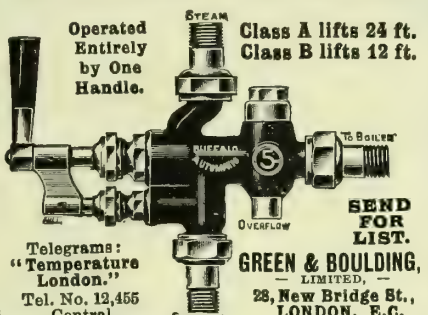
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NO DANGER OF MANTLES BREAKING BY WIND, &c.
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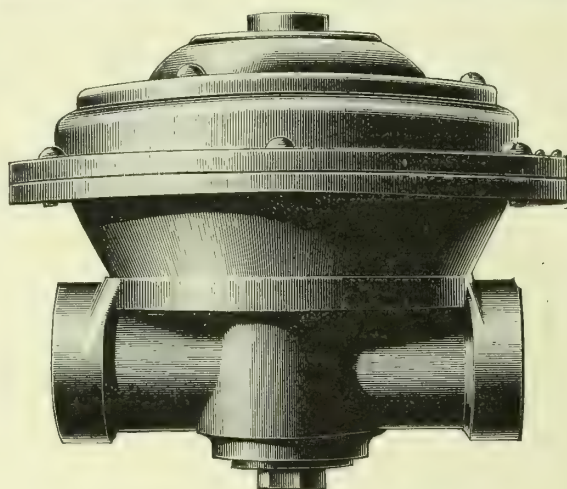
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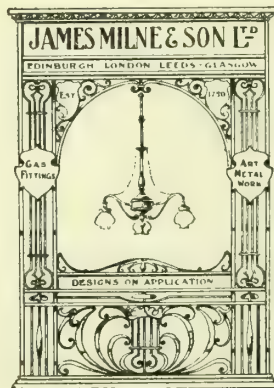
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DESIGNS.NOTE.—If you have not already received our **Latest Season's Designs** of Inverted Gas Pendants
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GAS REGULATION on the TOP of the LAMP.

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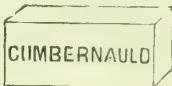
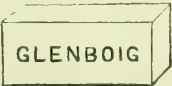
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Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,

LONDON, E.C., September 21st, 1909.

DEAR SIR,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.16
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

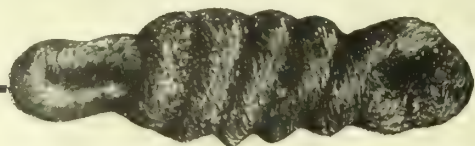
PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " 1050 C.	4.76 %
" " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " 1050 C.	12.6 %
" " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.



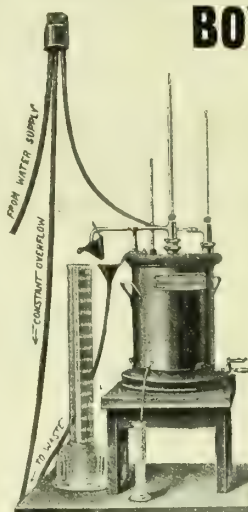
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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
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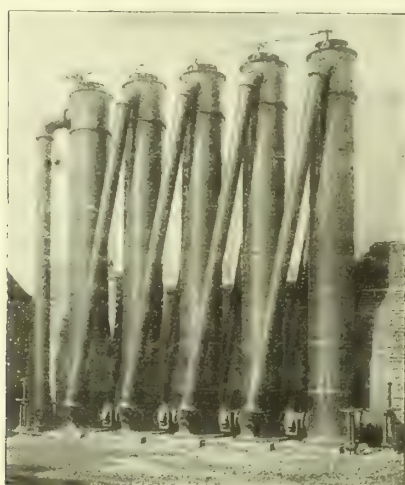
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NOTE—It does not matter how irregularly the number of Lights in use vary, this is the only Petrol-Air Gas Generator which maintains under all conditions of tests an unvarying quality of Gas.

TESTIMONIAL.

ROYAL SCOTTISH NURSING INSTITUTION,

DEAR SIRs,

69, QUEEN STREET, EDINBURGH, 24th February, 1909.

I have much pleasure in testifying to the brilliance of the Lights, purity of the atmosphere of the rooms, agreeableness to the eyes, with entire absence of odour, together with the fullness of health, enjoyed by myself and inmates of St. Cyr. Ceres, during my residence for four months during Winter, while the house was lit night and morning (and small lights during night) by Petrol-Air Gas produced at the Village Gas-Works by a Centenary Turbine Gas Generator. The brilliance and comfort with the lights could not be excelled.

I am, yours truly,

(Signed) Nurse B. BROWNIE.

N.B.—St. Cyr House has 50 Burners for Lighting, besides points for Cooking and Ironing.

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NON-EXPLOSIVE and ECONOMICAL.

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 4 ins.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 5 ins.
3-light	. . .	1 ft. 5 ins.
4-light	. . .	1 ft. 8 ins.

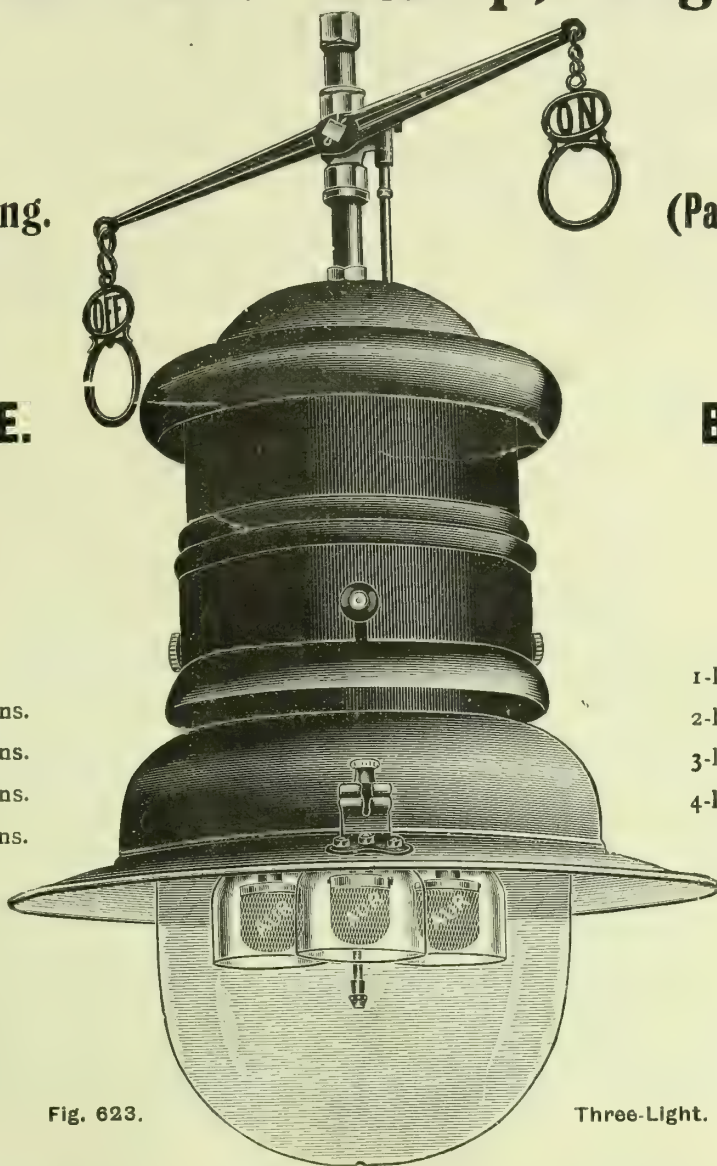


Fig. 623.

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4¹/₂ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	5/9	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	57/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6
Case contains	80	18	18	12	Welsbach Mantles, 4 ¹ / ₂ d. each, or 4s. 3d. per dozen,				Not made subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4¹/₂d. each.

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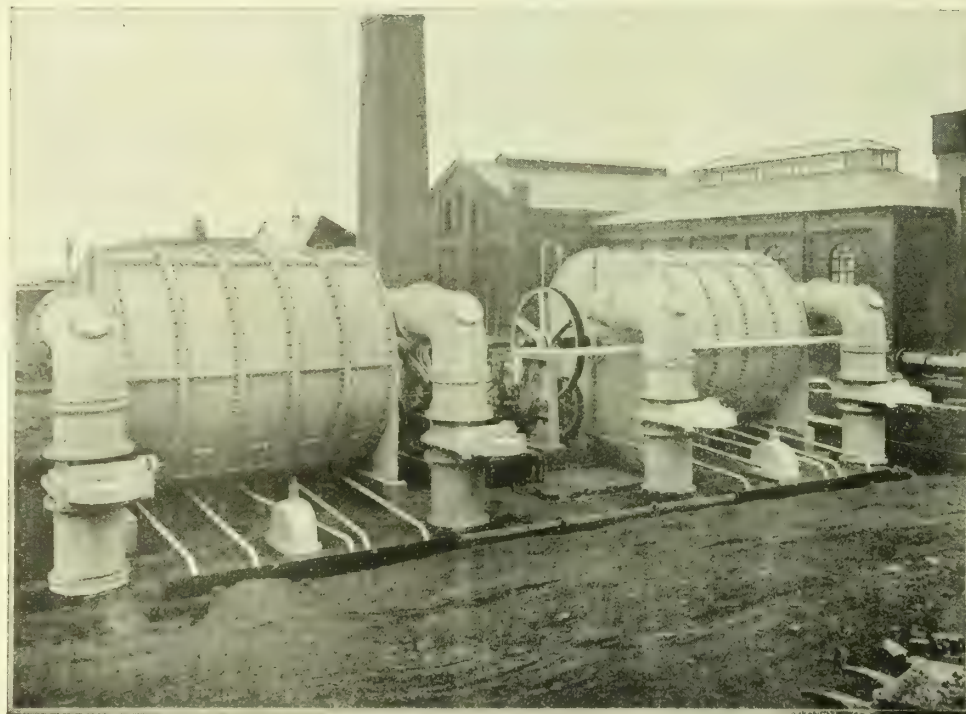
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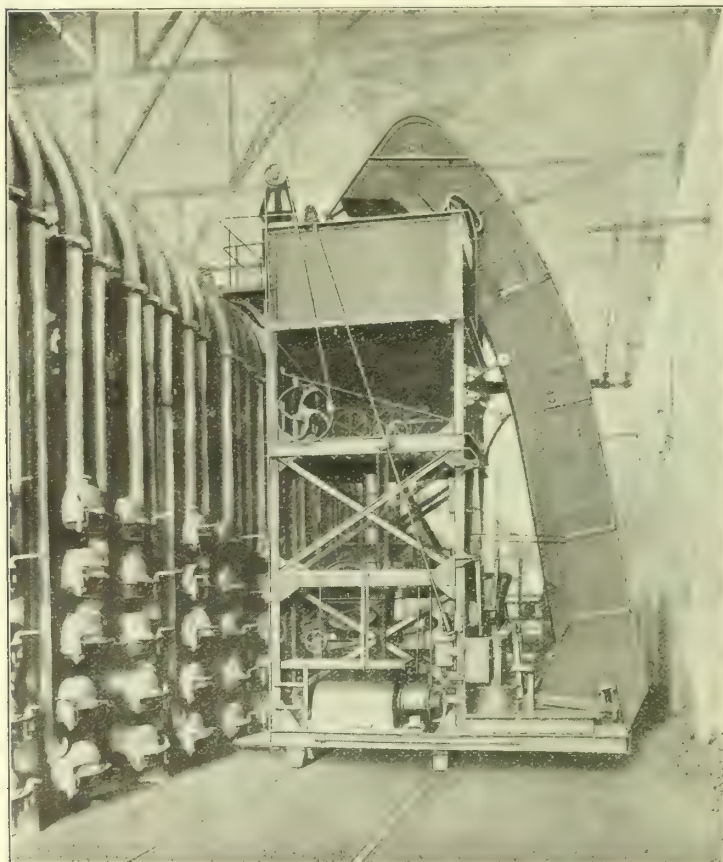
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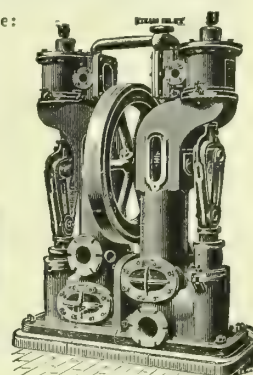
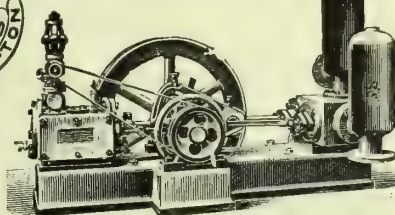
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**Fig. 598. "CORNISH" STEAM-PUMP FOR
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**Fig. 685. "RELIABLE" STEAM PUMP FOR
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Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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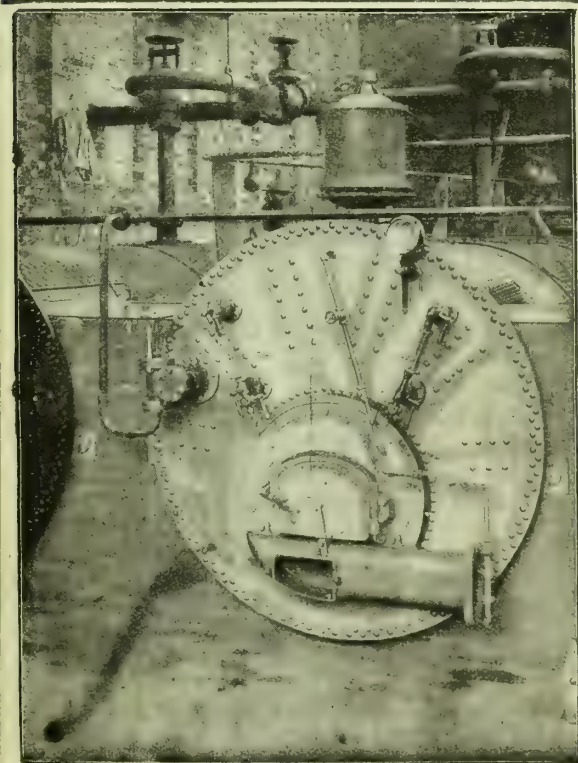
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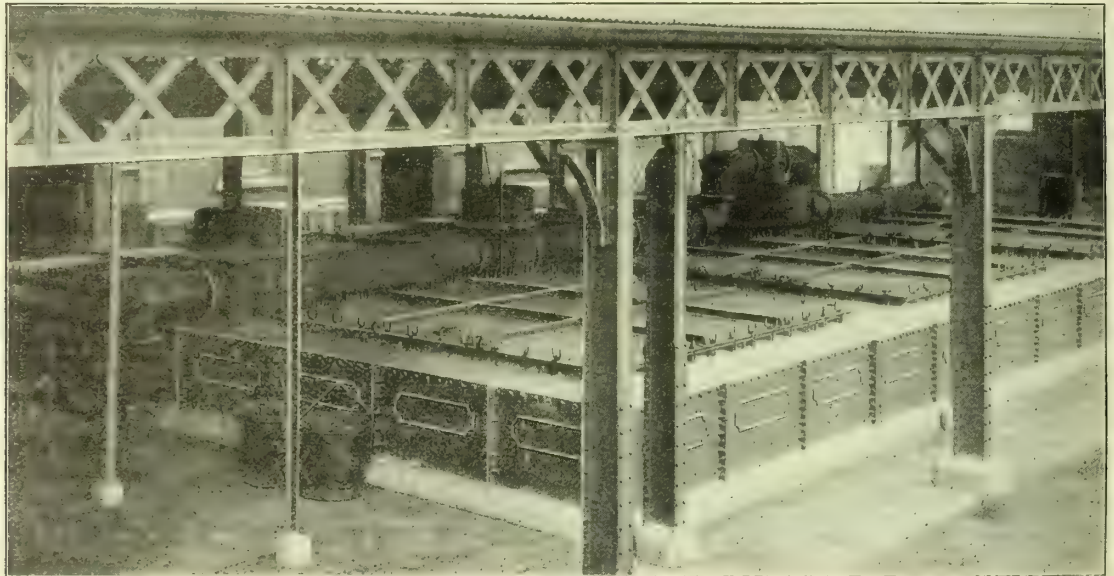
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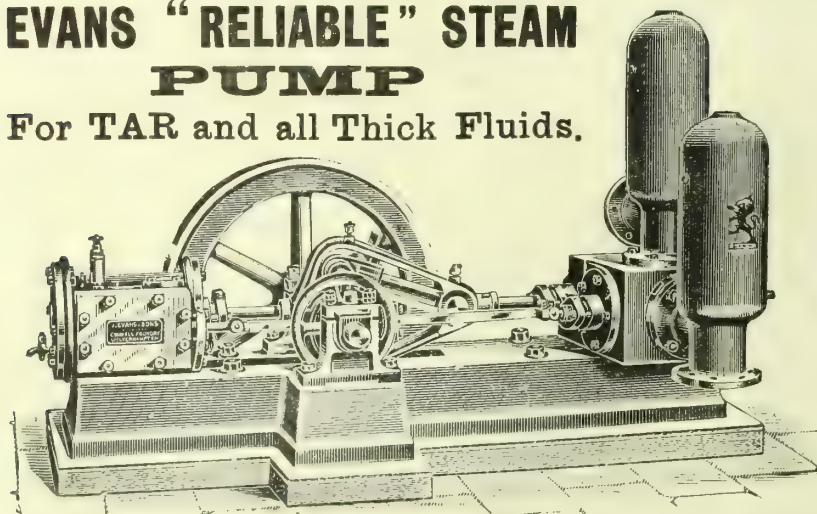
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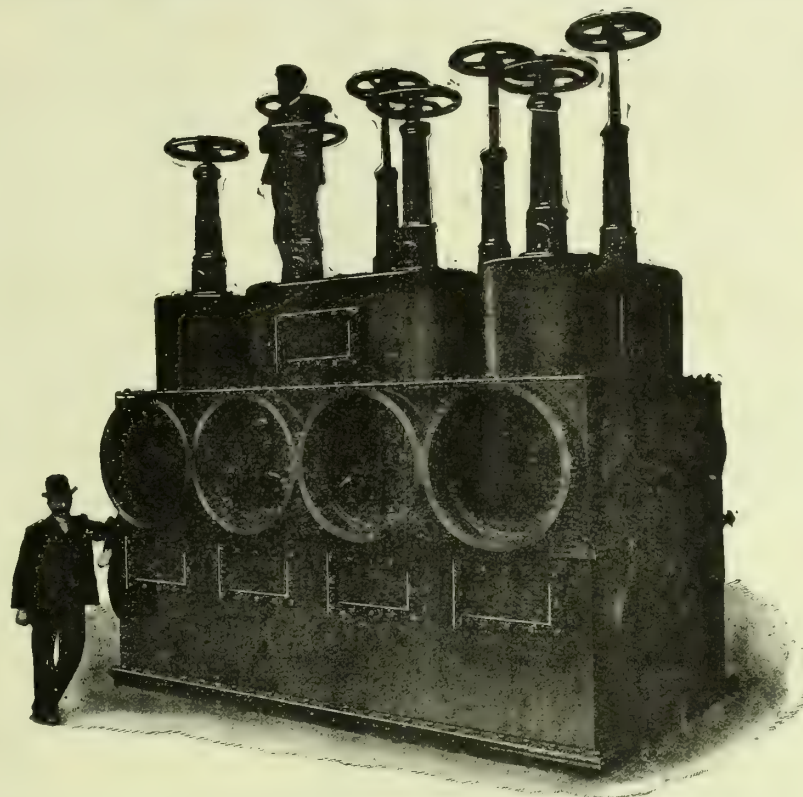
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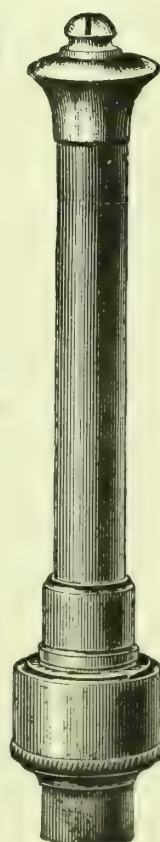
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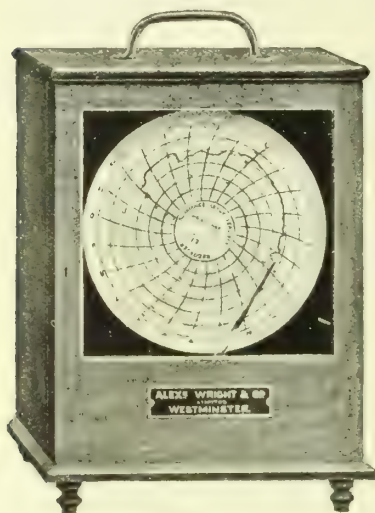
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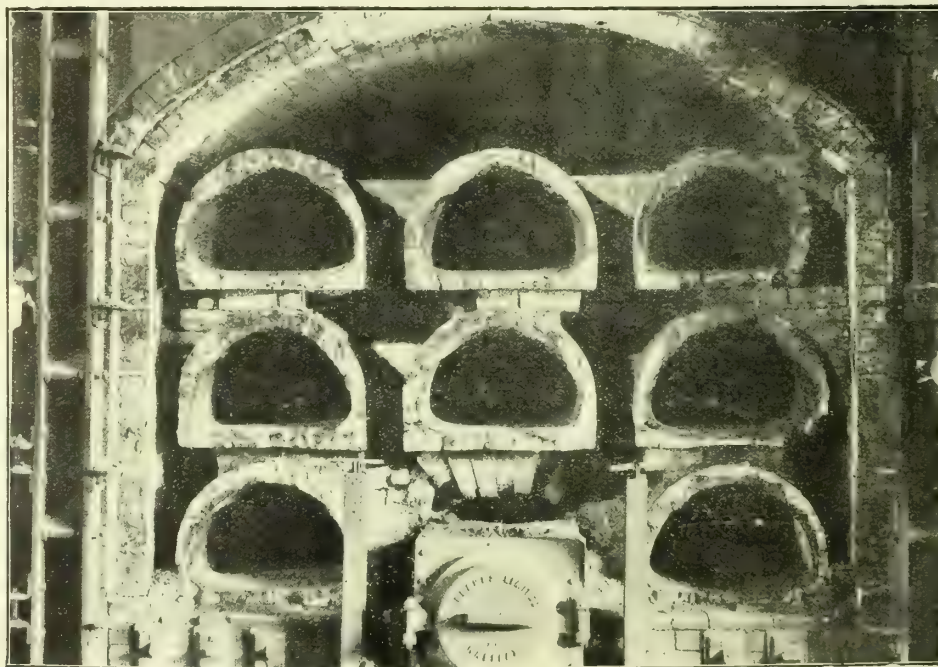
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THE  
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Inverted Incandescent  
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are the ACME of  
Efficiency, Simplicity,  
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**PAGE OF SPECIALITIES.**

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**MANTLES**  
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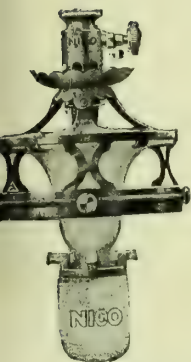
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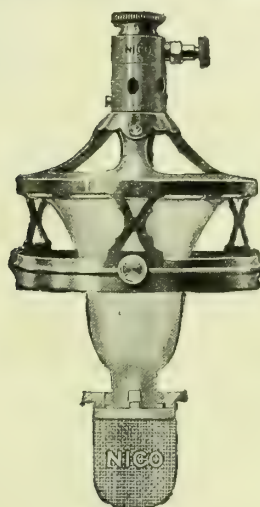
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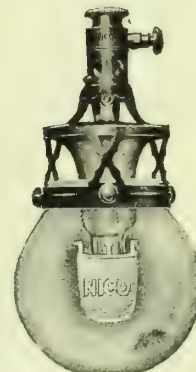
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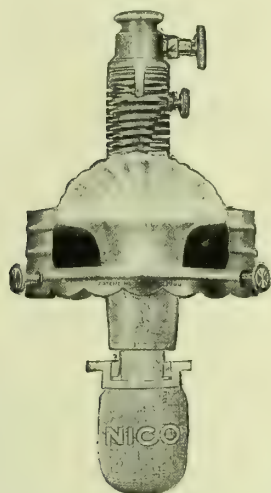
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Standard "MEDIUM" Size.



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Standard "LARGE" Size.



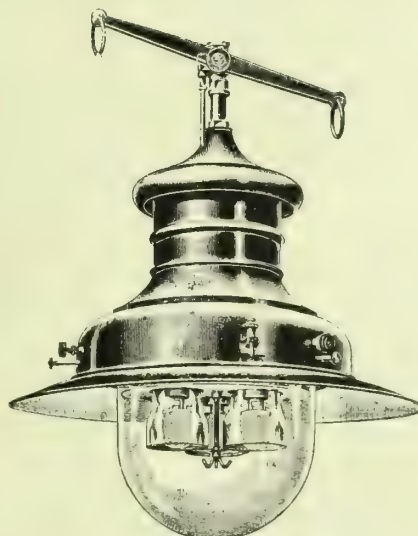
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ANTI-VIBRATING, SECONDARY AIR SUPPLY.  
Perfect Combustion, Highest Possible Efficiency.  
Made in Two Sizes.

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Upright  
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per c.f. with Low Pressure;  
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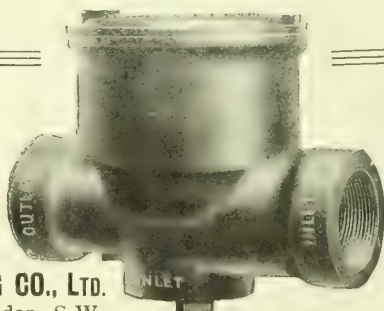
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*It interests Gas Managers  
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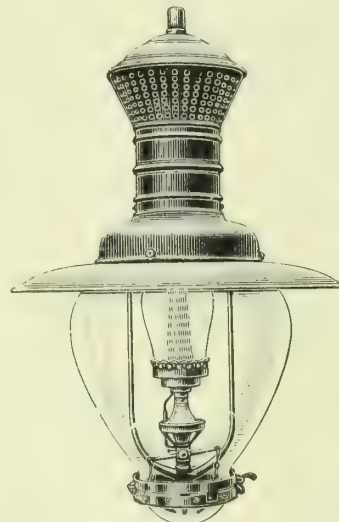
Works: Wimbledon, London, S.W.

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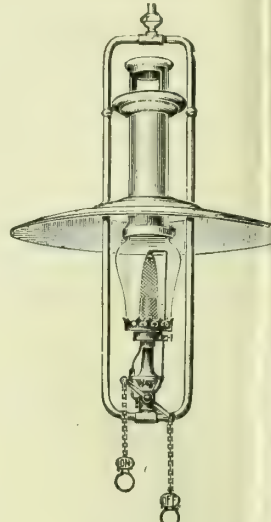
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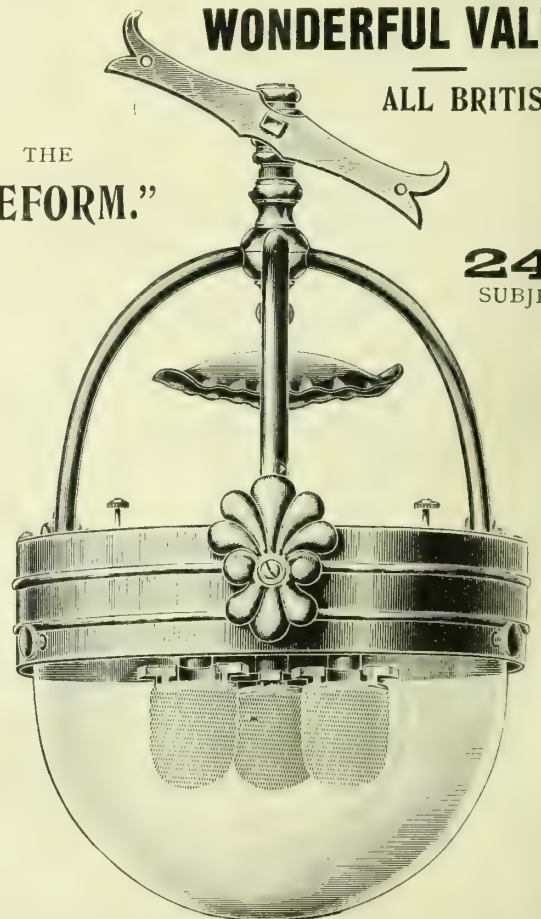
200, 400, and 700-Candle Power from a Single Mantle  
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**WONDERFUL VALUE**

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(For INDOOR and OUTDOOR LIGHTING.)

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### COMPARE PRICES.

The very latest, easiest Lantern to regulate,  
access to all parts, most up-to-date, &c.

125-Candle Power Light for each Burner.

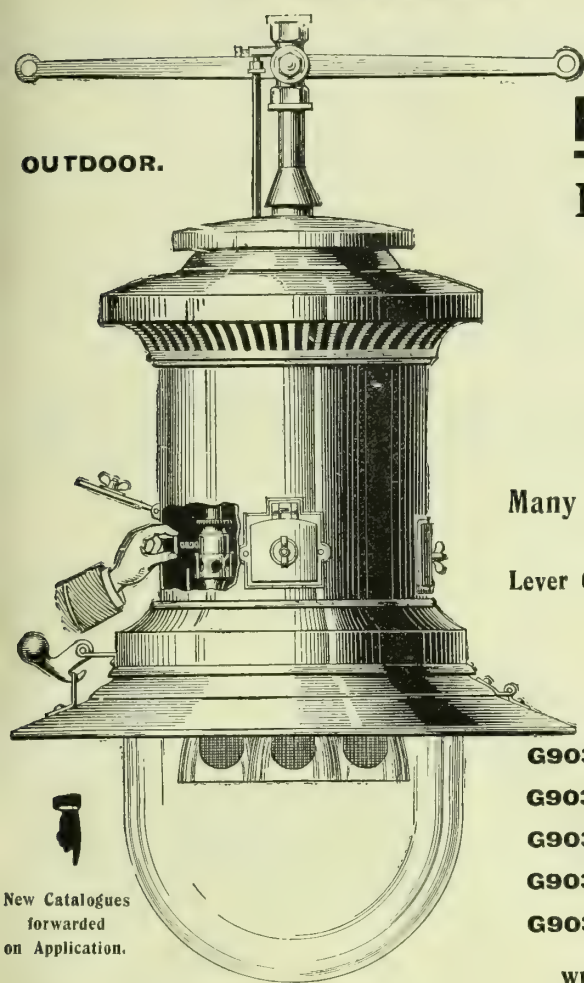
Consumption, 4 feet per Burner.

Many Thousands in use with the largest Gas Companies at  
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Lever Cock Control, Wind-Proof, Rain-Proof, Dust-Proof, Shadowless.

Full Directions for use sent with each Lantern.

Highest grade Black Enamel finish Lanterns, priced complete with  
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White Enamelled Indoor Lanterns are supplied at Slightly Lower Prices.

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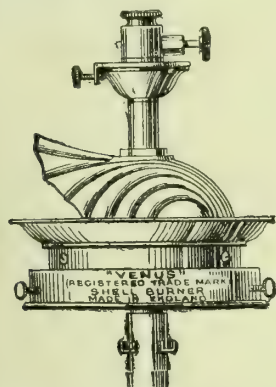
"THE Original Type" with LATEST Improvements.

Venus "Shell" Burners have Gas Regulators made throughout of Cast Brass fitted with reliable Stuffing  
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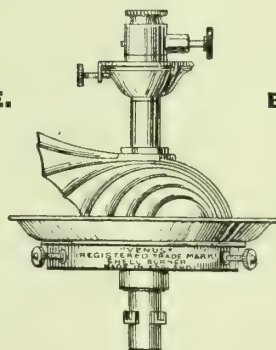
Venus "Shell" Burners give a pure, steady light, equal to 80-c. p., with a consumption of 3 c. f. per hour.  
Fitted with Square Lug Nozzles, taking ordinary size Mantles and Globes.

Gas and Air Regulators are fitted to all "SHELL" Burners. An ANTI-BACKLIGHTER is fitted to each Burner.

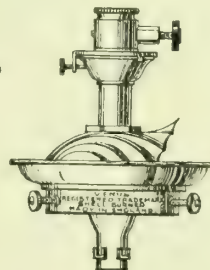
**LARGE.**—For  $3\frac{7}{16}$ -inch Fitting Globes. **MEDIUM.**—For  $2\frac{3}{4}$ -inch Fitting Globes. **BIJOU.**—For  $1\frac{3}{4}$ -inch Fitting Globes.



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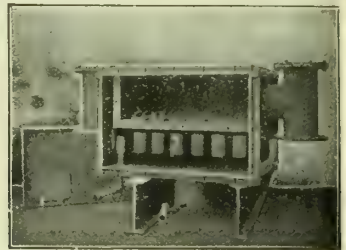
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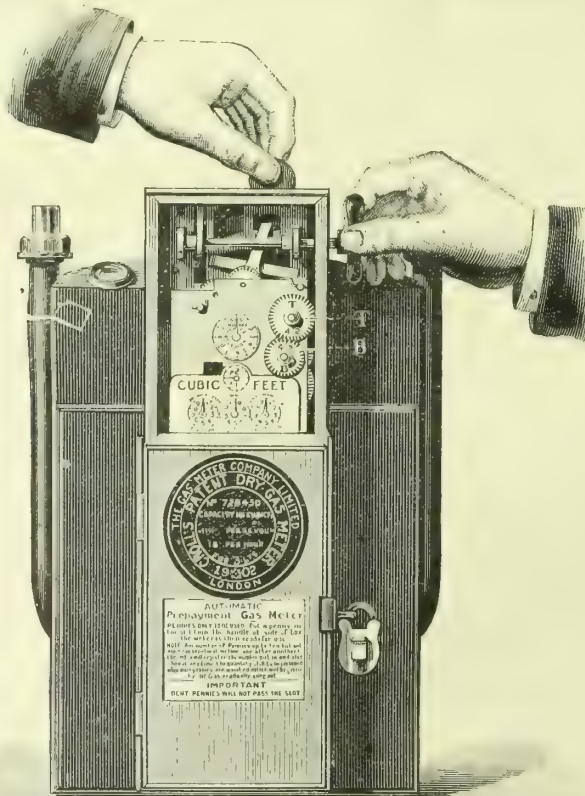
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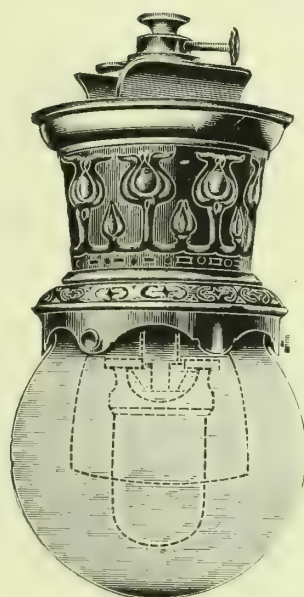
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| Belfast (2nd) . . .             | 4,500,000         | Gelsenkirchen, Westphalia . . .    | 175,000           | Revel, Russia . . .         | 350,000           |
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| Berlin—Charlottenburg . . .     | 2,500,000         | Geneva, Switz. . .                 | 500,000           | Romford . . .               | 300,000           |
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| Berlin—Rixdorf (2nd) . . .      | 700,000           | Göteborg, Sweden . . .             | 300,000           | Rotterdam, Holland . . .    | 850,000           |
| Berlin—Tegel . . .              | 3,500,000         | Göteborg (2nd) . . .               | 600,000           | Rotterdam (2nd) . . .       | 1,500,000         |
| Berlin—Tegel (2nd) . . .        | 6,350,000         | Graudenz, Prussia . . .            | 200,000           | Rotterdam (3rd) . . .       | 750,000           |
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| Bournemouth (2nd) . . .         | 500,000           | Hebden Bridge . . .                | 200,000           | Santiago de Cuba . . .      | 400,000           |
| Bremen, Germany . . .           | 550,000           | Heidelberg, Germany . . .          | 200,000           | Scarborough . . .           | 800,000           |
| Bremen (2nd) . . .              | 950,000           | Holyoke, Mass. . .                 | 600,000           | Schwelm, Westphalia . . .   | 100,000           |
| Bremen (3rd) . . .              | 850,000           | Hong Kong . . .                    | 450,000           | Shanghai . . .              | 225,000           |
| Brentford . . .                 | 1,200,000         | Hull . . .                         | 1,500,000         | Shanghai (2nd) . . .        | 225,000           |
| Brentford (2nd) . . .           | 850,000           | Ilford . . .                       | 650,000           | Shanghai (3rd) . . .        | 1,600,000         |
| Brentford (3rd) . . .           | 350,000           | Innsbruck, Austria . . .           | 200,000           | Southampton . . .           | 800,000           |
| Bridgwater . . .                | 200,000           | Ipswich . . .                      | 750,000           | Southampton (2nd) . . .     | 500,000           |
| Bridlington . . .               | 150,000           | Kampen, Holland . . .              | 350,000           | Southampton (3rd) . . .     | 600,000           |
| Bridlington (2nd) . . .         | 200,000           | Kiel, Sleswig . . .                | 1,000,000         | Southgate . . .             | 400,000           |
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| Brussels—St. Josse (2nd) . . .  | 600,000           | Leiden (2nd) . . .                 | 575,000           | Stockton-on-Tees . . .      | 500,000           |
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| Brussels—Ville (2nd) . . .      | 750,000           | Lemberg (2nd) . . .                | 500,000           | Swansea (3rd) . . .         | 450,000           |
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| Brussels—Ville (4th) . . .      | 350,000           | Liège (2nd) . . .                  | 750,000           | Swindon (2nd) . . .         | 450,000           |
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| Budapest, Hungary . . .         | 50,000            | Liverpool . . .                    | 3,500,000         | Sydney—Harbour (2nd) . . .  | 500,000           |
| Budapest (2nd) . . .            | 1,750,000         | Liverpool (2nd) . . .              | 4,500,000         | Sydney—Mortlake . . .       | 500,000           |
| Carlisle . . .                  | 600,000           | Liverpool (3rd) . . .              | 750,000           | Sydney—Mortlake (2nd) . . . | 500,000           |
| Carlsruhe, Germany . . .        | 500,000           | Longton . . .                      | 600,000           | Syracuse, N.Y. . . .        | 850,000           |
| Chigwell . . .                  | 350,000           | Louvain, Belgium . . .             | 800,000           | Taunton . . .               | 225,000           |
| Chorley . . .                   | 300,000           | Lübeck, Germany . . .              | 400,000           | Taunton (2nd) . . .         | 350,000           |
| Commercial, London . . .        | 850,000           | Maastricht, Holland . . .          | 200,000           | The Hague Holland . . .     | 1,000,000         |
| Commercial (2nd) . . .          | 850,000           | Magdeburg, Germany . . .           | 1,400,000         | The Hague (2nd) . . .       | 500,000           |
| Commercial (3rd) . . .          | 1,250,000         | Maidenhead . . .                   | 225,000           | Tilburg, Holland . . .      | 400,000           |
| Commercial (4th) . . .          | 2,000,000         | Maidenhead (2nd) . . .             | 225,000           | Torquay . . .               | 350,000           |
| Copenhagen . . .                | 700,000           | Maidstone . . .                    | 500,000           | Tottenham . . .             | 750,000           |
| Copenhagen (2nd) . . .          | 2,500,000         | Malines, Belgium . . .             | 500,000           | Tottenham (2nd) . . .       | 750,000           |
| Courtrai, Belgium . . .         | 250,000           | Malmö, Sweden . . .                | 350,000           | Tottenham (3rd) . . .       | 350,000           |
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| Coventry (2nd) . . .            | 600,000           | Manchester . . .                   | 3,500,000         | Tottenham (5th) . . .       | 1,000,000         |
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| Cracow (2nd) . . .              | 200,000           | Mansfield . . .                    | 330,000           | Tunbridge Wells . . .       | 1,000,000         |
| Crefeld, Germany . . .          | 500,000           | Marlborough . . .                  | 100,000           | Utrecht, Holland . . .      | 1,000,000         |
| Croydon . . .                   | 1,250,000         | Mayence, Germany . . .             | 700,000           | Utrecht (2nd) . . .         | 1,000,000         |
| Croydon (2nd) . . .             | 625,000           | McKeesport, Pa. . .                | 500,000           | Verviers, Belgium . . .     | 1,000,000         |
| Croydon (3rd) . . .             | 625,000           | Merthyr Tydfil . . .               | 300,000           | Vienna . . .                | 3,500,000         |
| Croydon (4th) . . .             | 550,000           | Middlesbrough . . .                | 1,250,000         | Vienna (2nd) . . .          | 2,500,000         |
| Debreczin, Hungary . . .        | 100,000           | Namur, Belgium . . .               | 175,000           | Waltham . . .               | 400,000           |
| Deventer, Holland . . .         | 150,000           | Nelson . . .                       | 400,000           | Wandsworth & Putney . . .   | 1,800,000         |
| Deventer (2nd) . . .            | 200,000           | Newburgh, N.Y. . .                 | 600,000           | Watford . . .               | 300,000           |
| Dorking . . .                   | 150,000           | New York . . .                     | 5,200,000         | Watford (2nd) . . .         | 350,000           |
| Dublin . . .                    | 2,000,000         | Nichteroy, Brazil . . .            | 250,000           | Wellington, N.Z. . .        | 350,000           |
| Dublin (2nd) . . .              | 2,000,000         | North Middlesex . . .              | 150,000           | West Bromwich . . .         | 550,000           |
| Dublin (3rd) . . .              | 650,000           | North Middlesex (2nd) . . .        | 200,000           | West Ham . . .              | 1,500,000         |
| Dundee . . .                    | 1,500,000         | North Middlesex (3rd) . . .        | 75,000            | West Ham (2nd) . . .        | 800,000           |
| Dunedin, N.Z. . . .             | 150,000           | Norwich . . .                      | 1,000,000         | Weston-super-Mare . . .     | 350,000           |
| Dunedin, N.Z. (2nd) . . .       | 275,000           | Norwich (2nd) . . .                | 300,000           | Weston (2nd) . . .          | 350,000           |
| Durham . . .                    | 200,000           | Norwich (3rd) . . .                | 500,000           | Wexford, Ireland . . .      | 100,000           |
| Düsseldorf, Germany . . .       | 1,000,000         | Nottingham . . .                   | 1,000,000         | Wiesbaden, Germany . . .    | 850,000           |
| Eastbourne . . .                | 1,250,000         | Nottingham (2nd) . . .             | 1,000,000         | Winchester . . .            | 225,000           |
| Edinburgh . . .                 | 2,000,000         | Nuneaton . . .                     | 125,000           | Winchester (2nd) . . .      | 125,000           |
| Epsom . . .                     | 225,000           | Oberhausen, Germany . . .          | 175,000           | Wolverhampton . . .         | 1,500,000         |
| Epsom (2nd) . . .               | 300,000           | Oldenburg, Germany . . .           | 200,000           | Zwolle, Holland . . .       | 200,000           |
| Essen . . .                     | 1,400,000         | Ostend, Belgium . . .              | 100,000           | Zwolle (2nd) . . .          | 200,000           |

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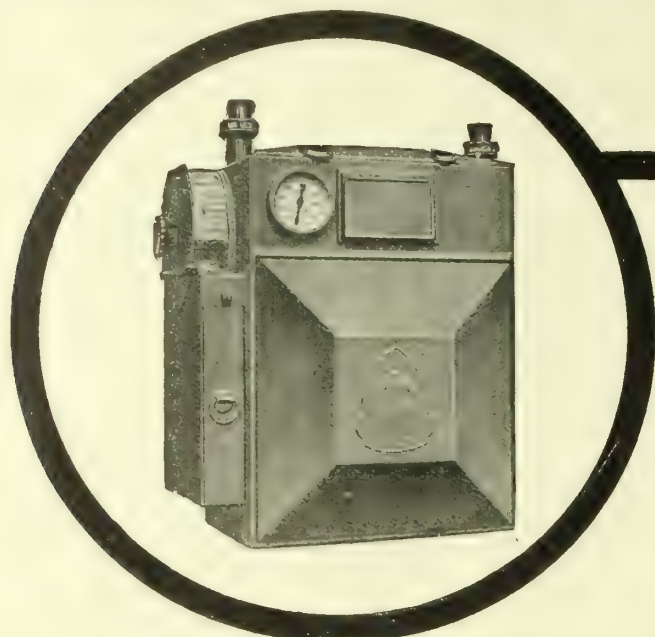
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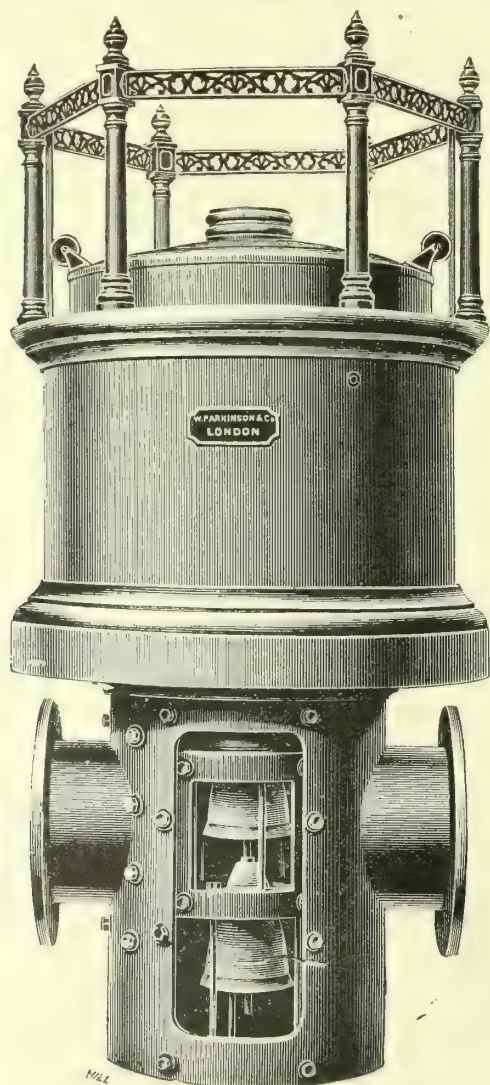
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## EDITORIAL NOTES—GAS, &c.

### Welcome.

BEFORE the next number of the "JOURNAL" is in the hands of readers, the German guests of the gas profession and industry of this country—to the number of about eighty—will have well advanced into the programme of works' inspection, sight-seeing, and hospitality arranged for them. The gas industry is world-wide; it has no geographical limitations. And it is one of the features of its technical advances that between practitioners of every country there is a give-and-take and community of interest that make for general progress. In the establishment of this intercommunication of thought and ideas and practices, the technical press of each country has, we modestly claim, done a worthy part. Our German friends will be received by the Institution of Gas Engineers, by the Gaslight, South Metropolitan, and Croydon Gas Companies, and by the Edinburgh and Glasgow Corporations as highly skilled engineers and managers who have made fame in the gas industry by their practices and their scientifically founded constructive ability. Members of the gas profession of this country have often crossed the sea to learn of them; and they come again to the mother country of gas engineering and gas practice to learn of us. As they have received their British colleagues in times past, and will do so with no less enthusiasm and cordiality in the future, so we receive them now. There will be absentees from the ranks of the visitors whose unavoidable detention at home we deeply regret. But those who will be with us will well represent the talent and business capacity of the technical ranks of the German gas industry. A cordial welcome awaits them; and the best wishes are expressed for all those conditions that will send them home filled with the enjoyment of their tour, and the renewal of old, and the creation of new, friendships.

### Gas Publicity.

THERE is news this week, but still only a modicum, as to what is being done in regard to the formation of a Gas Publicity Committee, and of a plan of campaign. It will be remembered that the matter was discussed at a joint meeting of the Commercial Sections at the time the members of the Institution of Gas Engineers were in session in London in June last; and it was then decided to bring into being a Gas Publicity Committee composed of members of the Commercial Sections, with power to co-opt other gentlemen who may be in a position to be of special value in connection with the work to be undertaken. Summer holidays have cumbered the leaders in the movement; and there are matters of some difficulty that have to be negotiated and disposed of before a concrete scheme can be put forward. It would be of little use to appeal to gas undertakings for financial co-operation with an immature scheme. It must be a concrete and fully-developed one, and launched in no shamby-pamby style. The spirit of the work must be infused into the introduction and prosecution of the scheme.

It was Mr. W. E. Price, of Hampton Wick, who gave the information, in a speech at the meeting of the Eastern Counties Association on Friday, that the movement is not dead nor sleeping, but that something definite will shortly be heard concerning it. It is the question of financing the publicity scheme that he wants the chief executive officials of gas undertakings to begin at once to turn over in their minds. We are out to fight; and the thing has to be thoroughly well done, or not at all. The challenge has been thrown down by the electricity industry through its Publicity Committee; and the gas industry has to take up the challenge, and deal with the work of the Electricity Publicity Committee through the same channels and to a like extent, or suffer the consequences of default. To do this properly and effectively, a good round sum must be spent annually.

Mr. Price speaks of (say) £20,000 a year. We hear the gasps of not a few of the officers of the gas industry who have had to approach their Boards and Committees for money for other purposes not immediately associated with their businesses. But really when one comes to look into the matter, the sum is not, by co-operation, a big one for the industry. If we take the last-issued Board of Trade returns relating to gas undertakings, it is seen that, in the year dealt with, no less than 173,957 million cubic feet of gas were sold by the statutory undertakings in the United Kingdom; and 2s. 6d. per million on this sale would represent nearly £22,000. It was the Tottenham and Edmonton Gas Company, we believe, that first of all initiated the idea of a 2s. 6d. per million contribution. It will be within the recollection of those present at the last Institution meeting, that, before its close, an announcement was made that that Company were prepared, tentatively for three years, to support a scheme of national advertising on the basis of a contribution of 2s. 6d. per million cubic feet of gas sold, providing fifty other companies would do the same. The sales of the Tottenham Company in 1909 would, at this rate, represent a contribution not far short of £200 a year. Contribution at the rate of 2s. 6d. per million is really a small thing; and yet it is intended to, and will undoubtedly, serve as a big insurance of gas sales.

If in June a scheme of the kind was imperative, it is still more so now. The activities of the Electricity Publicity Committee have since been extensive, and have partly been directed to rubbing the gilt off the gas victories in competitions for public lighting. We are not sorry at the present time to see this activity, though there has been much electrical misrepresentation, inasmuch as the activity is bound to cut into the somnolence and apathy that exist in only too many places in the gas industry. When the enemy is at the very door, it has a stimulating effect within. This national advertising and protection scheme should be received throughout the gas industry with the enthusiasm and material support that it deserves.

### The Low-Pressure Inverteds in Westminster.

A DECADE ago, standing before members of the Southern District Association of Gas Engineers and Managers as their President, Mr. Corbet Woodall made use of words which impressed themselves indelibly on memory: "I know many cities, in many lands; and I am constrained to declare that London, which saw the first Gas Company 'started nearly a hundred years ago, is at this hour the 'worst lit capital city in Europe.'" The disgrace and the reproach that this declaration fixed upon the Metropolis and its local authorities in those days have been minimized but slowly; and, truth to tell, there never has since been a time when the lighting of London, as a whole, could be pointed to as a shining example of what the illumination of the arterial ways and by-ways of the great cities and towns should be. There have been small typical illustrations of good lighting, but nothing more. Incandescent vertical burners took the place of flat-flames; and, in a few main streets, high-power gas-lights appeared. But the local authorities—save those owning electric light undertakings, and a few others upon whom special influence was brought to bear—did not evince any particular desire to mend matters, by extra outlay on lighting, other than by putting up, at enormous expense, electric arc lamps. But a change is now coming over London. The old impeachment has to be considerably modified. The standard of street illumination has been raised; and there is a general movement from the archaic to the modern. For this the ratepayers of London have much for which to thank the Gas Companies. The latter have forced the pace to greater efficiency and economy, and have compelled the electricity suppliers to cut down their grossly extravagant charges for the service they rendered. Still, the Gas Companies, by progress in invention, can and do present the most economical and efficient



means of lighting the public thoroughfares. But though there is this movement from the archaic to the modern, London in its lighting arrangements will ere long represent a big patchwork, in large sections, of various systems of illumination. The streets of huge districts will soon be completely illuminated by the most modern systems of high and low pressure inverted lamps, the contracts for much of which have been obtained in open competition with electric lighting; while, on the other hand, in certain municipal electricity-ridden boroughs, the streets will be shortly entirely given over to electric lamps, and the ratepayers will be paying more for illumination than the ratepayers in those districts that have adopted the latest forms of gas lighting. The comparison in cost and illuminating effect will now have to be, not between what is electrically and what has been in gas lighting—a comparison preferred by Marylebone and the Electricity Publicity Committee—but between what (say) Marylebone, Hampstead, and Shoreditch are doing with what is being done in the City of Westminster, Finsbury, Hackney, Bethnal Green, Stoke Newington, and other districts in the area of the Gaslight and Coke Company, and in several districts served by the South Metropolitan Gas Company.

But, on this occasion, reference has to be made to the lighting of the City of Westminster, which will in a short time be able to claim to be (in all but the districts still under the domination of electric arc lamps which gas lighting has long since left in the rear), any way for the time being, the best-lighted city in the world, from its very heart to the narrow stuffy streets, lined by the abodes of poverty and worse, and which morality, health, and safety demand shall, when daylight fails, be illuminated in the very best possible manner. The high-pressure installation will be completed soon. The steel tubes have almost threaded their way wherever required; and the lamp-columns are now being erected. But the installation of the low-pressure inverted lamps is practically finished; and now shows us how the Gaslight and Coke Company are, by their aid, going to sell illumination under contract, with tests carrying penalties for infraction, in the large area. Electricians have tried to belittle what is being done in Westminster. Taking no note of the high-pressure gas lighting, there are, in this low-pressure installation of special "Nico" lanterns and inverted burners, no less than 2200 lamps and 7000 burners, distributing in the streets in the aggregate hundreds of thousands of candle power.

We have tramped through the streets—streets bounded by the residences of the rich and wealthy, by the shops of the traders of the West-end, by the huge blocks of offices of professional men, by residential flats, and by the homes and lodgings of the poor; and it can be said that never before have those many-charactered streets been illuminated as they are illuminated to-day by inverted burner lamps developing, on low pressure, 30 candles per cubic foot of gas consumed. The rays cover the road and the footpaths, and penetrate into corners and places where at nightfall light has never reached before. It is a fine demonstration of progress in illumination by the modern high efficiency means at the disposal of the gas industry. Whether we walk in roads illuminated by the two-burner, three-burner, or five-burner lamps, the same effects appeal, the same verdict applies; the differences in the degree of light being due only to the differences in the number of burners per lamp—these being justified by considerations of position and traffic. Take the Vauxhall Bridge Road—a main wide road, with tramcars, well patronized by London's workers, passing along it at frequent intervals, with its other heavy vehicular traffic and its thick pedestrian traffic. From the Victoria Street end, one first traverses the portion lighted by electric arc lamps; and then, from Rochester Row to Vauxhall Bridge, there are five-light inverted-burnered lanterns. On walking from the electrically lighted part of the road into the gas-lighted part, it is like passing from dusk of evening into full daylight; and leaving the new lighting to pass on to Vauxhall Bridge, which is lighted by vertical incandescent burners, causes one to be very dissatisfied with that which at one time we looked upon as a model piece of bridge lighting. Progress changes our ideas and our tastes, even in the matter of illumination.

The low-pressure installation in Westminster has been well done; and we are sure that the Westminster City Council, and the Chairman (Mr. Jacques Abady) and members of the Works Committee, will feel the utmost satisfaction with what the Gaslight and Coke Company (we may

specially mention Mr. F. W. Goodenough, the Controller of Gas Sales, in this connection) and their contractors, the New Inverted Incandescent Gas-Lamp Company, have done. Details are not required here. They are set forth in the special illustrated article in other columns, in which article there are several useful hints referring generally to public lighting necessities in these times, with special reference to the inverted gas system. Having thoroughly inspected the work done, and the effects, we feel that the new lighting in Westminster marks a stage from which great public lighting developments throughout the country will spring, and that it will assist in securing from the responsible local authorities a more broad-minded treatment of the public lighting service than has (may we not say?) ever before been accorded to it. The Westminster City Council have led the way in a more enlightened policy, and in a most effective manner.

### Technical and Commercial Affairs at the Eastern Counties Association Meeting

THE Presidential Address that Mr. J. W. Auchterlonie delivered at the meeting of the Eastern Counties Gas Managers' Association on Friday, at Cambridge (where the members were received in the happiest possible manner) was one that showed a comprehensive grasp of, and interest in, all current matters of policy and development affecting the affairs and operations of the gas industry. The address ought to be taken in combination with the visit of inspection paid to the works of the Gas Company. For in these works were seen materialized the skill and views of the Engineer, which have contributed, with the lines of policy and development that thread themselves through his address to the production of that satisfactory financial condition which it was the pleasure of his Chairman (Mr. E. H. Parker, M.A., J.P., D.L.) to acknowledge at the luncheon. That the gas industry is displaying great vitality, is seen in the variety of the topic that Mr. Auchterlonie presents in his deliverance. Much endeavour is being exercised in the causes of technical and commercial progress; but all are conscious that there is still a considerable amount of defect that has to be mended, and a largeness of lethargy that has to be dispelled. Both are prominent characteristics of the day. The one is lauded by Mr. Auchterlonie; the other condemned. In carbonization, there is exuberant effort; and old ideas and ideals are fast undergoing change. On this question, we have the President pointing out, by his action rather than by words, that, in the present position of horizontal and vertical retort working, the inclined retort is being passed by. He himself has not seen fit to extend the installation at his works; but he has given preference to the old horizontal in conjunction with the modern modes of projection and ejection, and working generally. But he does not tie himself to this system; and the vertical retort has in him an ardent admirer. There is voicing, too, by the President of the prevalent opinion among the practical and scientific men associated directly with carbonization, that the tilt Professor Armstrong recently indulged in against the carbonizing methods of the gas industry was of quixotic character; and the person most concerned will, without doubt, be interested in the view, very neatly expressed in a lecture by Mr. J. B. Peace (to which we shall be referring presently), "that such indiscriminate combativeness as is disclosed by Professor Armstrong, in his recent attack on our methods, is more a personal characteristic than a professional one."

But it was on the needs of the industry in relation to its commercial work that the President was strong, and made many effective points. He is an earnest supporter of co-operation, and not of the class that expresses sympathy in words, but stops short at the necessary provision to carry on a defensive and educational campaign. "Money," he says, "is badly wanted for safeguarding the interests of the industry generally." True; but the trouble is to get the majority of boards of directors and gas committees to see this, so long as dividends are maintained, and the amount of surplus profit shows little or no diminution. It seems as though a personal shock of some kind is needed to disturb them from their languor, and show them their error. A mild—but confessedly only a mild—influence might be to direct their attention to the co-operative activities of the competitor, and to a list of those who have, in their own area of supply, gone over from gas to electricity. There are other things to be done, too, in the commercial interests



and one is to provide suitable men by suitable training for all work that has direct or indirect part in the commercial business of a gas undertaking. The human element, as the President puts it, in the work of a gas undertaking is of an importance that cannot be under-estimated. This is a belief on which the Directors of the Cambridge Gas Company and their chief technical officer act; and in one direction it has found its way to co-partnership.

There is only one other point of the address—though many others invite remark—on which we will make observation. It is this: "If gas undertakings had been sufficiently alive to the interests of the public, we should not to-day be agitating for a uniform standard for testing the illuminating power of gas. Such standards would have been abolished altogether; and a calorific standard would have been the test in use." It would, in our view, be a mistake to pass too precipitately from the one standard to the other. It is better not to go too hastily, lest mistakes in conditions result that it may hereafter be difficult to remove. The supersession of illuminating power by calorific power as the standard quality, will come; but those entrusted with the management of gas undertakings have preparatory work to do in thoroughly satisfying themselves as to the standard and conditions that it would be wise to accept under the special circumstances of each concern. If there are undertakings already prepared for the change—local authority or company, but preferably the former to escape opposition at the start—and which are going to Parliament next session, why not insert a clause in their Bills for the repeal of the illuminating power standard, and a provision for a calorific power one? The whole industry would watch with singular interest the result of this progressive enterprise.

From the normal lines of thought at their meetings, the members were, on this occasion, drawn by the lecture, on the theory and practice of engineering, delivered to them by Mr. J. B. Peace, M.A., of Emmanuel College, who is one of the Directors of the Gas Company. The lecture comes appropriately in the present position of the affairs of the gas industry. "Echoes still linger of the old quarrel between the professor and the practical man—between the rule of the book and the rule of thumb." In the gas industry, at any rate—save maybe here and there—there is no such lingering of the dispute. The evidences of what the gas industry owes to the theorist and the scientific investigator are too material to admit of anything but the desire of the fullest feasible co-operation. No one knows better than the practitioners of the gas industry that observation and deduction alone must eventually bring us to a blank wall, over which it is impossible to pass to make further advance, and that developments from observation and deduction alone frequently embody defect and waste, hidden from the eye and comprehension of the practical man, and requiring for revelation the aid of a different order of reasoning and penetration than he himself can bring to bear. Take the gas-engine, the gas-fire, the gas-burner, as examples. They were all more or less subject—they are not in improved form perfect even now—to defect and waste until the theorist and scientific investigator stepped in to assist the practical man. The same in regard to the whole of the operations attending the production of gas and the serviceable development of the residuals. All are controlled and regulated by the inventions of theory and science.

It is quite true that the gas engineer and manager himself is too busy, as Mr. Thomas Glover says, working for the best issue in his balance-sheet, to think much of theory and fundamental principles. But, at the same time, the balance-sheets of gas undertakings would not be what they are to-day had it not been for the assistance rendered by those who, by the promptings of theory and the disclosures of scientific research, have turned waste into profit. In the constructional work of gas undertakings, in the use of the raw materials, and in the produce of those materials, there has been great waste in past times. But that has been, and is still being, changed. "In every art, in every science, the spirit of inquiry, of research, is the one essential condition of advance. Without it, the old routine, sufficient in its time, lingers on to find itself helpless in the days of fresh demand and new conditions." That has been accepted in the gas industry as an indisputable truth; and this has been attested in the most practical way by linking the industry with one of the recognized seats of industrial learning and research, in order that it may be the better equipped for meeting all the fresh demands and the new conditions. Through this association, the gas industry are

hoping, as time passes, to eradicate much old defect and misconception, and gain new ground in economy and efficiency. The industry likewise welcomes the work that is being done in different directions, through Committees of the British Association, in separating useful knowledge from error—more especially in connection with internal combustion engines—and putting the results freely at the disposal of practical men, thereby giving them fresh points from which to work for greater efficiency. There is still waste in the gas industry—in its operations and in its methods of utilization. So long as there is waste, there is work to be done on processes as they exist, in addition to that which is necessary to secure advance. We do not recognize any finitude in the useful ends of the gas industry; and so long as there is no such recognition, so long will there be no questioning, other than by the narrow-minded and short-sighted, of the value of the co-operation of theory and practice.

### The Coalite Position.

PROSPECTUS promises falsified, not one penny piece yet distributed in dividend, prices of shares reduced to next to vanishing point, plant undergoing repeated remodelling, and much plant idle. There one has summed up the present position of the British Coalite Company's affairs after three years' working from the time the concern was called into being as the channel by which something great and revolutionary was to be performed from an already, on paper, good and commercial scheme. Readers can easily piece together from our pages the whole history of this project, which never has had a sound technical foundation upon which to build a good commercial structure. The noise originally made by the promoters, the pretty pictures drawn from their vivid imaginations, the easy manner in which the newspapers were gulled into giving support to the scheme, the intoxication of those who became shareholders by visions of golden gain, their hopes and aspirations, their disappointments, the abandoning of the Company by first Directors, and the incoming of other good, receptive souls such as Sir William Preece, are matters composing well-known history now; and there is only speculation as to what the end will be. But how the present Directors must now regret that they were less sentient than those who preceded them, and who retired. We do not envy the Board their next appearance before the shareholders some three months hence, when a further tale of the falsification of prediction will have to be spun.

The "Daily Chronicle" has been doing some service to the public and to the shareholders by piecing together into narrative form the facts regarding the Company that might have been found for most part scattered in our pages, and presenting the lugubrious result to their readers. We have reproduced (last and this week) the principal parts of the matter—not so much because it tells us anything that was not known before, but because it focuses certain of the main events in the history of the Company. The financial, technical, and commercial positions, it will be seen, all have "failure" written above them after three years' working. One of the latest interesting schemes of the Company was the supply of coalite plant to gas-works on very seductive terms; and from these plants profits were going to be made for the despairing coalite shareholders to the tune of some thousands a year. Alas! the numerous "negotiations" of which there was talk do not appear to be working out in the way intended by those who have been scheming to promote the salvation of the Company. We hear nothing to-day about successes in making terms with gas-works. Little is heard of the plant at the Plymouth Gas-Works; the Hythe plant, it is believed, has not been re-started yet; the Wednesfield plant, it is understood, is not working; and the Barking works (which were "going to be" capable of dealing with about 3 million tons of coal) are reported to be a painful scene of desolation. Grass, if the "Chronicle" man speaks truly, is the most prolific product of the site, machinery is stationary, gasholders and hoppers are rusting. These are the works round which a big gas-driven electrical power scheme was going to spring up; these are the works that should be tearfully busy now producing coalite with which to stock the cellars of a London that was supposed to be absolutely languishing for coalite. Only the noise of men engaged in repairs or some such work, it is said, disturbs the stillness. Going further afield, it is not noticed that the Coalite Company are exhibiting at the Glasgow Smoke Abatement Exhibition, while their



competitors are doing so. We wonder whether shareholders at their next meeting will be content with the cheery assurances and optimism of Sir William Preece, and go away from the meeting feeling that "all's well." The optimism and the facts have no congruity. Meanwhile, many of the shareholders are doubtless reflecting over the fact that cunning brains have constructed many asses' bridges in the City, and are regretting their misfortune in having been tempted to cross one of them.

### British Gas Company Finance.

The British Gaslight Company, Limited, are presenting a strong financial position in these times; and therefore the Chairman of the Company (Mr. J. Horsley Palmer) was last Wednesday happy in the tale he had to tell. The Hull undertaking has such a sound financial backing that the Board feel fully justified in reducing the price of gas from 2s. to 1s. 10d. per 1000 cubic feet. There was a day when Hull was able to rejoice in gas in the Company's area at a price of 1s. 9d.; so only another 1d. reduction will be needed to bring it back to its best record. The cost of coal, renewals, and increased expenditure in various directions, have accounted for the necessity of the price being for some time 3d. above its lowest point; but the Company and their Engineer at the station (Mr. John Young) are to be congratulated upon the price once again coming down to a figure that makes the gas supply one of the cheapest in the country. At Norwich, too, the Company are feeling the benefit of the release from the large scheme of reconstruction and remodelling work that Mr. Thomas Glover has had to cope with there, by which an old-standing legacy has been wiped out, to the extent that conditions will allow. The references of the Chairman to Norwich were highly complimentary, and deservedly so. Among other matters, Mr. Palmer had something to say on the practice of the Company in paying dividends clear of income-tax; but he has a preference for paying dividends with the tax deducted. Whether the tax is deducted, or whether the dividends are paid clear of the tax, appears to make no difference to the prices of stocks or shares on the Stock Exchange. There is a proposal coming forward that, in the case of this Company, the tax shall in future be deducted; but the Directors will see that the shareholders do not suffer in the amount of the income they derive from their holdings. Considering the blindness of the Stock Exchange to the advantage attaching to dividends being paid clear of income-tax, and considering also the hint the Chairman gave as to the shareholders not being injured by the suggested change, we foresee the market value of the British Gas Company's shares appreciating within a measurable distance of time.

### The Manchester Juniors and University Lectures.

As will have been seen from the report of the proceedings at the opening meeting of the present session of the Manchester and District Junior Gas Association, which appeared in last week's issue, a scheme of Manchester University Lectures has been brought to fruition; and it is to be hoped that the reception accorded to it will be such as to amply reward those who have taken such trouble in its preparation. Appreciation of what has been so willingly done by those who have been approached on the subject will best be shown by large attendances at the lectures. And these should not be difficult to secure; for, as Mr. F. Thorp, the President of the Junior Association, remarked, the "bill of fare" submitted is an excellent one. The advantage enjoyed by those who are nowadays studying in the gas profession is already universally acknowledged; and the present scheme affords one more illustration. An announcement in our advertisement pages is to the effect that, under the auspices of the Manchester District Institution of Gas Engineers and the Manchester and District Junior Gas Association, a course of six lectures will be given at the Victoria University on the "Science of Gas Manufacture and Combustion;" and that tickets and full particulars may be had from the Hon. Secretaries of the Associations—Mr. W. Whatmough, of Heywood, and Mr. J. Alsop, of Stockport. Admission will be free; and the lecturers will be masters in the particular branches of the subject with which they will deal. An opportunity like this should be jumped at; and if we rightly judge our friends in the North of England, it will be. A further course of lectures was, it will be remembered, also foreshadowed by

Mr. Thorp; and of this we shall no doubt hear more anon. Meanwhile, it is in regard to the series of six lectures now announced that we are desirous of enlisting the cordial co-operation of those in the Manchester district who are desirous of furthering the interests of the gas profession.

### Gas Legislation.

In other columns, we commence our usual review of the Gas Acts passed during the session of Parliament that has still a few weeks to run before its tale will be finally ended. The half-dozen Acts noticed in this first article are those of new companies seeking incorporation and parliamentary powers and limited companies desiring to raise their statutory status, and who have realized their desire as expressed in the Acts before us. But in dealing with them, it has been found in the majority of cases that the changes from their initial form are so few, and, so far as a general interest goes, so unimportant, that we have, instead of outlining the principal clauses of the Acts, confined ourselves almost entirely to indicating where they differ from their originals. Chiefly the variations are in the amount of capital sought, or in the proposed standard or maximum prices for gas. In connection with the latter, it will be remembered that all these are companies submitting themselves to parliamentary regulation for the first time; so that in their case it is not an existing statutory standard price that has been altered. There has also been little trimming-down or modification in other respects. There is one thing, however, in which there is absolute uniformity in the six Bills noticed; and it is that Parliament has agreed to all the companies having the "Metropolitan" No. 2 burner as the one for testing their gas, the standard illuminating power of which is also uniform—viz., 14 candles. The six Acts are the only survivors of the eleven Bills promoted by companies wishing, for the first time, incorporation and statutory powers under Special Acts.

### "Cause Unknown."

We do not appear to be getting any nearer to a solution of the cause of the latest fire in a drapery establishment at Brixton, at which one of the lady assistants lost her life by precipitating herself from a bedroom window in her fright. Part of the premises was lighted by gas and part by electricity. But at the resumed inquiry by the Coroner (Mr. Wyatt) last Thursday, the Fire Brigade officers who had been engaged in investigating the cause of the outbreak, were as far off determination as before. But gas was exonerated by Superintendent Allison of the London Salvage Corps. He says that he does not think the gas-jets had anything to do with the fire. But he has not the slightest doubt that the fire originated underneath the stairs in a cupboard. On the other hand, District Officer Woodger is of opinion that it occurred in or near one of the shop windows; and these windows, we know, were electrically lighted. However, there is a diversity of opinion; and the origin of the fire remains still a mystery. Therefore, it can only be concluded that this will make another addition to the rapidly lengthening list of fires coming under the category of "Cause unknown." The Electricity Supply Companies were again represented by Counsel at the inquest.

### Office Heating, and a Discount.

The heating of offices in industrial and commercial centres makes in itself an important branch of winter business; but no in all cases is sufficient attention paid to it. For such use, the old coal fire is extravagant, and in view of the attention and labour involved, is a positive nuisance to the business man. A writer in the "Financial Times" (with its large circulation among business men and financiers) has been expatiating on the subject. He is obviously a partizan, and has an eye to only one means of circumventing the trouble and nuisance of a coal fire—that is the electric radiator. He has little to say about the expense. In this he shows wisdom. It is strange he overlooks the gas-fire, which is far more efficient as a heater than the electric radiator; while all the advantages he attributes to the latter are obtained by the former. There is the handiness. The gas-fire can be turned on and off just as required; and its range of regulation is greater. Heating by it, too, is much more expeditious. Like the electric radiator, the gas-fire does not make the air impure, nor does it give off fumes. As a matter of fact, it is constantly causing fresh air to be drawn into the room in which it is used, and the ejection of air from the room. Circulation of air in this way is no



induced by the electric radiator. There is one matter to which the writer of the article makes pointed reference; and it is that "as regards cost for electricity used for heating purposes, the supply companies give a very special low rate for all current used for radiators." This is a matter that may be worth consideration. Consumers like the notion of a good discount or rebate. It appeals to them; and it is a potent factor among people whose business is commercial or financial. To allow a rebate for the gas used for fires, it is unnecessary nowadays to have a dual system of piping and a second meter. A small discount meter fixed near the gas-fire answers the purpose. There are places where such meters have been introduced with good effect; and where they have been introduced, report says, they will stay.

#### Promotion of Health and Cleanliness by Local Authorities.

Mr. J. G. Newbigging, the Corporation Gas Engineer of Manchester, got close to this subject at a dinner the other night, which ended an interesting day for the members of the City Council, part of it having been spent inspecting the nearly completed mammoth gasholder (of approximately 10½ million cubic feet capacity), which will stand as a monument to the work for Manchester of the Gas Engineer. Mr. Newbigging was replying to the toast of his health; and his thoughts and words ran on the question of the supply of cheap gas by which coal could be displaced as a heating agent. More sanitary conditions of the atmosphere would mean an improved health-sheet for the community and an increase of cleanliness. To this end, the duty of local authorities is to do all they can to remove obstacles from the path of a cheap supply of gas. It was a smart point that Mr. Newbigging made in this connection, when he said, to effect this cheapness, he would rather see gas and electricity rate-aided than rate-aiding. If these views were held generally in the Council, Manchester would before very long be atmospherically a far different city.

#### On the Horns of a Dilemma.

The representatives of the South Wales miners are in a position which appears to become less and less tenable as time goes on. Though nominally the "leaders" of the men, they are evidently no longer able to effectively impress their views as to policy on those who are supposed to "follow." Consequently the employers are having forced on them rapidly accumulating evidence that an agreement with the Federation Executive does not necessarily mean an agreement with the general body of miners. The latest evidence of this is the fact that, a few months after the signing of an agreement the very object of which was to guarantee stable conditions over the field for a fixed number of years, a decision has been arrived at by the miners to take a ballot on the question whether there should be a general coal-field strike in support of a sectional dispute. At a meeting of the Conciliation Board, the owners pointed out that the proposal was a breach of the wages agreement; and the men's leaders, though denying this, admitted that their official recommendation on the subject had been defeated and their advice rejected. They had therefore to do something; and the decision to have a ballot was the step which they ultimately persuaded the conference to take. It was added that they felt so deeply the rejection of their recommendation, that the question of resignation of their official positions on the Executive, "if not actually discussed, was fully present in their minds. Under other circumstances they might have taken this grave course, and allowed the policy of the Federation to fall into other hands; but it was their unanimous view that the situation did not call for so serious a step." This explanation no doubt is the correct one; but, of course, it does not touch the real point of the coalowners' complaint, which is that the adoption of a proposal so antagonistic to the spirit of the agreement, under the circumstances set forth, is calculated to disturb the confidence of the owners in the power of the workmen's leaders over the men. If this kind of thing went on, it was truly pointed out, they would never be able to rely upon the leaders carrying out any agreements which might be arrived at. This, of course, is the *crux* of the whole matter; and it is a development of the Trade Union system which can only be regarded with the gravest misgiving. In the present case, the admission at the meeting of the Conciliation Board of the workmen's representatives that "they had to carry out the instructions of the delegates' conference or resign," sums up the matter in a light which cannot

be welcome to the other party to an agreement solemnly entered into by the leaders on behalf of the men.

#### Another Wreck.

The Mid-Oxfordshire Gas Company has become a wreck. It was the expected that happened; and after the condemnation by a Committee of the House of Commons of the whole financial side of this promotion of one of the groups of City company mongers (of which the central figure is Mr. E. O. Preston), it is difficult to feel any amount of sympathy, except for those who acted in absolute ignorance, for many of those who have lost money in the concern. The report of the Assistant Official Receiver which was presented at a meeting of creditors and contributories, gives a great many dry financial details, which in the eyes of the competent in gas-works affairs tell a tale of gross over-capitalization. It is merely the "opinion" of the Official Receiver that this is one cause of the failure of the Company; a second cause being inefficient management. But however good the management might have been, it could never have ensured success on the financial conditions built around the concern for the sole purpose of enriching those who were responsible for the promotion and subsequent proceedings. There is much more to be discovered beneath the bald figures of the report published elsewhere; and the truth of the whole matter can only be disclosed by investigation at the hands of an independent gas expert. A Liquidator was appointed, together with a Committee of Inspection; but the latter is insufficient for the purpose. The view was expressed at the meeting that it was necessary to look beyond the accounts furnished by the Directors and the books of the Company to get at the real position. And that is so.

#### Obituary.

We regret to learn of the death, on the 5th inst., at sea, on his way home from South America, of Mr. HERBERT GANDON, third son of the late Mr. Charles Gandon, for some years Engineer of the Crystal Palace District (now South Suburban) Gas Company. Deceased was originally with his father at Lower Sydenham; but early in 1900 he obtained the appointment of Superintendent of the Neepsend works of the Sheffield United Gas Company, in succession to Mr. Alexander Allan, who had gone to Nelson. Five years later, Mr. George Martin, the Manager of the Ceará Gas-Works, had to relinquish his position and return to England; and Mr. Gandon was selected to discharge the duties. His engagement was for three years; and in 1908 he came to England on a visit. He, however, renewed the contract for a similar term, and returned to Ceará. At the annual meeting of the Company last October, the Chairman (Mr. F. A. Wallroth) referred in very appreciative terms to the work that Mr. Gandon and the staff had done. Deceased was in his 43rd year; and the cause of death was heart failure.

#### Personal.

Mr. GEORGE BRAIDWOOD, of the Glasgow Corporation Gas Department, formerly Hon. Secretary of the Scottish Junior Gas Association (Western District), has been appointed Assistant-Manager to the Coatbridge Gas Company, in terms of the advertisement which recently appeared in the "JOURNAL." There were 84 applications for the position.

The "Journal für Gasbeleuchtung" reports that Dr. HANS BUNTE, the Editor of that journal, and Professor at the Technical College at Carlsruhe, has been elevated from the rank of Geh. Hofrat to that of Geh. Rat, or Privy Councillor. Also that, on the occasion of the 80th birthday of the Emperor of Austria, Herr CHRISTIAN BOLZ, the Technical Manager of the Austro-Hungarian Gas Company at Buda-Pest, had been invested with the Order of the Iron Crown, in the third class.

At the meeting of the Tynemouth Town Council last Wednesday, Mr. JAMES WEIR M'KERROW, Assoc.M.Inst.C.E., Surveyor to the Morpeth Rural District Council, was appointed Secretary and Manager of the Water Department of the Corporation, in succession to Mr. Henry Clarke, who had been 45 years in the service of the Corporation and their predecessors, the Water Company. Before going to Morpeth, Mr. M'Kerrrow, who is thirty years of age, was for upwards of five years with the Newcastle and Gateshead Water Company.

Mr. J. W. BROWN, the Assistant Engineer and Manager at the Matlock and District Gas-Works, has just obtained the post of Manager to the Chapel-en-le-Frith, Chinley, and District Gas Company, Limited. He is not yet 25 years of age, and was for four years pupil at Matlock, leaving there to gain experience in constructional engineering with Messrs. S. Cutler and Sons, with whom he remained for nearly four years. Mr. Brown has been at Matlock as Assistant for two-and-a-half years. The appointment promises to be immediately an exceptionally busy one; contracts for laying over 5 miles of new mains and fitting up upwards of 500 slot installations having just been settled.



## THE WESTMINSTER NEW PUBLIC LIGHTING CONTRACT.

### Details of the Low-Pressure Lighting by "Nico" Lamps and Burners.

INTEREST in the new public lighting contract of the City of Westminster has been largely concentrated on the high-pressure gas section of the lighting, inasmuch as in it are comprised certain world-famous centres and streets in which the high-pressure lamps are depositing high-power electric arc lamps. But it must not be forgotten that by far the larger portion of the contract refers to lighting by low-pressure inverted lamps in considerable districts, involving some 2200 lamps and something like 7000 burners. This in itself is a contract of no mean order; and it is subject to the same stringent conditions as the high-pressure lamps. Precisely as in the case of the latter lamps, the Gaslight and Coke Company are selling illumination, subject to strict penalty tests, and not gas at a certain price and undertaking maintenance at a quoted figure. They are selling, and the City Council are purchasing, light of a stipulated value as tested at the angles of 50° and 20° by the street photometer. This being so, the Gaslight and Coke Company had to exercise the utmost prudence in the selection of both lamps and burners, and, in the selection, special consideration had to be paid to the questions of economy in time, of manufacture, and expense in maintaining the lamps up to the standard set by the contract. Choice fell upon the latest design of the "Nico" street burner and lantern; and the New Inverted Incandescent Lamp Company are to be heartily congratulated upon their success—more especially when it is remembered that not upon them but upon the Gaslight and Coke Company rests the entire responsibility of answering to the Westminster City Council for their contract quantity of light. Under the peculiar circumstances of this

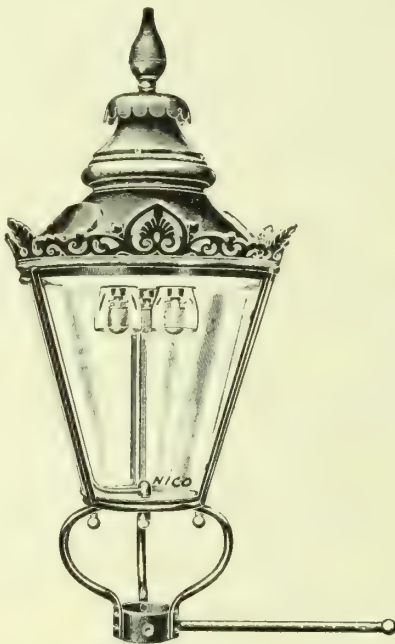
contract, there will be a desire, among those responsible for public lighting elsewhere, to receive information concerning the lamps and burners, as well as other details and disinterested impressions.

#### THE BURNERS AND THEIR EFFICIENCY.

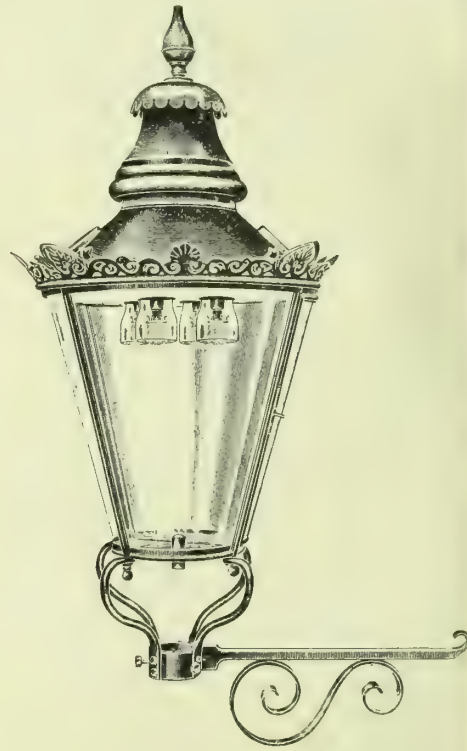
In the development of the new "Nico" street-lamp burners and the series of lanterns, such as have been adopted by the Gaslight and Coke Company for the city of Westminster, much thought, experiment, and trouble have been expended in designing a combination that would prove highly efficient in illuminating power, economical in upkeep, and capable of withstanding the stresses of the severest of climatic conditions. As in the development the burner received first consideration, and the design of the lantern succeeded, so in this description the same order may be followed. But there is one point connected with the burners that necessitates a feature of the lantern tops being at once referred to. The burners (which are of the same type all through the 2200 lanterns) being of angle form, the New Inverted Company were able to dispense with the hinged top which is usually the vogue in street lanterns specially made for inverted burners, and to construct the tops with wind and rain proof inspection doors. By this means, there can be expeditious adjustment at any time, during lighting hours or otherwise; the gas and air regulators being exposed immediately the inspection door is opened. Through these doors, too, the burners (being only fixed by a slip union joint) can be readily removed should occasion demand. Each burner has its own means of regulation; and when the gas supply is once adjusted, the needle is made fast by means of a lock-nut



Two-Light Lantern.



Three-Light Lantern.



Five-Light Lantern.

on the handle of the regulator. This will be recognized as being a necessary security in streets where the traffic is great and the vibrations consequently severe. By this arrangement, there is no possibility of the gas-regulator, when once it is set, being affected by any vibration to which it may be subject. Then, again, the burners (which, by-the-by, are registered, as are also the lanterns), although highly efficient, are of very simple construction; and no matter for what length of time they may be in use, the efficiency will be maintained. For street-lighting, the strength of an inverted burner and its protection are important considerations. These burners are made of heavy cast brass; and the short pendant part of the bunsen in close proximity to the mouth-piece is protected by a heat-resisting material. The burners are made to take standard size mantles. It should, however, be mentioned that the burners allow a very good margin of adjustment. They can easily be set to pass varying quantities of gas within a range of  $2\frac{1}{2}$  to 5 cubic feet according to requirement; the only difference being that, with the smaller consumptions rather shorter mantles are employed.

An interesting matter, in view of the contract conditions as to illumination, is the efficiency of the burners. This is no less than 30 candles (maximum) per cubic foot of gas consumed per hour; so that the duty rendered by a burner using (say)  $3\frac{1}{2}$  cubic feet of gas per hour, is therefore (to be within the mark) 100 candles.

#### THE NEW "NICO" LANTERNS.

With regard to the lanterns, in their design, consideration was specially paid to the various points that experience shows are demanded in a good street lantern for lighting by means of inverted gas-burners. The lanterns must be of good strength, give facilities for rapid attention to the parts vital to the maintenance

of efficiency, must allow of the ready cleaning of the inside surfaces of the glass, must be constructed so that the shadows thrown by the ribs are neutralized as much as possible, and withal they should be neat and of graceful appearance. Street lanterns ought not to be, and there is no occasion for them to be, a disfigurement to the streets. There are many ancient specimens still in active service whose early destination should be the scrap-heap. They are out-of-date, ineffective, and an eyesore; but in the streets of London, there is a present passing of the old, and an incoming of the new in this respect. The new "Nico" lanterns as now seen in numerous streets in Westminster—the types are here illustrated—have a very graceful appearance; and examination enables one to pronounce the workmanship as being of a very high order. The one and two-light lanterns are made with two curved panes; and therefore have only two ribs, one of which faces the roadway and the other the houses or whatever else borders the pathway. Thus, if one looks through a successive number of the lanterns as fixed in a street, one gets an unimpeded view through them. There is not the slightest obstruction to the illumination lengthwise of the roadway; and on the two sides there is an infinitesimal shadow thrown by the ribs—this being largely neutralized by the position of the inverted mantles. The lanterns are made of strong copper, with a lead corona. In the one and two light lanterns, only one inspection door (already referred to in the paragraph treating of the burners) is required in the head through which the maintenance of burners and their regulation can be attended to. It is obvious the only time it will be requisite





[Photographs by Borup Bros., Streatham High Road, S.W.]

**A Night View in Ashley Gardens**  
(Three-Burner Lamps.)

to open the door will be for burner readjustment or cleaning purposes. One of the panes of glass is hinged, and is so contrived that the hinge is not strained when opened for maintenance and glass-cleaning purposes. The two-light lanterns (of which 720 have been installed in the City of Westminster) are mounted on four-armed frogs, with double ladder-bars; and they are fixed on columns which bring the light 12 feet above the roadway.

Taking next the three-light lanterns, of which there are 936 fixed on standards of similar height, and 180 on brackets. These are constructed with three curved panes, and are made with two inspection doors in the head of the lamp—two burners being accessible through one door, and one through the other. The lanterns on standards are mounted on triple-arm frogs, with double ladder-bars. The bracket lanterns are of the same type. The lanterns are constructed on lines similar to those described in connection with the two-burner lamps.

Regarding the five-light lanterns, there are 264 of these installed on standards which bring the light 15 feet above the roadway. They are constructed with four curved panes, two of which are wider than the others; the wider panes facing up and down the street. This arrangement has been found to give the minimum amount of shadow. In the head of the lamp are two inspection doors—one giving access to three of the burners, and the other to two. These lanterns are mounted on four-armed

frogs, with double ladder-bars, having scrolls underneath to give them relief.

All the lamps are made with enamelled reflectors, from which glass cylinders surrounding the mantles depend. Of course, if desired, the lamps can be used without glass cylinders; but their employment is recommended, as the efficiency is no doubt increased thereby, and the mantles are protected during the cleaning of the lamps. The lanterns as installed at Westminster are provided with trap doors for torch lighting; but obviously they can be fitted with a flash bye-pass if this system is preferred.

As previously suggested, the day of the old style ugly gas lantern in our streets ought to have long since passed; and we hope to see more and more their replacement by the new form of lanterns. Conversion to the inverted system gives the opportunity to do more in this respect. The inverted burner does not require the perpetuation of any of the bad characteristics of the older forms of lantern; and in these "Nico" lanterns, there has been a successful effort to avoid them. It will be noticed that the lanterns are not cumbersome looking. A thing that is graceful cannot be cumbersome; and these are graceful looking lamps. It will also be remarked that the lanterns are rather more shallow than those commonly made for the upright system. Perhaps it will be of interest to quote the dimensions of the lanterns. The two and three light ones are 36 inches high over all; the diameter is



**Night View in Prince Consort Road.**  
(Three-Burner Lamps.)





Night View in the Vauxhall Bridge Road.

(Five-Burner Lamps.)

18½ inches at the waist, and 8½ inches at the bottom. The five-light lanterns are 45 inches high; the diameter is 21½ inches at the waist, and 10½ inches at the bottom.

Perhaps we ought to mention here that the New Inverted Company are not binding themselves to this one type of street lantern. They are, we understand, engaged upon the production of a range of square type lanterns for places where the cost of the circular copper lantern cannot be entertained. And, moreover, it is recognized by them that there are many existing lanterns in which the vertical form of burner is used which can be transformed to the inverted system by the use of conversion sets. The Company have made provision accordingly. This, however, is a digression; and we must proceed.

#### WHERE THE NEW LAMPS ARE TO BE SEEN.

The City of Westminster covers a considerable area; and it is rather difficult to define its boundary. It extends, for instance, from Temple Bar, taking in the Thames Embankment, to Chelsea Bridge; and the low-pressure inverted lamps are being installed in all the streets other than those in the Strand area in which the Charing Cross Company's contract for electric arc lamps has not yet expired, and those in the district comprising the area formerly governed by the St. George's (Hanover Square) Vestry—whose final act before becoming merged in the City of Westminster was to commit their successors to electric arc

lighting for a term of thirty years—and in those streets in which high-pressure gas lighting will reign. Therefore it is impossible to give a complete list of the streets in which the new low-pressure lamps are to be seen. It will, however, assist visitors to the west-end in making an inspection if we mention that, in regard to the two-light lamps, good specimen lighting can be examined in the Soho district, or in Vincent Square, Westminster. The illumination effects of the three-light lamps may be inspected in St. James' Square, or in the area lying between the Haymarket and St. James' Street, as well as Buckingham Gate, and in Horseferry Road, Rochester Row, Ashley Gardens, and other thoroughfares off Victoria Street. As to the five-light lamps, an excellent installation can be seen in the Vauxhall Bridge Road, between Rochester Row and Vauxhall Bridge, in Kensington Road, from the Albert Memorial to Knightsbridge, or in Great George Street, Westminster. It is a really splendid example that is to be seen in the Prince Consort Road, between Queen's Gate and Exhibition Road, at the back of the Albert Hall. Five-light lamps will also be employed in certain situations in other parts of the district.

#### ACKNOWLEDGMENT AND IMPRESSIONS.

In connection with this Westminster lighting scheme, it would not be right to conclude this notice without saying that great credit is due to the Controller of Gas Sales of the Gaslight and



Portion of Vauxhall Bridge Road as "Illuminated" by Electric Arc Lamps.



Coke Company (Mr. F. W. Goodenough), who went most exhaustively into the merits of the various lamps submitted to him prior to the contract being placed with the New Inverted Incandescent Gas-Lamp Company; and he has naturally taken an enthusiastic interest in the development of the whole work of installation. It may also interest readers to know that the New Inverted Company (who are to be congratulated upon the part they have taken in this historic contract) have also secured the order for the supply of similar lamps for lighting the Boroughs of Finsbury and Bethnal Green. They have spared no pains in the effort to produce in the City of Westminster justification for the trust reposed in them, and in enhancing their own reputation and that of the gas industry. The reward is found in the result. An inspection of the lighting by the new lamps, in certain portions of the areas referred to above, enables us to say that where the lower power low-pressure lamps are employed, there is ample and uniform lighting; and, where the high-power low-pressure lamps are installed, the effect

is remarkably good. We progress. Consider that where a flat-flame lamp at one time stood consuming 5 or 6 cubic feet of gas per hour, and giving at best only about 15-candle power, now a lamp fitted with inverted burners, using together about the same quantity of gas, will shed a light far around of a value of 150 candles. The change in conditions is magnificent; and what can be done on low-pressure gas supply is richly illustrated to-day in the City of Westminster. It will be idle for the competitors to say the lamps are not doing this or that. The eye itself carries conviction; and the photometers of the Westminster City Council and not of the Gas Company will be the arbiters as to the fulfilment of duty. They will afford sufficient ratification of our own convictions from inspection only. "Westminster," we remember hearing the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) say, "will soon be the best lighted city in the world." He was then certain, as certain as it is humanly possible to be, of the eventual confirmation. The



Night View in Kensington Road.

(Five-Burner Lamps.)

confirmation is with us so far as the low-pressure installation is concerned; and in but a few weeks, it will be in respect of the high-pressure lighting.

In street lighting, an important essential is that the system shall be the very best under the worst of climatic conditions. Towards the end of August, some tremendously heavy gales and rain-storms were experienced. The inverted mantles used in the "Nico" lanterns stood firm, and were wholly unaffected. The next worst condition will be a dense London fog. It is generally admitted by the public and by competent judges other than those electrically interested, that the light of incandescent gas-lamps has greater penetrating power in fogs than that of electric lamps.

With our streets fog-bound, there is faith that these inverted gas-lamps will render a good account of themselves in comparison with electric lighting. We need not make any contrast regarding the economy of the lamps in relation to the electric light or vertical incandescent gas-lamps. The fact of their presence in Westminster to-day suffices to show that the City Council, in the purchase of illumination, found that a better bargain could be struck with the Gaslight and Coke Company than with the Electric Lighting Companies; and, as a matter of fact, some £8000 (or 60 per cent.) is being saved annually in comparison with what the Electric Lighting Companies, on being applied to, were able to offer.

## GAS STOCK AND SHARE MARKET.

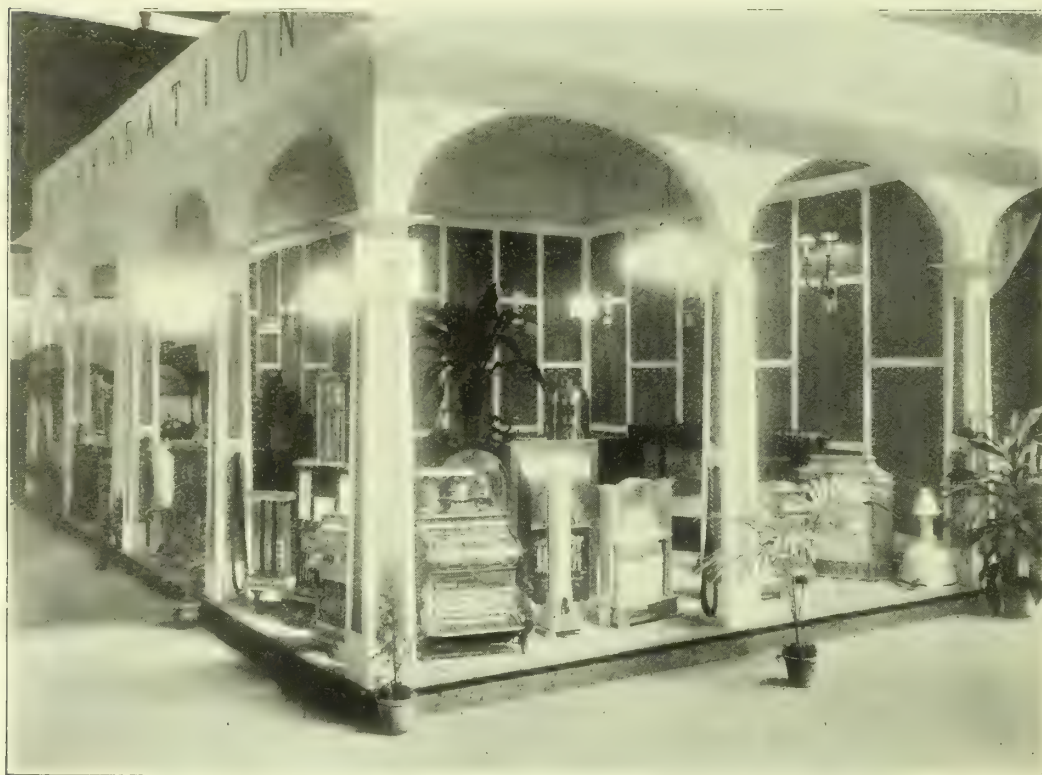
(For Stock and Share List, see p. 863.)

THE persistent inertia of the Stock Markets was again last week (to devise a so-called Hibernianism) in full action. Nothing seems able to impart a spark of vitality to the sleepers, though they should have awakened from their autumn repose some time ago. So that the state of things on the Exchange last week was pretty well a mere repetition of the week before. The opening on Monday was sluggish enough, and the tone was inclined to be dull and heavy. Government issues were rather weaker, though Consols were unchanged. Railways were lower (disappointed by the protraction of the labour dispute); the Foreign Market was irregular; and Americans were far from strong. Gas stocks were in good demand; and Breweries were still advancing. Tuesday was terribly inactive—hardly any movement being perceptible. Rails were, however, a little more cheerful. Wednesday came and went in unbroken calm. Movements were slight and irregular. The gilt-edged division were rather weaker; and Consols fell  $\frac{1}{8}$ . But Rails maintained their strength; and the Foreign Market was strong. On Thursday, a shade more activity showed itself here and there, and prices accordingly looked up a little—the strongest lines being Railways, Foreign stocks, Breweries, and Gas. On Friday, things fell back into their old lethargy; but the tone was

not weak. Consols lowered  $\frac{1}{8}$  for the account. There was scarcely anything to note on Saturday, except that the weak American Market shaped rather better. Railways appeared tired by the long delay in a settlement. In the Money Market, the tendency fluctuated; rates giving way at first and recovering later on. Business in the Gas Market presented a fair aggregate, and the all-round strength of stocks left nothing to be desired—several issues making nice advances. In Gaslight and Coke, the ordinary was strong and active; all transactions being within the limits of 106 and 106 $\frac{1}{4}$ . The secured issues were fairly busy; the maximum marking 88, the preference from 103 $\frac{1}{2}$  to 104 $\frac{1}{2}$ , and the debenture 80 $\frac{1}{2}$  and 81 $\frac{1}{2}$ . South Metropolitan was more active, and changed hands at from 121 $\frac{1}{4}$  to 122 $\frac{3}{8}$ . The debenture made from 80 to 81 $\frac{1}{2}$ —a rise of 1. Commercial were quiet. The 4 per cent. realized 105 $\frac{1}{2}$  and 106, and the 3 $\frac{1}{2}$  per cent. 101 $\frac{1}{4}$ . Among the Suburban and Provincial group, Alliance and Dublin was done at 85 $\frac{1}{4}$  (a rise of 2), ditto debenture at 95 and 96 $\frac{1}{4}$  (a fall of 2), British at from 45 $\frac{1}{4}$  to 45 $\frac{3}{8}$ , Brentford new, at 186, and Tottenham "B" at 113—a rise of 1. On the local Exchange, Liverpool "A" was done at 220—a rise of 1. In the Continental companies, Imperial was active at from 186 $\frac{1}{2}$  to 187 $\frac{1}{2}$ , ditto debenture realized 93 and 93 $\frac{1}{2}$  (a rise of 1), European fully-paid 23 $\frac{3}{4}$ , and ditto part-paid 17 $\frac{1}{4}$  and 17 $\frac{1}{8}$ . Among the undertakings of the remoter world, Oriental changed hands at 139 free, Melbourne 4 $\frac{1}{2}$  per cent. at 102 $\frac{1}{4}$ , Primitiva at from 7 $\frac{1}{4}$  to 7 $\frac{3}{8}$ , ditto preference at from 5 $\frac{1}{4}$  to 5 $\frac{3}{8}$ , and ditto debenture at 98 $\frac{1}{4}$ .



## THE GLASGOW SMOKE ABATEMENT EXHIBITION.



IN the "JOURNAL" last week, a full notice appeared of the opening of this exhibition on the 16th inst., together with a description of the principal gas exhibits. It was then mentioned that that of the Corporation forms the head of two long lines of stands occupied by appliances for the utilization of gas for heating, cooking, motive power, and lighting, and that a finer display has seldom, if ever, been seen. Above we are able to give two reproductions of photographs of portions of the stands; and we think it will be acknowledged that our correspondent's remarks were justified. Besides the display of "Glasgow" cookers and range fittings as supplied on simple hire, there are samples of gas-fires which may be obtained on the hire-purchase system recently inaugurated by the Corporation. There is also a representative collection of radiators, water-heating appliances, a greenhouse heater, a flashlight advertisement sign, and various other gas-heated appliances for domestic and industrial use. The latest types of lamps and burners, &c., for household and shop lighting

are shown. The special gas exhibit of the Corporation is a modern dwelling-house completely furnished in good style, and entirely fitted up with gas appliances. The house (some particulars of the contents of which appeared last week) contains a dining-room, bed-room, bath-room, kitchen, and laundry; and cookery and laundry demonstrations are given. We are pleased to learn from the Manager of the Exhibition (Mr. James M. Freer) that it is attracting considerable public attention, as shown by the fact that during the first eight days the attendance numbered no less than 29,000.

At the Fenton Wesleyan Church last Thursday, the marriage was solemnized of Miss Elsie Mary Surtees, eldest daughter of Mr. R. Surtees, the Engineer and Manager of the Fenton Gas-Works, and Mr. John W. Drewry, eldest son of Mr. G. Drewry, of Fenton. After the ceremony, a reception was held in the Town Hall; and subsequently Mr. and Mrs. Drewry left for Eastbourne.



## GAS ACTS FOR 1910.

[FIRST ARTICLE.]

THE Gas Acts passed in the still unfinished session of Parliament are before us for review. To complete the history of the session, we are still waiting for the third reading of the Standard Burner Bills. The Acts that are noticed to-day are those of new Companies or Limited Companies who have now been invested with full statutory powers under Special Acts. But during the session, there has been quite a big massacre of such promotions. At the beginning of the year, there were up for review eleven promotions in this class; but five of them fell victims to circumstances—Chipping Norton, Mallow, Maltby, Tipperary, and Whitland—leaving only six Acts in the group to notice.

The first measure to be reviewed is that of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company, by which the Bishop's Stortford, the Harlow and Sawbridgeworth, and the Epping Gas Companies are to be amalgamated; and the undertakings of the Ongar, Newport (Essex) and Much Hadham Gas Companies are to be vested in the new concern. The proposed purchase of the Dunmow Gas Company has dropped out of the scheme. The amalgamated Company have also secured power to supply electricity. Information as to the capitals of the existing Companies, and the terms and conditions of amalgamation, &c., was given when noticing the Bill on Jan. 4 last (p. 23). The amalgamated Company will come into being on Jan. 1 next, with a capital of £240,000, of which £104,568 is to be the original capital, and £135,432 the additional capital. The original capital is divided into £30,800 of ordinary "A" stock, £64,368 of ordinary "B" stock, £6,400 of 5 per cent. preference "C" stock, and £3,000 of 4 per cent. preference "D" stock. The allocation of the original stock is set forth. As to the additional capital, this will be issued as "B" stock or new preference stock; but the total of the preference stock is not to exceed £120,000. The issue of the additional capital will be subject to the modern form of auction clauses. The dividend on the "A" and "B" stocks is to be at the rate of 5 per cent. per annum. Power is taken to create reserve and special purposes funds. In the general reference to the question of redemption funds in our editorial columns for Sept. 6, we wrote under the impression that this Company, as well as the Brighton Gas Company, had received power to create such a fund; but since the time the Bill was last under notice, the provision has disappeared. Power is taken to borrow (inclusive of £14,825 already borrowed) up to one-third of the issued capital. The number of Directors at the outset is to be nine; but no vacancy is to be filled until the number is reduced below six, and thereafter the number of Directors is not to be more than six or less than four. The first Directors are to be Messrs. L. J. W. Arkwright, A. S. Barrett, E. L. Burton, F. C. Edwards, W. J. Gee, F. H. Jones, H. E. Jones, W. W. Nicholls, and H. Sworder. Any Director of the three Companies or of the Ongar Company holding office at the date of amalgamation, and who shall not be a first Director of the new Company, is to be entitled to, as compensation for loss of office, a sum equivalent to three times the amount of remuneration paid to him as Director in respect of the year 1909. Protection is given to various local authorities in regard to road work, and to the Great Eastern Railway Company in relation to their property. The price for gas supplied to the public lamps in the district of the Hadham Rural District Council and in that of the Sawbridgeworth District Council is not to be greater than that charged to private consumers in those districts, and is to be subject to a discount of 5 per cent. For the fixing of the prices of gas, "inner" and "outer" areas are specified. In the "inner" area, the price is to be 4s.; and, under the sliding-scale, half-yearly penny variations of price will enable the increase or reduction of the dividend on the "A" stock by 1s. 9d. per cent., and on the "B" stock by 1s. 3d. The price of gas in the "outer" area is not at any time to exceed 1s. per 1000 cubic feet more than is charged in the "inner" area. But there may be differential prices as between district and district in the "outer" area; but the prices are not at any time to be less than that charged in the "inner" area. A special provision as to price relates to Ongar. Within 1½ miles of the existing Ongar gas-works, the price is not to exceed 3s. 6d., unless at any time, owing to increase in the cost of coal or other unavoidable circumstances, the auditors shall certify that it is imperative that the price charged in the "inner" area should be increased above the price charged immediately before the passing of the Act. In the Bill the prepayment meter clauses were varied by the stipulation that the charge for the hire of a meter without fittings should not exceed 15 per cent. per annum on the cost of the meter and the fixing. This has in the Act been reduced to the ordinary condition of 10 per cent. on the cost of the meter. The standard illuminating power of the gas is to be 14 candles, when tested by the "Metropolitan" No. 2 burner. The limits of electricity supply include Bishop's Stortford, Thorley, Birchanger, Great Hallingbury, Stansted Mountfitchet, and Elsenham. In Bishop's Stortford, the electricity authorization is not to be exercised until any powers for the supply of electrical energy which may have been vested in the District Council are revoked or cease to be in force. Conditions as to the purchase by the

Council, at the expiration of 21 years, or any subsequent seven years, of the portion of the electricity undertaking used solely or mainly to supply the urban district are incorporated. Separate accounts are to be kept for the gas and electricity undertakings. [Parliamentary Agents: Messrs. Sherwood and Co.]

The Farnham Gas Company, Limited, will henceforth be known as the Farnham Gas and Electricity Company. The only variation from the particulars given when reviewing the Bill on Jan. 4 is that the standard price of gas has been altered from the proposed 3s. 9d. to 3s. 6d. per 1000 cubic feet. The standard illuminating power of the gas is fixed at 14 candles, tested by the "Metropolitan" No. 2 burner. The area for the supply of electricity is defined as the parish and urban district of Farnham and the parish of Farnham rural. It must be mentioned that the capital of the Company is to be £60,000, whereof £19,200 is the original capital, £10,000 the preference capital, and £30,800 the additional capital. Including, too, £6800 already borrowed, the Company are allowed to borrow up to one-third of the issued capital. This has to be stated, because it is provided in the Act that if within two years, or such extended period as the Board of Trade may prescribe, the Company have failed to commence to exercise the electricity powers, the additional capital is to be reduced from £30,800 to £17,000. Separate accounts are to be kept as between the gas and electricity undertakings. [Parliamentary Agents: Messrs. Sherwood and Co.]

In the Garnant Gas Act, it is seen that the capital proposed in the Bill has been reduced from £18,000 to £10,000, with authority to borrow up to one-third. The power to create a reserve fund appears to have been deleted; but sanction to the formation of a special purposes fund is given. It is also provided—and this is a very general stipulation nowadays—that the carry-forward is not to exceed the amount required to pay the maximum dividend for one year. Lands are scheduled for the works. The maximum price of gas has been reduced from the proposed 5s. per 1000 cubic feet to 4s. 3d.; and the charge for public lighting is to be 20 per cent. less than that to private consumers. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Baker and Co.]

There has not been a great deal of change in the measure promoted by the Gowerton Gas Company, the provisions of which were dealt with in the "JOURNAL" for Jan. 4 last. In the definition of the limits of supply, the proposal that they should, in addition to the main parts, include "as much of the parishes of Penderry and Cockett as is not within the existing area of supply of the Swansea Gas Company" has been expunged. The capital of the Company remains at £15,000, divided into 3000 shares of £5 each; but "800 of the said shares shall be preference shares entitled to a non-cumulative preferential dividend at the rate of 5 per cent. [not 7 per cent.] per annum out of the profits of the Company in any year, and the remainder shall be ordinary shares." There are no other changes from the particulars extracted from the Bill on the date already named, except that the old 10 and 15 per cent. discounts clause has disappeared, it being quite unnecessary with the extension by the following words of section 13 of the Gas-Works Clauses Act of 1847: "Provided also that every such contract entered into by the Company shall be alike in terms and amount under like circumstances to all consumers." The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Baker and Co.]

Dealing only with the modifications of the information published on Jan. 11 from the Bill of the Havant Gas Company, it is noticed that the capital contemplated has been reduced from £23,500 to £22,000, in 4400 shares of £5 each. Of this capital, £3000 is to be "A" ordinary, £7000 "B" ordinary—the "A" and "B" forming the original capital—and £12,000 additional "C" capital, not more than half of which may be raised as preference capital. The only other changes are that the proposed standard price of gas has been reduced from 4s. 3d. to 4s. per 1000 cubic feet. A discounts clause of 10 per cent. for prompt payment and up to 20 per cent. for large consumption has been deleted; there being contentment with the liberty allowed by the addition to section 13 of the Gas-Works Clauses Act, 1847. The sundry references to electricity that appeared in the Bill as originally lodged have been removed. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. [Parliamentary Agents: Messrs. Baker and Co.]

In the Wicklow Gas Company's Act, we see the proposed share capital has been reduced by £2000 to £14,100, of which £10,100 will be original capital, and £4000 [instead of £6000] additional capital. The standard price proposed for gas has been reduced from 5s. 3d. to 4s. 6d. per 1000 cubic feet. The illuminating power is to be 14 candles, tested by the "Metropolitan" No. 2 burner. Power is taken to apply for a Provisional Order for the supply of electrical energy. The other particulars noticed at the time the Bill was introduced are the same; but there has been inserted in the Act an agreement made with the District Council. *Inter alia*, it is provided by it that the prices to be charged by the Company to consumers of gas in the urban district, during the period of three years from the passing of the Act, shall not exceed 4s. 9d. per 1000 cubic feet for lighting, 4s. 5d. for cooking and heating, and 4s. 1d. for motive power. A purchase clause is included, operative in any of the next three sessions of Parliament, [Parliamentary Agents: Messrs. R. W. Cooper and Sons.]



## CONCILIATION IN LABOUR DISPUTES.

IN last week's issue, some particulars were given from the first part of the report in connection with industrial disputes in 1909, which was lately issued by Mr. G. R. Askwith, of the Labour Department of the Board of Trade; and it was stated then that an opportunity would be taken of noticing in a similar manner the second portion of the report. The section so far dealt with related entirely to disputes which resulted in an actual stoppage of work.

The number of disputes which had resulted in a stoppage of work, but which were ultimately settled by conciliation or arbitration in 1909 was larger than in any year before. In fact, both 1908 and 1909 show a gratifying improvement in this respect on the figures which preceded them; and this increase occurred during a period when the total number of disputes was certainly not above the average. The number of workpeople involved in these settlements in 1909 was lower than in 1908—a year in which there were great disputes in the engineering, shipbuilding, and cotton trades, all of which were settled by conciliatory methods—but, at the same time, it was a great deal higher than in any of the other years in the period 1900-9. There were 436 disputes resulting in a stoppage of work which began in 1909; and 63 disputes (directly involving 79,273 workpeople, or 46 per cent. of the total directly involved in all the disputes of the year) were settled during that year by conciliation—that is to say, by the mediation of a third party or board—or else by reference to arbitration. But, of course, in some cases settlements of outstanding disputes were not arrived at until this year, while some which began in 1908 may have been settled by conciliation or arbitration in 1909. As already remarked, conciliatory methods are becoming more and more adopted as time goes on; and this is a satisfactory feature of the figures now before us—even though they deal with actual strikes and lock-outs which were ultimately put an end to in this manner, whereas with conciliation at its best stoppage of work at all should be out of the question. In 1905, 25 strikes or lock-outs were settled by conciliation or arbitration; in 1906, the figure was 46; in 1907, 45; in 1908, 56; and, as already mentioned, in 1909, 63. The number of workpeople affected, of course, varies largely in different years, and is not necessarily proportionate to the number of disputes. It is stated in the report that during the past ten years, conciliatory methods of settling disputes have been adopted more frequently in the mining and quarrying industries than in any other group of trades. Of 385 disputes (directly involving 320,893 workpeople) settled by conciliation or arbitration during the period 1900-9, no less than 116 (directly involving 112,175 workpeople) occurred in these industries. The building trades come next, with 63 disputes; then the metal, engineering, and shipbuilding trades, with 57 disputes; and after that the textile trades, with 47 disputes. Of the 63 disputes settled in 1909 by conciliation or arbitration, 35 were arranged by conciliation, and 28 by arbitration. There were 23 of them settled under the Conciliation Act of 1896; and this compares with 16 disputes so settled in 1908, and 9 in 1907. In six cases, the disputes last year terminated under the Act were settled by conciliators; and 17 by arbitrators appointed under the Act.

As pointed out, the figures given above had reference solely to those disputes in which an actual stoppage of work occurred, whether or not permanent Boards of Conciliation and Arbitration were concerned. The real object of such Boards is not to settle strikes and lock-outs, but to prevent their occurrence by timely adjustment of differences which might otherwise lead to stoppage of work. The number of permanent Boards of Conciliation and Arbitration known to have taken action in 1909 was 124; and the number of cases considered by them was 1997, compared with 1842 cases considered by 114 Boards in 1908. There was thus an increase in the number of Boards taking action last year, over that of the preceding twelve months. Of the 1997 cases referred to in 1909, 698 were settled by the Boards or their Committees, and 327 by Umpires or Arbitrators appointed by them. Of these 1025 cases, only 23 involved a stoppage of work—eleven in the coal-mining industry, one in the iron-mining industry, three in the textile trades, and the remaining eight in other branches of industry. In 777 cases, the questions in dispute were withdrawn or settled independently; in 80 instances they were referred to higher Boards; and the remaining 115 cases were still under consideration at the end of the year. As usual, the matters dealt with varied greatly in importance. On the one hand, the reduction in wages arranged by the Board for the Coal Trade of the Federated Districts affected 310,000 workpeople; while, on the other hand, the 328 cases settled by the Durham Miners' Joint Committee affected in most instances only a few employees. The greatest number of cases settled was, of course, in the mining and quarrying industries, which accounted for rather more than one-half of the total number of cases settled during the year by all the Boards. This preponderance is due to the Joint Committees for the coal trade of Northumberland and Durham, which deal solely with disputes at individual collieries, and in 1909 settled 466 out of the 564 disposed of by all the Boards and Committees in this group. The number of Boards which have settled cases in the last five years, so far as is known to the Labour Department of the Board of Trade, is as follows:

1905, 60; 1906, 78; 1907, 73; 1908, 83; and 1909, 101. Several new Conciliation Boards were formed last year; but, at the same time, one or two ceased to exist. In addition to the bodies here referred to, there are in existence certain arrangements between employers and workpeople for the settlement of disputes by conciliatory means which do not quite fall within the description of what is usually understood by Conciliation Boards—such as the schemes in the cotton, engineering, and shipbuilding trades.

## ELECTRICITY SUPPLY MEMORANDA.

**Epistolary Publicity—An "Attack of the Nerves"—Wanted, Men with Alert Business Brains—How the Bermondsey Council Fulfil their Obligation—The Joint Wiring Bill—The Coal Factor—Different Points of View—Municipal Domination at Canterbury.**

THE Electric Supply Publicity Committee are systematic, watchful, and persistent in the work of obtaining free insertion of their "advertisements" in the newspapers. They are not going to take any first refusal of insertion as final rejection on the part of an editor. Our readers know from local information and from the reference in the "Memoranda" last week that a misleading—misleading by suppression of material facts—letter on the subject of the public lighting of London (see *ante*, p. 767), signed by Mr. H. B. Renwick, the Chairman of the Electricity Publicity Committee, has been sent through the land to the daily and weekly newspapers. Some editors thought fit not to publish the letter. But its non-appearance has simply been followed by a second letter from the not-to-be-beaten Renwick, with the view of obtaining publication of the original one. One of these letters, framed for the purpose of impressing an editor with the importance of the communications of the Electricity Publicity Committee, has fallen into our hands. It is marked "Not for Publication;" but that meant by the editor to whom it was addressed. To the best of our belief, he has no intention of publishing it in his paper. But it has been handed to us as a matter of interest; and our conscience does not forbid the passing of the interest on to our readers. Mr. Renwick thus addresses the editor of the newspaper in question:

*Lighting of London.*

Sir,—With reference to my letter under the above heading, dated 8th inst., which I sent you for publication, I do not find that the same appeared in your last issue. In view of the wide interest and importance of the matter, and the various inquiries which have reached me, an authoritative statement appears to be looked for; and I trust that you will kindly insert same in the next issue of your valued paper.—Yours truly,

Then follows the signature of the recently much-advertised Mr. H. B. Renwick. But the editor of the "valued paper" to which he addressed this stimulating communication evidently does not regard his former *ex parte* statement as being an authoritative one; and hence the waste-paper basket. We shall be sorry if Mr. Renwick has any objection to the publication by us of the foregoing letter; but the methods and acts of the Electricity Publicity Committee are matters in which our readers take some little interest, in conjunction with the amusement they have been afforded by the obvious agitation the Committee have undergone lately through the bowling-over of electricity offers for public lighting in London by the economy and efficiency of the inverted gas-burner. The victories are not only in connection with the removal of certain arc lamps from the heart of London, but in respect of competing tenders. Just one word of counsel here. The Publicity Committee will be ill-advised to start its campaign by making themselves a nuisance to editors of newspapers, as, by so doing, they will soon lose this channel of making grievances public, of presenting their emendations of gas statements, and of trying to persuade the public that facts are deceptive things.

There seems to be a very deep-seated fear of gas men at the present time among electrical people. In addition to the awful display of fright over the public lighting question, there was in the "Memoranda" last week reference to the timidity of the Hastings electrically-influenced Board of Guardians over a proposal that Mr. Botley should have a look round the workhouse and advise as to the improvement of the gas lighting prior to a scheme for installing the electric light being obtained from the Corporation Electricity Committee. And now attention is transferred to Watford. There the Council have received from the Local Government Board a letter sanctioning certain electric lighting loans; and in the letter there were some strictures concerning the public lighting, and a suggestion that the Council should look further into the question of using gas in the streets. There was a request, at the last meeting of the Council, that the letter should be read, so that the ratepayers might be informed as to what the Board had to say on the subject of the management of the public lighting department, and for the ratepayers' guidance in future. The Chairman of the Electricity Committee raised an objection to the letter being made public; and the act may be taken to mean that there was truth in what the Local Government Board said, and that the Electricity Committee had nothing to say in defence. Otherwise, why the reticence and display of pusillanimity? Possibly, the large ratepayers can find another way of obtaining knowledge respecting the contents of the letter over which the Electricity Committee are so obstinately secretive.

The electrical engineering correspondent of "The Times" has



been giving his professional readers something about which to think. He does not believe in the old cry of overcrowding in the electrical profession. Those hundreds of young fellows who are elbowing each other about in the hope of getting a job at a salary that will perhaps keep body and soul together if expended with a due sense of the necessity for a cast-iron economy, will wonder whether that engineering correspondent has ever occupied their own precarious and penurious position, and, if so, whether the more comfortable conditions of the present have blotted the period from memory. On the other hand, those who have a position, lucrative or otherwise, in the electrical profession will indulge in a little introspection to ascertain whether this particular shaft of the "Engineering Correspondent" is directed to them: "It is," he writes, "the curious fate of the new professions to prove specially attractive to incompetents." So it is his view that there is a great deal of sifting out to be done in the professional ranks of the electrical industry, in order to get rid of the incompetents. But what is to be done with these electrical incompetents. The gas industry has no use for them; the Church has all too long borne the stigma of affording a haven for dullheads; the entrances to the chambers in the Temple have no space left for the writing up of new names; there is big competition in other professions; and there are already too many electrical journals, and they are fully staffed. The only idea that occurs to us by way of suggestion for the incompetents that have been attracted to the electrical profession is that positions might be found for them as tram fare collectors on the electrical tramways. This would not be such a drastic severance as complete dismissal from electrical service. What the electricity supply industry wants according to "Engineering Correspondent" is a better selection of recruits, and the encouraging of the brighter intelligences. This appears to be sound advice; and apparently it is, accepting our friend as having a personal intimate knowledge of his subject, very necessary advice. His indirect abuse of the existing electrical professionals must be to them intolerable. "The industry," it is written, "is positively hungry for the services of men of alert business brains and of technical fertility." If the industry is so hungry, then there must be few in it at the present time with the qualities he describes. What has he to offer the men of bright intelligences, alert business brains, and technical fertility who are so sadly required? It appears to lie only in the future. "The prospect of the commercial development of electricity is boundless." Well, so it has been (in print) since the early eighties; and many men who thought that they had bright intelligences, alert business brains, and technical fertility, and who were then attracted to the profession believing in its boundlessness, have since departed, little richer than when they entered the profession, to their final rest. But the point is that the industry is to-day positively hungry for such men; and there are men who are hungry because the industry cannot find positions for them.

Is there anyone looking after the Bermondsey Borough Council, to see that their legal obligations in connection with the electricity undertaking are complied with? In 1902, at the instance of the South Metropolitan Gas Company, there was inserted in the Bermondsey and Woolwich Electricity Orders a clause, in which the following appeared: "The undertakers shall once in every year . . . cause to be laid before them a statement and balance-sheet . . . and thereupon fix annually the charges to be made for the supply of energy in the then ensuing year, at such rates (not exceeding the maximum rates specified in this Order), so that, as far as is reasonably practicable, the revenue for that year shall not be less than the expenditure for that year." Deficits in connection with the Bermondsey undertaking appear to be the chronic state. For instance, in 1908-9, the deficit was £2645; and in 1909-10, it was £1277. This is not complying with the decree of Parliament; nor do we think the deficits represent what is "reasonably practicable" in regard to revenue being at least equal to expenditure.

The Incorporated Municipal Electrical Association, we are asked to believe, are well satisfied with the measure of support they are receiving for the joint Bill to be promoted next session for wiring and fittings powers, to invest the promoters with a stand-by clause, and to give additional protection against unauthorized competition. Up to the last information to hand, 82 replies had been received to their circular of inquiry; but only about half (or, to be exact, 42) have promised financial support. Twenty are so sympathetic with the proposal that they are prepared to open their hearts to an extent sufficient to let out a little moral support for the Bill; and a further five merely express themselves in favour of the proposal. Twelve of the responding authorities will take no action. One of the remaining three will consider the matter again; the second will support the Bill in regard to the stand-by and unauthorized competition clauses, but not wiring and fittings; and the third authority are indifferent, being already in possession of the powers. "Moral support" and friendly expressions in favour will not go far towards providing the "sinews of war." A joint Bill costs money, particularly when a number of people are interested in projecting themselves across the path of the measure, as will be the case in this instance.

An interesting article has appeared in the "Electrical Review" on the subject of coal supplies to electricity stations. The writer points out what a sensitive factor coal—representing about one-third of the total working expenses—is in the making or marring of the financial issues of a concern. "Upon the price of coal almost hangs the life or death of a station." It is clear that, in

those stations where the power load, with its low prices, has attained to considerable proportions, any serious rise in the price of coal would have a disastrous effect—more so than when the power business only formed a very small proportion of the whole, and before the consumption for private lighting began to recede through the metallic filament lamps. The writer of the article in question does not favour sitting quietly waiting for the trouble to come; but he looks round to see what electricity supply undertakings can do in the way of fortifying themselves against the evil days of high-priced coal. In his view, something could be done in saving expense by joint purchase and conveyance of coal by undertakings whose stations can be served by water carriage. He thinks that "gas folk" would not be above supplying electric undertakings with information on the subject of the conveyance of coal by their own steamers. The writer, we fancy, is referring more particularly to the London Gas Companies, who, however, bring the coal they require from the North and not from Wales. He refers also to what is being done by one company (to whom it would not be difficult to affix a name) in these words: "About four years ago a certain gas company, whose works are not an hour's row from Putney Bridge, purchased a second-hand steamship, and worked her regularly for many months, bringing coal from the Tyne and Hartlepool neighbourhood down the coast and up river under many bridges to alongside their works in London. Orders were placed with the collieries direct. The trial proved so successful, even after taking into account the cost of the unloading gear, that a new ship was ordered and built to the particular requirements of the work. Being a much faster vessel than the old one, supplies quickly became too plentiful, and but little difficulty was experienced in finding other people willing to hire the ship for similar purposes. The enterprise paid better than was anticipated. Therefore what is to stop others from going and doing likewise?" Nothing, if all the conditions are similar. It is, however, very interesting to find that the electrical industry are still willing to take hints from its old and successful "enemy."

Only the other day, the "Chemical Trade Journal" was upbraiding us for something or other we seem to have been saying about Professor Armstrong; and the blow was severely felt when our contemporary said: "If only one-fifth of the scientific knowledge that has been applied to the electrical industry had been applied in the gas industry, the latter would have been in a position to defy competition from any source from the illuminating and heating point of view." It is rather confusing to read this, and then the statement of the Engineering Correspondent of "The Times" as to the requirement of more brains and technical fertility [see a previous paragraph] in the electrical industry, and finally to have the writer on coal expressing the willingness of the electrical industry to take advantage of the experiences obtained from the gas industry's enterprise. Someone must be wrong; and in view of the financial condition of the gas industry, we rather think it is the "Chemical Trade Journal."

Another instance of the complete domination of a Board of Guardians by a Municipal Electricity Committee comes from Canterbury; and we place it in conjunction with the Hastings case dealt with last week. The lighting of the workhouse and infirmary is in question; and there seems to have been a great deal of indecent haste on the part of the Guardians in running through a scheme in favour of the Electricity Committee. At any rate, there has been no adequate consideration of the most modern form of gas lighting, which could be introduced at an initial expenditure comparatively small against the cost of introducing electric lighting. But the Guardians have fallen into the convenient error of contrasting what has been in gas lighting, with what is in electric lighting, according to the *ipse dixit* assertions of the Corporation Electrical Engineer. They have had no real guidance on the question; and though Mr. H. G. Page, the Engineer of the Gas Company, wrote to the Guardians putting a different complexion on the statements of the Electrical Engineer, the Guardians have treated the letter slightly. They want no inconvenient correspondence, nor do they desire to wait till the inaccuracy of the Electrical Engineer's statements as to comparative costs is proved. All they propose doing with Mr. Page's letter is to acknowledge it; and as to the practical challenge to the Electricity Committee by the Gas Company's Directors, through their Secretary, Mr. James Burch, as mentioned last week (p. 798), the Guardians brush that aside as being no concern of theirs. In other words, the Guardians by their action declare that a question of economy is not a matter about which they need trouble themselves. This is a new principle in regulating the conduct of the public interests by such bodies, and not a principle that is to their credit. The challenge of the Gas Company has not yet been taken up by the Electricity Committee; the assigned reason being that there was no meeting of the members of the Committee during August. We observe, however, that the Electrical Engineer has returned thanks to the Guardians for the considerate treatment of his department, and says that he is now making arrangements for the laying of the necessary cables to the workhouse. He does not mean to lose any time in getting a supply of electricity to the premises, with the Gas Company so anxious to disprove his assertions. But who has given the Electrical Engineer power to proceed with his arrangements to lay cables involving capital expenditure if there has not been a meeting of the Electricity Committee since the challenge of the Gas Company was issued?

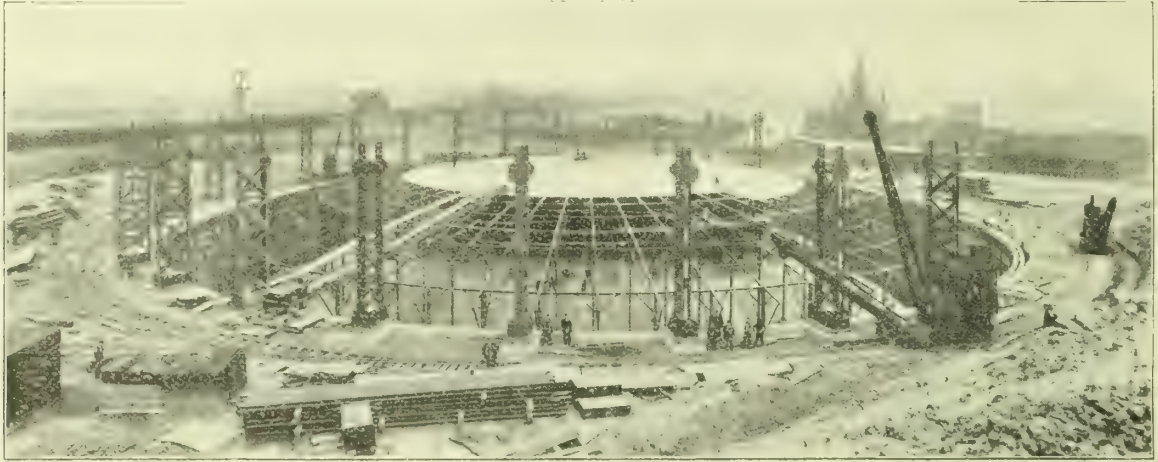


## NEW TANK AND GASHOLDER AT MANCHESTER.

### Inspection by the City Council.

At the invitation of the Gas Committee of the Manchester Corporation, about ninety members of the City Council made last Wednesday afternoon an inspection of the new gasholder and tank now in course of construction at the Bradford Road station. The party, which included the Lord Mayor (Councillor Charles Behrens), Miss Ashton (a lady member of the City Council), and Alderman Gibson, the Chairman of the Gas Committee, spent some hours in viewing the works under the guidance of the Gas

Engineer (Mr. J. G. Newbigging, M.Inst.C.E.) and his assistants. The more energetic members of the Council climbed to the top of the new structure, and in this way gained a better idea of the huge undertaking. In a paper read before the Manchester District Institution of Gas Engineers on Feb. 27, 1909, and published in the "JOURNAL" for March 2 (p. 618), Mr. Newbigging gave full details of the new tank; and particulars of the holder itself were given in an earlier issue—viz., on Jan. 12, 1909 (p. 102).



The Latest Photograph of the Holder.

For the information of the members of the City Council taking part in the proceedings, a pamphlet, bearing the title of "Memoranda re the New Tank and Holder," had been prepared by the

boards 89,500 superficial feet and  $1\frac{1}{2}$  inches thick, walling timbers 14,660 cubic feet, struts 18,330 cubic feet, punchings 3000 cubic feet. Total depth of excavation in the trench, 50 feet; ditto in the pipe recess, 56 ft. 9 in. Total weight of steel and ironwork in tank framing, 258 tons. Water required to fill the tank, 9,042,018 gallons, or 40,366 tons. Cost of tank, £35,638.

### GASHOLDER FOUR-LIFT.

Total capacity of holder, 10,410,000 cubic feet. Ground level to top of holder crown, 182 feet when filled. Ground level to top of guide-framing standards, 169 ft. 6 in. The steel standards and guides are 32 in number, each weighing 30 tons complete. Floating weight of the holder, 1607 tons. Total weight of steel and iron work in the holder complete, 3080 tons, excluding tank-framing previously given. Estimated cost of the holder with tank-framing and inlet and outlet pipes, £52,600.

The holder will be the third largest in the world—that at East Greenwich having a capacity of  $12\frac{1}{2}$  million cubic feet, and the New York gasholder one of 15 millions. In the East Greenwich holder, however, the guide-framing is carried to the height of the third lift only; so that the Manchester structure, while being not quite the largest in the world, is probably the heaviest of its kind. The whole of the work has been designed by Mr. Newbigging. The Contractors for the holder are Messrs. Ashmore,

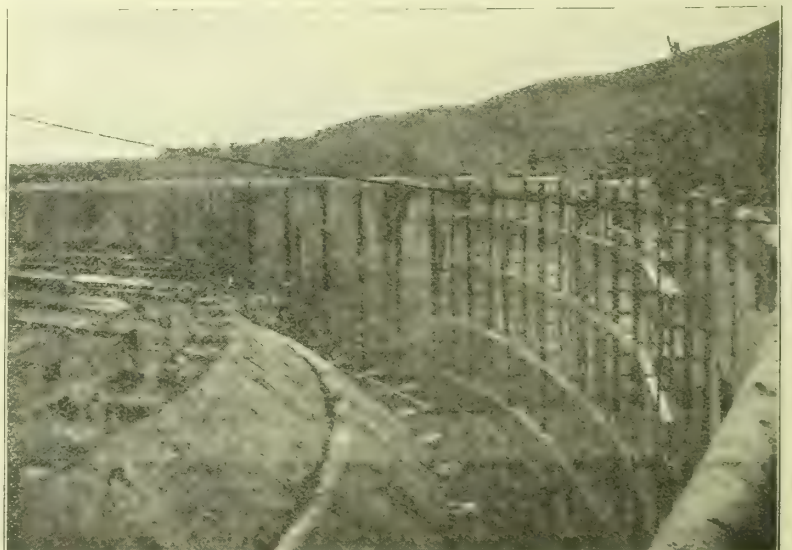


The Tank and Holder as they Appeared last April.

officials of the Gas Department, under the direction of the Engineer. This set forth that the Bradford Road gas-station covers an area of 52 acres and 3856 square yards; that the foundation stone of the works was laid by the late Alderman Hopkinson on Oct. 10, 1877, the land having been acquired in 1870 for gas first manufactured on Dec. 16, 1884; that the present capacities of the works are 8 million cubic feet of coal gas per 24 hours and  $6\frac{1}{2}$  million cubic feet of carburetted water gas, with a total storage capacity of 13.8 million cubic feet; and that the value of the land, buildings, apparatus, and gasholders was £857,366. The following particulars were furnished as to the new tank and holder.

### TANK.

Size of tank, 285 feet in diameter and 43 feet deep. Excavation for tank walls, &c., 107,000 cubic yards. Clay puddle, 7940 cubic yards; cement concrete, 5660 cubic yards. Number of bricks required for tank, 4 millions. Thickness of tank wall, 5 ft. 6 in. at base, and 2 ft. 9 in. at the top. Stonework, 10,225 cubic feet. Timber used in the excavation to keep the ground intact until the walls are built—polling





Benson, Pease, and Co., Limited, of Stockton-on-Tees; the contract for the tank being let to a local contractor.

### Hospitality of the Gas Committee—A Novel Suggestion by the Gas Engineer.

At the conclusion of the inspection, the party drove to the Town Hall, and were entertained at dinner by the Gas Committee. The company included the Lord Mayor, Alderman Gibson, Mr. Newbigging, Mr. A. Price (Superintendent of the Gas Department), Mr. Charles Nickson (Consulting Superintendent), and Mr. T. Vosper (Chief Clerk). A short toast list was gone through.

Alderman GIBSON, in the course of his speech in responding for the Gas Committee, presented some interesting particulars in regard to the development of the gas undertaking of the Corporation, and showed how the need had arisen for the construction of the new tank and holder at the Bradford Road works. He mentioned incidentally, on the question of cost, that the first holder put up for the Corporation averaged £21 per 1000 cubic feet of gas; while the present one would only average £8 10s. per 1000 feet. As to the need of greater storage capacity, he told the company how some five years ago the gas supply nearly gave out. It was about Christmas time, and so foggy that gas was being consumed practically all through the day and night for nearly a week. As they had no capacity for storing more than an average day's consumption, the Gas Department was, so to speak, working from hand to mouth; gas being used as fast as it could be made, and there being no reserve. Alderman Gibson added that during the whole of his seventeen years' chairmanship of the Gas Committee they had never had sufficient storage capacity; but with the new holder in use in the winter of 1911 they would be in a position to meet without trouble any abnormal demand.

Mr. J. H. THEWLIS, in proposing the toast of "The Engineer," spoke in flattering terms of the ability of Mr. Newbigging, who had, he said, secured for himself a high and well-deserved reputation in the gas profession, as had his father, whose advice was still in request as a consulting engineer. By his knowledge and experience, the Engineer to the Gas Department had, in the construction of the new tank and holder, relieved the Council from having to call in an expert; and he had, as a consequence, saved the city a very considerable sum by carrying out the work himself. It was a matter of great satisfaction to the Corporation to know they had so valuable a servant, under whose guidance the work in connection with the new tank and holder had been carried out. Not only did Mr. Newbigging see to the getting out of the designs and specifications, but he superintended the operations from the start to the present advanced state of construction.

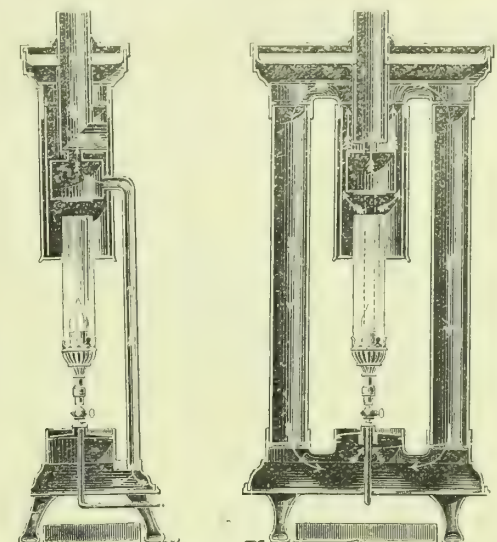
Mr. NEWBIGGING, on rising to respond, was received with applause, which was continued for some time. In the first place, he thanked Mr. Thewlis for the way in which he had proposed the toast, and for the kind reference made with regard to himself. He said he did not overlook the fact that much of the success he might have attained in supervising the technical work of the Gas Department in Manchester was due to the encouragement he had received from the Chairman of the Gas Committee, and to the thoroughness with which Alderman Gibson had entered into any schemes submitted to him for improving the work of the Department. He was also fortunate in having as his colleagues a thoroughly capable technical staff, whose assistance in the carrying out of such work as the visitors had just seen had been invaluable, and whose earnest desire, equally with his own, was that the gas undertaking should be brought to the highest state of efficiency, and be worked in the best interests of the consumers. It was a happy thought of Alderman Gibson to invite the members of the City Council to inspect the work they had in progress at Bradford Road in the construction of the 10 million cubic feet gas-holder—particularly at this time, when it was in its most interesting stage of construction. Having seen it for themselves, and been supplied with a considerable amount of information with regard to the structure, it was unnecessary for him to take up their time by going into further details. He might say, however, that the Contractors selected by the Committee to construct the tank and holder were firms of the highest reputation in this class of work, and had carried out their contracts thoroughly and well. In twelve months' time, the whole of the structure would be completed and available for use. The Gas Department would then reap the economical and other advantages which adequate storage capacity would give; and he was sure they would all wish with him that the Chairman might be there to inaugurate the holder to the public use. Proceeding, Mr. Newbigging said: I should like, with your permission, in a few words, to take this opportunity—an opportunity which rarely presents itself, of an official being able to speak to his City Council—to impress upon you the advantages which accrue to such cities as Manchester in giving a cheap supply of heat and power in the shape of gas and electricity, in order that solid fuel can be displaced to the greatest possible extent. It is estimated that about 750,000 tons of solid fuel—mainly bituminous coal—are used annually in domestic fires in Manchester; and if this could be reduced even to the extent of one-half, it is difficult to properly realize what an effect it would have in improving the atmospheric conditions of the city, and the lessening of damage to the health and property of its inhabitants. It is useless to adorn the city with costly and beautiful buildings in the shape of Art Galleries and the like, without first attempting to make provision to save them from disfigurement and destruction by reducing the output of smoke, with its attendant evils; and the city has in its possession two departments—gas and electricity—which can effect the only practical remedy for the smoke nuisance. This desirable state of affairs can only come within reasonable expectation of being realized by removing every obstacle in the way of distributing cheaper supplies of gas and electricity. I venture to say that one of the best pieces of work carried out by the Chairman during his tenure of office was the abolition in 1903 of the charge for the hire of cooking-stoves—costly as this has been to the Gas Department in loss of revenue—when there were only 12,803 in use; the advantage being shown by the fact that there are now upwards of 50,000. At a low estimate, these 50,000 cooking-stoves have displaced 50,000 tons

of coal per annum in domestic fires. At least an equal quantity of coal could be displaced, if somewhat similar facilities were given for the use of gas-fires for heating; and I trust the City Council will see their way to reverse their decision of a few months ago. When it is remembered that only about 20 per cent. of the total quantity of gas manufactured in Manchester is used for purposes other than illumination, it can be seen what a field there is for development in this direction. I am sanguine enough to believe that it is within the range of "practical politics" that future generations will realize that, instead of such departments as gas and electricity being rate-aiding, it will be more profitable to have them rate-aided, as the savings which would be effected in preserving the health and property of the inhabitants of large cities, by supplying gas and electricity at low prices, will far outweigh the sums contributed by them in aid of the rates. The Corporation of Glasgow are taking a strong lead in the direction of cheapening their gas and electricity supplies, and educating the people in their efficient and economical use, in order that the smoke evil may be effectually dealt with; and I trust Manchester will not rest satisfied to take second place in such a campaign.

### CLARK'S SYPHON STOVES.

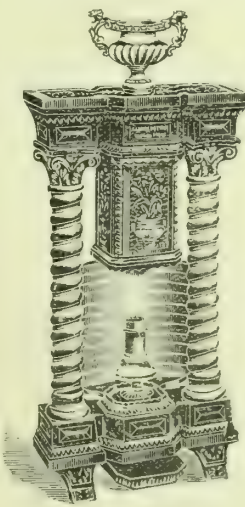
#### A New Greenhouse Heater.

THERE is on view in the new show-rooms of the Clark's Syphon Stove Company, Limited, at No. 132, Queen Victoria Street, E.C., a very attractive array of improved patterns of the well-known "Syphon" and other heating stoves, which will repay careful inspection. The name of the firm's specialities has, of course, long been familiar; but, nevertheless, there are two or three points about the stoves which, to the average lay mind, require some explanation, in order to be fully understood.

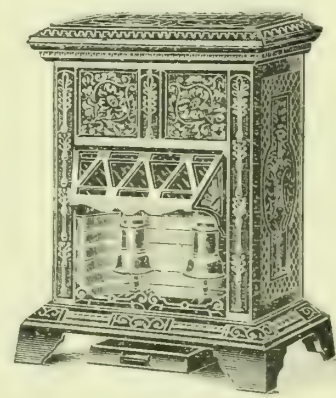


The Action of the Syphon Stove.

As shown, the hot gases, after leaving the burner, first of all strike the central heating chamber, pass over the shoulders and down the side columns, and are condensed, as in ordinary condensing stoves. Then, as illustrated above, the hot air is drawn from the condensing chamber by a vacuum caused by the heating of the central heating chamber, up the tube at the back of the stove, where it is re-burned or re-heated and allowed to mix with the superheated air, before being sent out into the room.



The "Corinthian."



The "Czarina."

Special attention may be drawn to the fact that these "Syphon" stoves are claimed to give out pure heat only; and they can be employed for the heating of any building or room. In fact, many



are now used for heating aviaries and greenhouses. When employed in the latter, a moist heat can be obtained by putting water in the top of the stove in the space provided for it. The Company manufacture several patterns of stove on this "Syphon" principle, and to suit the varied requirements of home, office, or workshop. Among others, there are the "Czarina" and the "Reflex," which are exceptionally powerful heaters; while the "Corinthian" and "Princess" are of decidedly artistic appearance. Since the Company was formed, special attention has been devoted to the matter of finishes; and a strong feature is now being made of the new bronze copper finish. This is a very pleasing and soft tint, and is excellent for decorative purposes. All the "Syphon" condensing stoves made by the Company are now fitted with patent and efficient governors, which automatically regulate the flame to suit the varying local pressures.

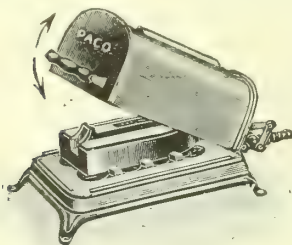
In the "Motex" garage and greenhouse heater, the Company have an appliance which promises to have a big future. A decided point is that the heater can be fitted inside the house. There is no danger of petrol fumes coming into contact with the flame of the heater, or of any of the products of combustion entering the room so as to injure plant life. The air is drawn in by means of flues through the combustion chamber, and the waste products carried out in a similar manner. There is a central flue, round which the atmospheric burner is fitted inside. This being quickly heated, it draws its requisite supply of air from the room and passes it through the stove. The water-chamber is made of strong copper, and is constructed to secure the best possible results from the gas consumed. It is arranged with an outer and with cross sectional chambers; and it contains only a small quantity of water, which permits of quick circulation with a small gas consumption. The "Motex" is made in two sizes, and is very compact. No. 1000 (14 inches diameter) will heat 40 feet of 3-inch or 60 feet of 2-inch piping, while No. 1001 (16½ inches diameter) will heat 60 feet of 3-inch or 80 feet of 2-inch piping.

The good name which Clark's stoves have always had should be enhanced by the improvements that have been introduced. The new management are tackling the business in a practical and energetic manner, which should ensure a big demand for their manufactures.

## THE "PACO-HENNIGER" GAS IRONING STOVES.

In many trades which need not be enumerated here, the use of a hot iron plays an important part; and therefore the question of the best and most economical method of heating this appliance is one that is worthy of careful consideration. Some ways may be inefficient, and some wasteful; but the features of the "Paco-Henniger" ironing stoves, in which gas is the heating agent employed, would seem to show that neither of these disadvantages will be found to attach to them. In fact, it is claimed for the system that it has been designed with the primary objects of reducing the consumption of gas to the lowest possible limit, and of supplying the worker at any time, according to the work at which he or she is employed, with irons ready for use and at the right temperature. The one, it is claimed, has been achieved by making the utmost possible use of the calorific value of gas, and the other by having paid due regard to every possible requirement peculiar to, and distinctive of, those trades where the handling of irons is part and parcel of the business. The "Paco-Henniger" ironing stove, though only now being introduced in this country, is not by any means an untried idea, for there are already over 4000 of the appliances used daily abroad; and an inspection and explanation of the apparatus in the show-room of the Agents—the Patent Appliances Company—at Nos. 15-17, City Road, E.C., convinces one that it is deserving of thorough investigation by those whose operations call for the aid of hot irons.

The stoves are of various sizes, and differently arranged to suit the needs of particular businesses. Taking the first illustration,

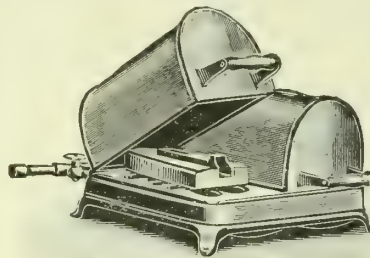


"Paco-Henniger" Single-Burner Ironing Stove.

which shows a single-burner stove, it may be remarked that the bunsen burner under the iron is, while heating is in progress, shut in by the cover, which is heavily insulated; and by means of baffle and guide-plates, the heat in the chamber thus formed is forced to circulate round the iron several times before the products of combustion pass out of the opening in the top of the cover. The object of this is to thoroughly heat the iron from all four sides, instead of only from the bottom, as with open burners or hot-plates. Underneath the burner there are fitted a baffle and a guide-plate, the intention of which is to serve the twofold purpose of shutting off the heating chamber and causing the primary air to be drawn in laterally and thus become preheated, so as to still further increase the power of the burner. The burner has a bye-pass; and in the smaller types of stoves, the extinguishing and re-lighting of the bunsen burner is performed automatically. That is to say, the hinged cover is connected with the burner-tap in such a way that, when the cover is lifted for the insertion or withdrawal of an iron, the main supply of gas is automatically

turned off, and only the bye-pass is left burning. Upon the lid being closed down again, the supply of gas is similarly turned on, and the burner is relighted. Thus there is no waste of gas. The small iron heaters shown are arranged for standing on a bench or table; but it may be pointed out that they can, if desired, be had fitted on convenient stands.

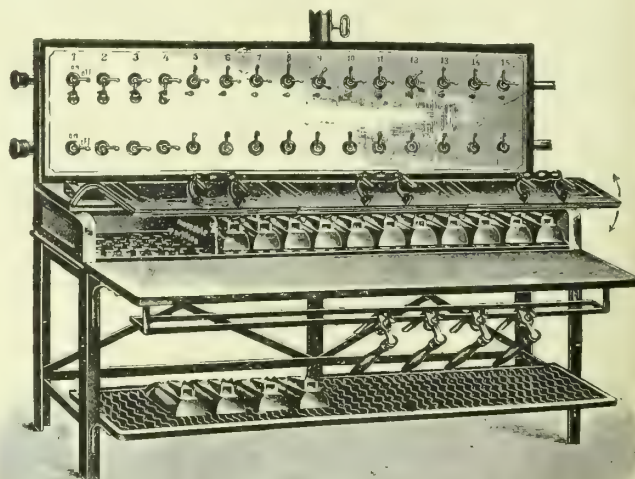
The above explanation of the principle on which the apparatus is constructed applies, of course, to the large as well as the small



"Paco-Henniger" Stove with Two Burners.

sizes. In the case of the former, however (all of which have stands), each burner and bye-pass is capable of separate and independent manipulation and adjustment from a switch or controlling board, which is provided in the manner depicted in the third illustration. In the three-burner size and upwards, too, the heating of all irons can be accomplished in one large, common chamber, which has the advantage that, when the irons have been heated, some of the burners can be turned down, leaving just sufficient—say, one burner—to keep the irons hot with the lid of the apparatus closed. As each burner can be regulated separately, it is possible to have the various irons at different temperatures; and this, we learn, is an important consideration in connection with the tailoring and clothiers' trades, the work of which does not under all circumstances demand irons of one temperature.

Another feature of these large stoves is an arrangement by which, when desired, the heating-chamber can be subdivided into separate compartments, by means of movable partitions, which are also insulated with asbestos. This further facilitates the heating of the irons to different temperatures; while, of course, if only one iron is needed, the subdivision of the chamber enables this to be quickly done with one burner only alight. With the large stoves, it may be added, the irons are heated in one or two tiers, according to the use for which they are required. One form of three-burner stove will heat six irons (in two rows), and will then keep them ready for use with the aid of the centre burner only, while the largest size of tailor's stoves has nine burners, and is fully capable of taking in the two rows from eighteen to twenty irons, according to their bulk; and when forty irons are available, this permits the continuous use of twenty, because as soon as one is withdrawn another can, of course, be put in its place. With the single-burner stove, as a matter of fact, it is guaranteed that, with a properly adjusted gas supply, and by employing three irons for interchanging, a continuous supply of hot irons can be provided for the simultaneous use of two workers, owing to the short time that is required for heating. Laundries and hat-makers, who must have as hot an iron as possible, and uniform temperature, are supplied with stoves in which the irons for heating are placed in one row; the largest stove having fifteen burners, to which the air supply takes place under a pressure of about 4 inches.



A Large "Paco-Henniger" Stove.

The iron itself is also the subject of a patent, the point of which is a detachable handle having an eccentric locking device. The handle has a tongue which is slipped into the iron; and then with one half-turn, an eccentric thumb-screw at the back engages with a catch on the iron, and thus grips the iron firmly. The rigidity of this grip is not lessened by wear, as both the eccentric screw on the handle and the catch on the iron are conically shaped. One handle fits all sizes of the "Paco-Henniger" irons; and it is, of course, not necessary to have a separate handle for each iron. Fixing and detaching is the work of a moment; and the handle is always cool, as it does not remain in the stove with the iron.

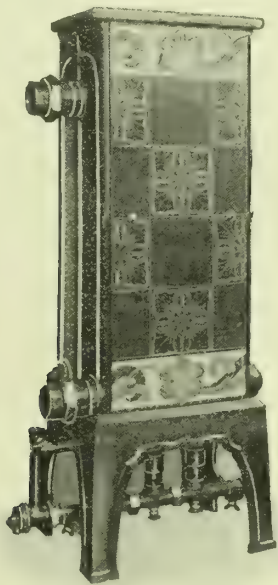


Among the advantages claimed for the system is that the complete combustion of the gas enables irons to be heated in a remarkably short time, which means an economy of gas, in addition to that which is secured by the bye-pass regulation of the burners. This complete combustion, too, is an obvious advantage from a hygienic point of view. Then, flexible tubing can be dispensed with. In large laundries it will probably be found more satisfactory for each girl to have a one-burner stove in front of her; but in many circumstances one large stove would likely be preferred. The bigger patterns are provided with flues. The appliances are of most substantial make, and can be confidently relied upon to enjoy a long life.

To the tailoring trade, the "Paco-Henniger" stoves should certainly appeal strongly; and they should also play an important part in connection with laundries, hatters', and other businesses. Thus there is a large field open to them, the filling of which, while proving satisfactory to both sellers and buyers, will also be a gain to the suppliers of gas. It is, of course, because of the latter consideration that we welcome the invention—as we do everything that is likely to popularize the use of gas—and bring it to the notice of our readers.

## THE "RAMASSOT" GAS-BOILER.

AMONG the varied assortment of exhibits in the engineering line which are now to be seen at Olympia, is a new gas-heated boiler for central heating by means of hot-water radiators, which is being placed on the market by Messrs. J. Marse and Co., of Imperial Buildings, Ludgate Circus, E.C. This has been named the "Ramassot" low-consumption gas-boiler; and as it is in action on the firm's stand, visitors to the Exhibition are afforded an opportunity of judging for themselves as to its water-heating efficiency. Usually, the appliance would be located in some such position as a hall; and its elegant appearance renders it suitable for any prominent place. The finish is, of course, a matter of taste. It can be painted, enamelled, or covered with glazed tiles; and a marble top adds to its attractiveness.



The "Ramassot" Gas-Boiler.

Appearance, however, though often, as here, an important factor, is not by any means the principal point in connection with gas-heated appliances, whatever may be their nature. We have first to look at their capacity for performing what is required of them. Judged also from this stand-point, however, the "Ramassot" boiler should not be found wanting; for the latest official trials, which were made as severe as possible, and were carried out by a Committee of the French Association of Boiler-Owners, showed an efficiency varying between 82 and 93 per cent., while, in addition to this, the apparatus was a few months ago granted the highest award by the Société Technique de l'Industrie du Gaz en France. The facts being so, it is not to be wondered at that the boiler is regarded by all interested in it with the utmost degree of confidence. The one at Olympia is fitted with three burners; and a few evenings ago this was seen (by means of a thermometer fixed on the outlet-pipe) to raise the temperature of the water in it from 66° to 190° Fahr. in ten minutes.

At present the boiler is made in five sizes, capable of supplying radiators having a heating surface of 65 to 430 square feet; but as it is made up in sections, the size merely depends upon the number of the sections, or the elements, employed. The height in all cases remains the same; and the elements are interchangeable. The elements are connected together by means of screwed nipples; and the water inlet and outlet are arranged at the side of the apparatus. There is a flue to carry away the products of combustion; and a collector is provided for drawing away the water of condensation. The sections are all made of the best

selected cast iron; and the centre of each is formed of a copper tube, which is expanded in position in such a manner as to prevent any possibility of leakage. Provision is made in this tube for expansion and contraction with varying temperatures. Each section has its own burner, which is of the firm's well-known "Visso" double bunsen type. Small jets, or pilot-lights, are also fitted; and these are first of all lit, and, when the main gas supply is turned on, they ignite the large burners. The small jets are then at once extinguished. The efficiency of the boiler is claimed by the firm to be due, in the first place, to the burner employed. Furthermore, they add that the action of the elements is based upon a well-known principle applied in a new form: (1) The central part of each element being formed by a copper tube, and serving as a chimney to the burner, it practically heats the water instantaneously; (2) the ribs of each element are so cast that, when all are bolted together, the hot gases completely surround the channels containing the water; and (3) the flames and hot gases return to the bottom of the boiler before passing into the atmosphere—their direction being contrary to the flow of the water. The water enters at the bottom of the boiler; passes up one side, and down the other; and then enters the annular space round the central copper tube. Up to this point, the water has been slightly heated by its contact with surfaces heated by the waste gases; but on reaching the hot copper tube, it becomes suddenly heated, and rises rapidly to the top of the annular space, drawing more water behind, and thus causing a quick circulation through the whole system.

A feature of the apparatus is the patent brass regulator, in which a mixture of glycerine and water acts on a rubber diaphragm attached to a piston. This piston (actuated by the influence of the temperature on the sensitive mixture referred to), according to its upward or downward movement, opens or shuts the gas supply. A second piston, fitted above the first one, is operated by hand, and can be set so as to determine the exact point of closing the gas-inlet. In this way, any desired temperature can be retained. The regulator prevents the water rising above a temperature of 203° Fahr.; and a bye-pass is fitted, so that in no case will the gas be entirely shut off from the burners. The consumption of each burner can be varied between 35 cubic feet and 5 cubic feet per hour; and when once a three-burner boiler has been raised to the desired temperature, it will keep hot 216 square feet of radiators with a consumption of about 15 cubic feet of gas per hour. Each burner is under separate control, so that one or more may be used, as required. With all the burners full on, the hand can be comfortably placed over the flue through which the combustion products pass; so that the loss of heat is slight. All parts of the boiler, it may be pointed out, are easy of access.

Though naturally the gas consumption varies according to the amount of heat required, it is claimed in all cases to be considerably less than that of any other gas heating arrangement. In conclusion, it may be remarked that the apparatus will work with any pressure of gas from 5-10ths upwards.

## IMPROVED WATER SUPPLY FOR PORTSMOUTH.

New Covered Service Reservoirs, Filter-Beds, &c., at Farlington.

By invitation of the Directors of the Portsmouth Water Company, a large party, including a number of ladies, visited the new storage and filtration works which have been carried out by the Company at Farlington, on Portsdown Hill, to the plans and under the supervision of their Engineer, Mr. Herbert Ashley, M.Inst.C.E. Among those present were the Chairman (Mr. W. Grant, J.P.), the Deputy-Chairman (Colonel C. Lanyon Owen, J.P.), other members of the Board, the Secretary (Mr. J. L. Wilkinson), the Engineer, the Mayor of Portsmouth (Sir W. T. Dupree), and the Town Clerk (Mr. G. Hammond Etherton); also some of the shareholders of the Company, and members of the Portsmouth Town Council and of the Urban and Rural District Councils outside the borough coming within the Company's statutory area.

On arriving at the site, the party were conducted into one of the reservoirs and welcomed by Colonel Lanyon Owen. Mr. Ashley then furnished the following particulars in regard to the works, which cover 12 acres of ground.

### THE FILTRATION WORKS.

The selection of Portsdown Hill as the site of the filter-beds carries with it, among other advantages, a very important one which makes this installation perhaps unique among filtration works in this country. Usually the water is filtered at a low level somewhere near the source, and pumped into high-level service reservoirs for distribution; but in the present case the pumping is done before filtration—the water being delivered by the pumps straight on to the filter-beds, from which it gravitates direct to service reservoirs, and thence to the Company's district. Consequently, it is never exposed to daylight from the moment of filtration until it issues from the consumers' taps. The pumping of the water prior to filtration is a great advantage. The works are constructed on the side of the hill, which slopes gently from north to south; the northern part of the filter-beds being cut in'o,



and founded on, the solid chalk, while the southern half is carried by means of concrete arches on brick walls over the northern portion of the new reservoirs, thus forming part of their roof.

The filter-beds first are seven in number; six of them measuring 200 ft. by 100 ft., while the middle one is about 150 ft. by 130 ft. The surface of sand in each of the filters approaches half-an-acre in superficial area. The square shape of the central bed allows room for the location in a central spot of the necessary permanent hydraulic sand-washing plant. Each bed is really a brick and concrete tank 9 feet in depth; the inlet for unfiltered water being on the northern side, while the outlet for the water after filtration is on the southern side. The unfiltered water flows from the pumping mains quietly on to the beds above the sand level through the inlet-wells on the northern side. After sinking slowly through the sand, it finds its way into innumerable small brick channels formed on the bottom of the filter-tanks. These channels run east and west, and converge to the main collecting channel, which runs north and south from the inlet to the outlet well. The filtered water flows southward down this channel direct through the outlet-wells and regulating apparatus to the covered service reservoirs, and thence to the consumers.

The sand itself is 3 feet in thickness, and is of so fine a texture that 75 per cent. of it will pass through a sieve having 1600 openings to the square inch. In order to prevent it from being carried down with the water as this passes through it, it is supported on layers of shingle very carefully graded from coarse to fine; the finer layers being just under the bottom layers of the sand, while the bottom or coarser layers rest direct upon brick drains. The most scrupulous care was taken in the selection of the sand. It was thought undesirable, for many reasons, to have sea sand; and that which was ultimately used comes from the top of an uninhabited hill near Pulborough—thus ensuring against the remotest chance of any contamination. The shingle which supports the sand came from near the Needles, to the west of the Isle of Wight; but, notwithstanding this extreme care in the selection of the source from which these materials were to be derived, both the sand and the shingle were most carefully washed—a work the magnitude of which may be imagined when it is borne in mind that no less than 30,000 tons had to be dealt with.

#### THE RESERVOIRS.

Each of the two new reservoirs measures 360 ft. by 160 ft., contains 13 ft. 6 in. depth of water, and has a capacity of rather more than 4 million gallons when full. Large as these reservoirs may seem to be on inspection, the capacity of each when full is no more than sufficient to supply Portsmouth for something like six or eight hours on a busy summer morning. The portion of the reservoirs lying outside and to the south of the filter-beds is covered with a ferro-concrete roof on the Hennebique system; the total area of roofing to both the old and the new reservoirs being 3 acres. From the new reservoirs a 30-inch outlet-main conveys the water to the base of the embankment of the old ones, at which point it is connected with all the gravitation mains of the Company. These connections were of an extremely difficult nature; the pipes varying in diameter from 12 to 36 inches. There were no less than 16 of them to make, and the work had to be done without interfering in any way with the supply to the district. By working on Saturday nights and Sundays for the most part, all these were carried out without any interruption to the supply. The two large service reservoirs built more than forty years ago, and situated to the west of the new works, and also the two small reservoirs a mile away, have also been covered with a ferro-concrete roof.

#### SOME FEATURES OF THE WORKS.

One of the most interesting features of the work has been the water-tighting of the floors and walls of the filter-beds and the new reservoirs. No less an area than 7 acres had to be dealt with, and the whole of this large surface was covered with two coats of cement rendering. The total thickness was 1 inch; the first coat being  $\frac{3}{4}$  inch thick, and the finishing coat  $\frac{1}{4}$  inch and brought to a fine, smooth face. The result has been extremely successful; the most careful tests, frequently repeated, disclosing no leakage whatever.

In two red-brick houses to the west end of the works are installed two Venturi meters. One of these registers all the water pumped on to the works, and the other that which passes out to the Company's district. The latter instrument not only registers the total flow, but keeps a continuous record of the rate of flow at every minute of the day and night; thus giving valuable information with regard to the requirements of the district from time to time. The readings of the two meters are compared week by week, and any failure to balance shows at once any defect in the whole works.

#### SOME STATISTICAL INFORMATION.

The filtering capacity of the works is 12 million gallons per 24 hours; and the high-level filtered water storage capacity is now no less than 14 million gallons, or very nearly 48 hours' supply. If the 3 million gallons of water in the filter-beds themselves are added, it is somewhat above this. It may be pointed out that in this respect Portsmouth is in a more favourable position than the Metropolis, which only possesses a high-level filtered water capacity of about a day's supply. In carrying out the works, no less than 200,000 tons of material had to be handled, 100,000 tons of which had to be brought by rail and transported up the hill. Some 800 tons of ironwork were used, 40,000 tons of

portland cement concrete, 30,000 tons of filtering material, 6000 tons of concrete, and no less than 3 million bricks. These had to be of great strength, as in places the brickwork is subjected to a pressure of 9 tons per square foot; and they all came from the neighbourhood of Horsham.

Mr. Ashley added that the works had been admirably carried out, without any extras being incurred, by Messrs. John Mowlem and Co., of London, who were represented by Mr. Harvey Collingridge; the Company's Resident Engineer on the works being Mr. D. S. Williams. The amount of the contract was £73,092; and the final quantities and account have been settled—the total being £73,263, or only £171 in excess of the original amount. The whole of the money, less 10 per cent. retention, has been paid. The retention-money amounts to £7326; and it will be paid at the end of March next, when the Contractors' term of maintenance expires. The contract price includes all the pipes, special castings, &c., the connections between the new and old mains—in fact, everything necessary for the completion of the work as it now stands. No land had to be bought; that upon which the works are built having been acquired by the Company many years ago.

The weight of water distributed every 24 hours by the Company amounts to very nearly 40,000 tons. The population now under supply is approximately 233,500; and it is growing at the rate of between 3000 and 4000 per annum. The weight of water used by each consumer is something like 54 tons a year; and it is supplied and delivered into the consumers' houses at a charge to the consumer of slightly less than 1½d. per ton—a remarkably low figure when it is considered that water has to be obtained, pumped, filtered, stored, and distributed at an extreme distance of something like eight miles from its source. The total length of mains, which vary in size from 2 inches to 36 inches, is nearly 250 miles.

#### Some Appreciative Remarks.

At the close of Mr. Ashley's remarks, which were listened to with much interest,

Mr. GRANT explained that the Directors, determining that the water supply of Portsmouth should be above suspicion according to the demands of modern sanitary science, had decided upon carrying out filtration works because of the cloudiness of the water at certain times after heavy rains. This cloudiness, which was due to the scouring-out of earthy matter from minute channels in the chalk, did not make it at all deleterious—at any rate, it had not affected the health of the town. But the Directors had faced their responsibility—recognizing that no great commercial undertaking (even a monopoly) could thrive in the long run unless it satisfied the reasonable needs of its consumers. Their endeavour was to satisfy the demands upon them in every way; and therefore the expenditure had not been studied in constructing up-to-date filtration works. He expressed great pleasure in proposing a vote of thanks to Mr. Ashley for his admirable work. The preparation of plans had been entrusted to him, and they were submitted to Mr. Charles Hawksley—one of the greatest experts upon water filtration works—who suggested a few amendments, which the Directors had accepted in their entirety. Messrs. John Mowlem and Co. had carried out the works at a cost of £73,000; and the contract had only been exceeded by £171. In conclusion, Mr. Grant expressed the hope that the relationship between the Corporation and the Company would continue to be of the most amicable character. The Company recognized that they had a duty to the town as well as to the shareholders. "Let us go forward hand in hand," he said, "as friends striving for a common purpose—namely, the good of the town. The Corporation should not grudge the shareholders of the Water Company a handsome dividend upon their enterprise, as a reward for the risks they ran at the commencement; and the Company on its part will not be unmindful of its duties to the community."

Sir G. COUZENS, the Senior Alderman, speaking for the visitors, congratulated the Chairman, Directors, and shareholders of the Company on their very fine achievement, and also thanked them on behalf of the Corporation for inviting them to their new works.

At the invitation of Mr. Grant, the company partook of tea in the reservoir; and at the conclusion of the repast they inspected the works in detail under the conductorship of Mr. Ashley.

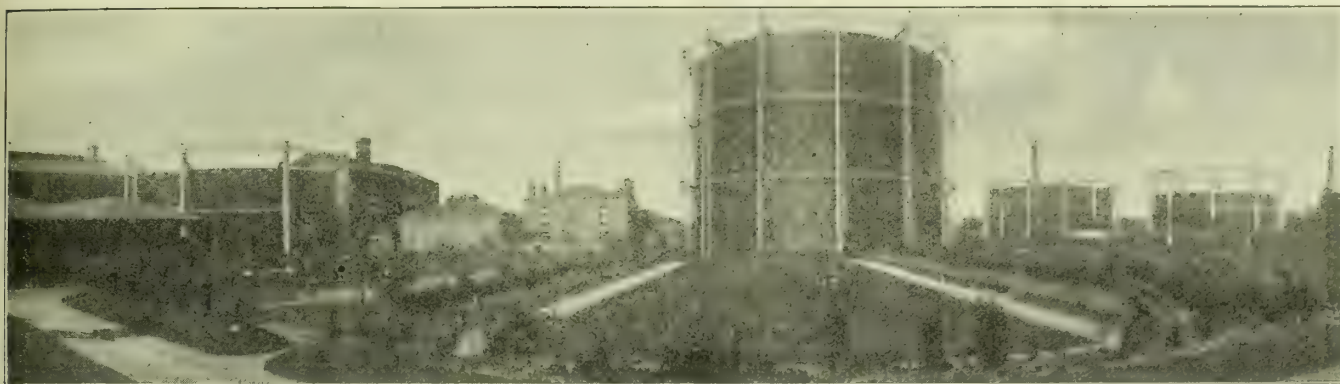
The London and Southern District Junior Gas Association have received an invitation from Mr. E. Pilbrow, Superintendent of the Joint Gas Companies' Exhibit at the Japan-British Exhibition, to visit the exhibit at 3 o'clock next Saturday afternoon, and afterwards to take tea in the Garden Club at 4.30 p.m. Mr. F. W. Goodenough, Controller of the Gas Sales Department of the Gas-light and Coke Company, has kindly consented to preside.

The First Gas-Works at Stonyhurst College.—A correspondent sends us the following extract from the "Stonyhurst Magazine" for August: "An entry in the 'Stoneyhurst Chronology' under the date 1810 reminds us that the first College gas-works were constructed in that year. Their situation was that occupied by the present plumber's yard behind the east wing of the new College. From their construction till their removal in 1847 to their present site, the gas-works were managed by the College plumber, John Grayson—usually known as 'Jack Gas'—a noted character. Subsequently, increased pressure of work in the departments of plumbing and gas making made it impossible for the one man to exercise the functions of plumber and gas man; so the offices were separated. In this centenary year of the introduction of coal gas into the College, it may be of interest to record that the original College gas-works were the first private installation of coal gas for lighting purposes set up in this country."



# EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Meeting at Cambridge.



The Cambridge Gas-Works as seen from the Office Windows.

[Recreation ground in the forefront, with quoit court, bowling green, tennis court, and shooting range.]

Assembling at Cambridge on Friday morning, the members of the Eastern Counties Gas Managers' Association found a programme of varied interest awaiting them; and a welcome on the part of the Chairman (Mr. E. H. Parker, M.A., J.P., D.L.) and Directors of the Cambridge Gas Company that could not anywhere be exceeded in respect of warmth and friendly feeling. What the visitors experienced so bountifully on this occasion, is the common continuous condition that prevails between the Board and their Engineer (Mr. J. W. Auchterlonie), who is this year the President of the Association; and what the mutual confidence and reliance that exist between Board and Engineer and Manager has produced in connection with the Company, was seen at the gas-works, which were the *rendezvous* of the visitors about noon. It is nine years since the Association formally visited the famous University town; and the greatest change that was noted was at the gas-works. The works, under Mr. Auchterlonie's engineership, have been remodelled and extended almost out of recognition by anyone who remembers pre-existing conditions; and it must be said after inspection and investigation that, in his technical and managerial work, Mr. Auchterlonie has served the Company wisely and well. His schemes and plans have not only produced works that serve the Company and Cambridge well, but they have included developments that have made his staff and men feel that they are part and parcel of the concern. The workers of the Company, from Chairman down to the lowest employee, are to-day a contented and happy party, all pulling in the one direction to secure prosperity for the undertaking.

The details of the works are given below. But in walking round them, one felt the pleasures of cleanliness and orderliness abounding on all sides. To run over the work that Mr. Auchterlonie has carried out since he has been in charge would be to describe practically the whole of the plant. It was found that in the horizontal retort-house he has introduced De Brouwer machinery, and he finds the working of this house, under the new conditions, more economical than the inclined retort equipped one, which in its time has done more economical work than the horizontal house

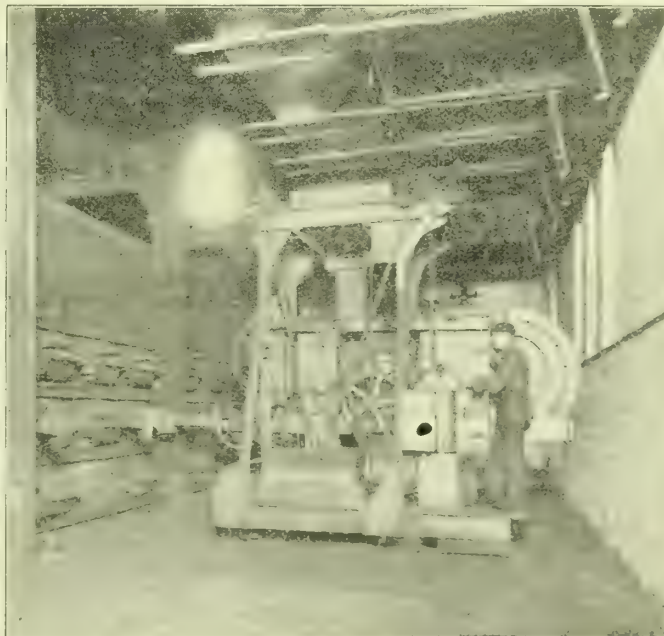
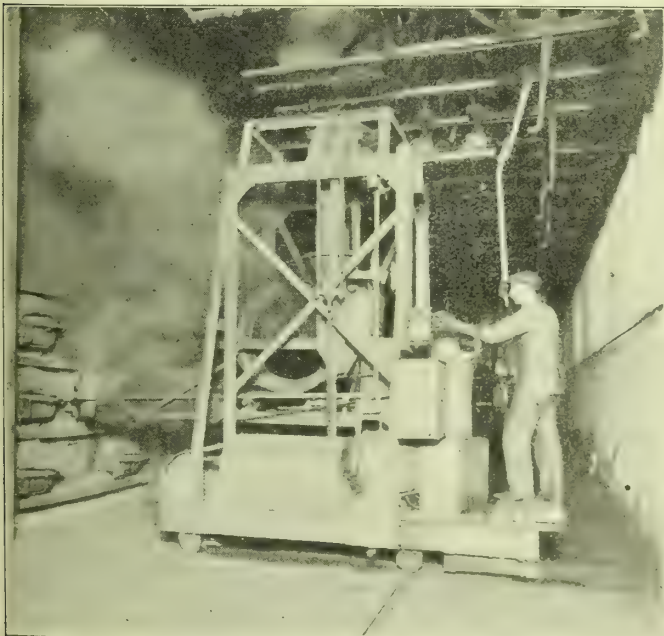
under the old conditions. What was one time economical, is now left behind by progress in other directions.

The De Brouwer plant necessitated an installation of electrical plant for driving; and to give this plant as much profitable work to do as possible, Mr. Auchterlonie uses the energy also for workshop driving. The range of new workshops that he has put in is a feature of the place, with their machine tools, which enable the works to be largely self-reliant in the matter of repairs and much new work. A new exhauster-house, excellently arranged and equipped, is part of the large scheme; and an elevated purifier-house, extensive and perfect in every respect, is another feature over which some time was spent. The evidence of the comprehensiveness of the engineering work that has been executed in late years is rounded off by the largest of the gasholders. Attractive in exterior architectural feature are also the new offices and (near by) the workmen's institute buildings; and internally there is also the material testimony to the thoroughness of design and provision. The board-room, drawing-office, and laboratory are of the special features of the block containing the offices; and the mess room, reading room, and billiard room, of the workmen's buildings. This is not a finished survey of the work upon which Mr. Auchterlonie has been engaged; but enough has been said to show that, since his advent in Cambridge, with the daily routine of a large business open to the competition of a well-managed Electricity Supply Company, the Engineer and Manager has not had many spare ends of time on his hands.

After what has been said, the following detailed notes on the works will prove of interest.

## THE CAMBRIDGE GAS-WORKS.

The site upon which the works are built adjoins the River Cam; the entrance gates being on Newmarket Road. The area covered is about 15 acres in extent; and the works have been so arranged that extensions needed by the increase in business can be simply carried out. The site includes the men's recreation ground, which is tastefully laid out, with grounds for quoits, bowls, and tennis, and miniature rifle-range.



The De Brouwer Charging and Discharging Machine in the Horizontal Retort-House.



The retort-houses are two in number. The retorts in No. 1 house are set horizontally, and consist of ten beds of eight through  $\square$  retorts, 24 in. by 15 in. tapering to 21 in. by 15 in., and 20 feet long; the retorts in each setting being in two vertical tiers of three and two central retorts. The firing is on the full regenerative system. The retorts are charged and discharged from a stage by electrically driven De Brouwer machines, supplied and erected by Messrs. W. J. Jenkins and Co., of Retford.

Coal is delivered to the charging machine from overhead hoppers, to which the coal is supplied by a conveyor, after being elevated from a coal-store flanking the retort-house. The coal-crusher at the foot of the elevator, together with the coal-handling plant, is driven by a 43 H.P. gas-engine, which also drives the dynamo for supplying the current for the De Brouwer machinery and workshops.

The coke from the retorts falls through openings in the stage-floor into coke-barrows on the ground floor, whence, after being slaked from an overhead water-service, it is wheeled out into the coke-yard. No. 2 retort-house contains ten beds of six inclined through retorts of  $\square$  section, 22 in. by 15 in. by 20 ft. long; the retorts in each setting being in three tiers. The firing is on the full regenerative system. The coal-crusher, elevator, and conveyor for this house are driven by a horizontal steam-engine.

Both retort-houses are provided with retort-house governors and tar-columns. In addition to the coal-sheds adjoining the retort-houses in which the crushers are situated, there are two covered coal-stores, each capable of holding 2000 tons of stacked coal.

Following the course of the gas from the retort-houses, a brief survey of the remaining plant may be made. The condensers are of the water type—Morris and Cutler's patent. They consist of

a cast-iron rectangular vessel, 30 ft. 6 in. long by 7 ft. 3 in. wide by 7 ft. 6 in. high, fitted with water-tubes.

In a well-appointed building, are housed three separate sets of rotary exhausters, each set driven by a separate horizontal engine. They consist of one single exhauster of 75,000 cubic feet per hour capacity, and a double set each of 50,000 cubic feet per hour, erected by the Bryan Donkin Company; while a smaller double set, having a capacity of 25,000 cubic feet per hour each, which does duty in the summer months, was made by Messrs. Gwynne and Co. All the exhausters are fitted with automatic governors connected to the steam supply to the engine.

There are three tower-scrubbers, by Messrs. Oliver, of Chesterfield, about 28 ft. 6 in. high by 6 feet diameter, fitted with wood gratings, and one washer-scrubber by Messrs. Kirkham, Hulett, and Chandler. An additional scrubber-washer has been placed in position by Messrs. W. C. Holmes and Co., of Huddersfield, and is capable of dealing with 2 million cubic feet of gas per day. It is driven by a horizontal steam-engine placed at the end; and provision is made for a future electric drive.

The new purifier-house, erected in 1906, from Mr. Auchterlonie's designs, by Messrs. C. & W. Walker, of Donnington, contains four boxes 40 ft. by 30 ft. by 6 ft. deep. These are mounted upon an iron staging in a large house constructed of steel framing, with brickwork enclosure on three sides, and open in front. The purifiers are all fitted with Clapham's "Eclipse" rubber joints. Milbourne's valves and patent fastenings are also provided. The covers are lifted by a travelling crane, by Messrs. Clapham Bros., traversing the whole length of the house. The oxide is emptied through the bottom of the boxes on to the revivifying-flow below. After revivification, the oxide is conveyed in large buckets, travelling on an overhead runway, to a hopper at the foot of an



Purifier House, with Four Oxide Purifiers, 30 feet by 40 feet, and 6 feet deep.

elevator, whence it is lifted to a band-conveyor at the height of the tie-bars of the roof principals, and discharged from an adjustable throw-off carriage, through canvas shoots, into any of the purifier-boxes. The elevator and conveyor are driven by a horizontal steam-engine; but provision has been made for electric driving in the near future.

After leaving the oxide purifiers, the gas is passed through three lime purifiers, each 30 ft. by 20 ft. by 4 ft. 6 in. deep. The boxes are on the ground floor; and the covers are fitted with water-lutes. There are also six small purifier-boxes, each 20 ft. by 10 ft. by 3 ft. 6 in. deep, which are used as catch-boxes only. Under these purifier-boxes, tar and liquor storage tanks are provided.

A Glover carburetter is fixed on the outlet of the purifiers, and "Rock Light" petroleum is vaporized with such satisfactory results that no complaint from naphthalene has been received in Cambridge for nearly two years, whereas a few years ago the trouble from this source was very serious.

The two station-meters, which are housed in tastefully decorated buildings, with open roofs, are of Messrs. Parkinson's make, and have a capacity of 50,000 and 30,000 cubic feet per hour respectively.

There are four gasholders on the works; their capacities being 185,000, 910,000, 280,000, and 530,000 cubic feet respectively—a total storage of over 1½ million cubic feet. Of these, the largest was erected in 1905 by Messrs. C. & W. Walker, to designs prepared by Mr. Auchterlonie. Two governors serve the town, and a smaller governor supplies the Fulbourn Asylum, at a distance of three miles from Cambridge.

A new boiler-house, containing two Lancashire boilers, each

7 ft. 6 in. diameter, by 30 feet long, has recently been completed to Mr. Auchterlonie's designs. The boilers are by Messrs. John Thompson, of Wolverhampton. They are provided with forced draught for burning breeze; and each boiler is capable of supplying all the steam required on the works. The boilers are fed by the returned water from the gas-condensers. The front of the house is provided with rolling shutters.

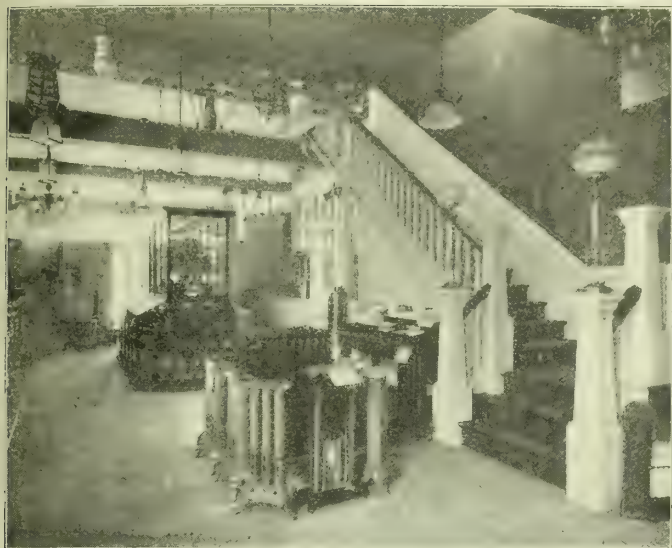
The tar and liquor is contained in three tanks, and is run down to the river, and taken in barges to King's Lynn. The necessary water for slacking coke is pumped up to an overhead tank from the river.

A complete range of new workshops, comprising engineers' shop, fully equipped with machine tools, smiths' shop, with power hammer and shearing machine, carpenters' shop, with planing and other machines and circular saw—all driven by electricity—has lately been added, in which all repairs required are capably dealt with.

A suite of new offices, consisting of coke office, works manager's office, drawing office, and a very completely equipped laboratory and board-room, together with fire-resisting stores, are contained in a well-constructed building of neat design, at the new entrance gates from Newmarket Road. In the laboratory there is a new recording calorimeter by Fery, manufactured by the Cambridge Scientific Instrument Company.

The workmen's comfort and welfare are provided for in the Workmen's Institute—a building in the same style as the offices, and facing same at the entrance. It contains a handsome mess-room (used also for concerts and meetings), reading-room, and billiard-room with full-sized table (the personal gift of the Directors to the Men's Recreation Club). The whole of the rooms are





Views in the Show-Room.

provided with a glazed tile dado of pleasing design; and the walls above are painted with enamel in subdued colours. The foregoing buildings were designed by Mr. Auchterlonie, and the work carried out under his personal supervision.

The total amount of coal carbonized last year was 35,100 tons; and the quantity of gas made in the same time was just under 400,000,000 cubic feet.

The show-rooms in Sidney Street are commodious, and attractive in appearance. They are fitted up in such a manner that no consumer coming into the offices to pay his account or give an order can fail to see the various appliances that the Company have for the consumption of gas. The offices also and work-shops are spacious and well equipped.

#### THE VISITORS AND THEIR HOSTS.

From the gas-works, the visitors were driven to the University Arms Hotel, where they were entertained at luncheon by the Chairman (Mr. E. H. Parker) and Directors of the Gas Company. Besides the Chairman, the other members of the Board present were: Mr. W. B. Redfern, Mr. J. B. Peace, M.A., and Colonel C. T. Heycock. Mr. H. Darwin was unavoidably absent. The officers of the Company were represented by Mr. Auchterlonie, the Secretary (Mr. A. E. King), the Accountant (Mr. G. W. Lawson), the Draughtsman (Mr. Hoff), and the Chemist (Mr. Wilkinson). The guests included the Mayor (Alderman Spalding), the Master of Corpus, Professor Pope, Mr. R. Stephenson (Chairman of the Newmarket Gas Company), the Manager of the Electricity Supply Company (Mr. Pierce), the Borough Surveyor (Mr. Julian), and the Borough Accountant (Mr. Gait). Between Company and Corporation, there prevails the utmost good and co-operative feeling; and there are no strained relations between the Company and their business rivals, the Electricity Company. The mention of the name of Mr. Pierce as being present as a guest was greeted with hearty applause.

After the generous luncheon,

The CHAIRMAN remarked that there was no set toast list, as there would be an opportunity of speaking later in the day. But he could not let this opportunity pass of expressing, on behalf of the Directors of the Gas Company, a hearty welcome to the members of the Association. He hoped that their visitors had been favourably impressed with what they had seen at the works; and he trusted they would find time to see something of the beauties of the town. He should like to say a special

word with regard to his friend Mr. Auchterlonie, the President of the Association this year. The members had been over the works; and they had there seen the result of Mr. Auchterlonie's ability. The Directors were indeed much indebted to their Manager. The works had been very successful under his supervision; and they counted themselves extremely lucky in obtaining so able a man. They had present that day the Chairman of the Newmarket Gas Company, who was for years the Chairman of their County Council, and rendered in that capacity valuable service. They had also present the Chairman of the Cambridge Water Company, and the Chairman of the King's Lynn Gas Company. The Master of Corpus was also present. Some gas companies lived in awe of the corporations in whose districts their work was conducted; but in Cambridge the relations between the Corporation and the Gas Company were of the most friendly description. The Mayor was with them on this occasion. Among them, too, was the Engineer and Manager of the Electric Light Company. Personally, he felt greatly indebted to the Electric Light Company; for their appearance on the scene had helped to smarten the Gas Company up a bit. He hoped that Mr. Pierce would be duly impressed as he looked round the room with the sort of competition with which he and his electrical colleagues had to contend. [Laughter and applause.] He asked those present to drink to the health of his Worship the Mayor.

The MAYOR, in responding, thanked those present most sincerely for the compliment paid him. On behalf of Cambridge, he also heartily welcomed the visitors; and, in the course of further remarks, he referred to the excellent supply of gas with which the streets of the town are so well lighted.

Mr. C. F. RUGGLES (Leighton Buzzard) said the members could not leave the table without thanking the Cambridge Gas Company for entertaining them in such princely manner as they had done that day. Each town in which the Association were privileged to meet, the Chairman and Directors had been most courteous and good to them; and exceedingly so had been the Chairman and Directors of the Company whose guests they were that day. [Applause.]

The CHAIRMAN thanked Mr. Ruggles for his kind words and the members for the manner in which they had endorsed them. With him, his fellow-Directors agreed that meetings of this kind were very useful to the whole gas industry. The interchange of ideas that took place on such occasions must be good, and must bear fruit.

#### THE BUSINESS MEETING.

The members were privileged to hold their business meeting in the handsome new Lecture Room of Emmanuel College. It was



regretted that Mr. John Young, the retiring President, could not be present to preside at the opening proceedings, but his predecessor in the presidency (Mr. C. F. Ruggles, of Leighton Buzzard) undertook the duties at the opening.

The HON. SECRETARY and TREASURER (Mr. T. A. Guyatt, of Ely) read the minutes of the meeting held at Great Yarmouth on April 29, and they were confirmed.

Among the letters of apology for non-attendance was one from the President of the Institution of Gas Engineers (Mr. Alexander Wilson, of Glasgow).

#### NEW MEMBERS.

On the motion of Mr. J. BARTON (Peterborough), seconded by Mr. J. H. TROUGHTON (Newmarket), the following names were added to the roll of membership: Mr. G. H. Gibbs, of Diss; Mr. G. M. Gribble, of Kirkby-in-Ashfield; and Mr. G. H. Judd, of Sheringham.

#### DISTRICT MEMBER OF THE COUNCIL OF THE INSTITUTION.

Mr. J. CARTER (Lincoln) said it was with peculiarly mixed feelings that he moved that their President (Mr. Auchterlonie) be the representative on the Council of the Institution. When he said he rose with "mixed feelings," he meant that he could not avoid entertaining some sentiments of regret that the Council of the Institution would lose the valuable services of Mr. John Young. He could only hope that some means would be devised whereby Mr. Young's more permanent position on the Council might be secured. It had been the practice of the Association to elect the President as their representative on the Council; and certainly this year they were not for a single moment likely to consider the question of varying their procedure. They would feel much honoured by the representation by Mr. Auchterlonie.

Mr. G. BAINES (Harwich) seconded the motion, and it was unanimously carried.

#### THE NEW PRESIDENT.

Mr. RUGGLES, in introducing the new President, said no words were needed from him regarding the fitness of Mr. Auchterlonie to be their President. They had that day alone seen sufficient of him and his work to recommend him to them as a gas engineer. He was one of many in the profession whom they all honoured; and not only as a member of the gas profession, but as a member of the Association they all respected him. They were proud indeed to see him holding the position in Cambridge that he was doing. They wished him a prosperous year of office; and hoped that he would see the Association during the year prosper as it had done in the past.

The PRESIDENT was heartily received as he took the chair.

#### THANKS TO THE RETIRING PRESIDENT.

The PRESIDENT remarked that his first duty was to move a hearty vote of thanks to their retiring President, Mr. John Young. They all regretted he was not with them that day. He was unavoidably absent in Scotland, and had written to him (the President) to say it was impossible for him to be present, much as he would like to have been. Mr. Young was one of the ablest Presidents the Association had had; and he (Mr. Auchterlonie) was personally very sorry to depose him both from the chair and from representation of the Association on the Council of the Institution.

Mr. J. DAVIS (Gravesend) seconded the motion, observing that, as a member of the Council of the Institution of Gas Engineers, he knew as well as anybody the value of Mr. Young's services; and it was with regret that he found Mr. Young was now retiring. He hoped that some steps might be taken to see that Mr. Young was continued on the Council.

The motion was heartily endorsed.

The PRESIDENT then delivered the following:

Gentlemen,—My first duty in addressing you is to thank you for the honour you have conferred upon me in electing me President of this Association. It shall be my earnest endeavour to serve the best interests of the Association during my presidency; and if I am unable to shed additional lustre on the high office, I trust I may hand it over untarnished to my successor.

In this address I propose to speak briefly on a few topics that may be considered of every-day interest to us as a profession at the present time, without attempting to give you a mass of figures and tables that cannot be grasped at the moment. We can all recall able addresses, full of valuable information, the subject-matter of which has been practically lost to students on account of its not being analyzed and indexed in the Technical Press. This information, had it been in the form of a paper, would have been easily found in the excellent system of cross-indexing adopted by our technical journals. In this connection, I think a word of recognition is due to our Technical Press for the instructive articles that appear from time to time relating to the latest developments in gas practice on the Continent, in America, and in the United Kingdom.

Our District Associations throughout the country continue to do splendid work in the interests of the gas industry at large; and the Eastern Counties Association can be congratulated upon its vitality and on the keenness of its members. This enthusiasm and camaraderie among gas managers is not, however, confined to the United Kingdom; for in our Colonies and in America, as

well as on the Continent, we have energetic and able *confrères* all doing valuable work. In June last, at the Brussels Exhibition, we had the unique spectacle of French, German, Belgian, and British gas engineers fraternizing in the most cordial manner; and in a few days the British Institution of Gas Engineers will be welcoming the German Association, who entertained so kindly the large party of British gas engineers who visited Berlin two years ago. To judge from the programme, their visit should be enjoyable as well as instructive; for, after visiting the London and Croydon Gas-Works, they are to visit the gas-works of Edinburgh and Glasgow, where they will be received by the Provosts of the cities. We trust their visit may be as enjoyable as was ours to Germany.

The duties of a gas manager may be roughly divided into three heads: (1) The buying of the raw material; (2) the manufacturing of such material into gas, coke, and other residuals; and (3) the selling of products, with all the duties pertaining thereto.

#### COAL—INCREASE IN PRICE.

Briefly considering these duties in the order stated, we find, under the first heading, that coal—the chief of our raw materials—has gone up slightly in price since last year. The cause of this advance has been attributed to the working of the Mines Eight-Hours Act, which became law on July 1, 1909. Undoubtedly, the operation of the Act has caused an increase in the costs of working at some collieries; but considering the increase in the number of pits being opened, and the improvements in the methods of working, I think we may fairly believe that prices will gradually adjust themselves to a somewhat lower level. At the same time, prices must ever be regulated by supply and demand.

The recent Board of Trade returns for the coal industry afford much interesting information. The output of coal in the United Kingdom during the year 1909 amounted to the enormous quantity of 263,774,000 tons—being an increase over the output of 1908, but a decrease on that of 1907. When we consider that the output of coal in 1885 was only 159,351,000 tons, we recognize the great expansion that trade has undergone during the past 25 years. Notwithstanding the enormous drain on our supply, the Royal Commission of 1905 estimated that the coal available in the United Kingdom amounted to 100,914,668,167 tons, which is an increase of over 10,000,000,000 tons on the amount estimated by the Commission in 1871. This seems extraordinary; but it is, of course, accounted for by the fact that to-day more information is available for the accurate estimation of the extent of the British coal-fields.

It is, I think, important that every gas manager should test and tabulate the results derived from the various coals he has purchased, so that the relative values of the different varieties may be correctly assessed. This is not always an easy matter; but as it is absolutely necessary for us to buy as cheaply as possible the class of coal most suitable for our circumstances, the various systems for such an assessment that have lately been brought before the industry are well worthy of attention.

#### MANUFACTURE.

To turn now to our manufacturing methods. It has long been an adage that dividends were made in the retort-house; but until the advent of the Siemens furnace and its introduction into gas-works, it is to the present generation of gas engineers surprising how little progress was made in the carbonization of coal from the days of Murdoch. Since the introduction of the Siemens furnace, however, a great advance has been made; and in the past ten years the improvements in the methods and in the results obtained have been both revolutionary and amazing. New systems have been brought out, tried, and adopted with such rapidity that no gas engineer can be sure that a system adopted this year will not be superseded next year.

#### INCLINED RETORTS.

At Cambridge, inclined retorts were adopted some ten years ago. Owing, however, to the difficulties encountered in the use of coal varying in physical properties, the system was not extended when the second house of direct-fired settings was re-modelled in 1904. Horizontal retorts were adopted, with De Brouwer electrical charging and discharging machines. We have been well satisfied with the economy effected, and with the improvement in results; but I should not like to say that if I were to-day called upon to re-model another retort-house, I should recommend the adoption of the system in preference to vertical retorts. All of us who visited Berlin two years ago must have been impressed by the simplicity and ease with which the experimental installations of vertical retorts were worked. Since then vertical settings have been much improved; and there are now some thousands of these retorts in use on the Continent. In this country also many minds are at work, and we have various systems of vertical retorts in use on a large scale. There is every reason to believe the many difficulties in the way of continuous carbonization will be solved successfully, and that at no distant date the conditions of working in our retort-houses will be enormously improved.

We are glad to know that both the Woodall-Duckham and the Glover-West systems are being introduced abroad. The former is reported in the "Times Engineering Supplement" as having been adopted at Lausanne after successful competition with the German systems. At Edinburgh and Glasgow, we have further installations being tried; so that shortly we shall have before us the data necessary to enable us to decide as to the best systems to adopt in our future extensions or reconstructions. Chamber



settings also are being tried on an extensive scale; and there is a healthy activity that augurs well for the future improvements in this (the main) department of our factories.

#### COALITE.

Professor H. E. Armstrong, in a paper read before the British Association at Sheffield, while admitting that great improvements were in sight in the application of gas to heating purposes, and that the use of gas is likely to be largely extended in the near future, criticized most adversely the present methods of gas manufacture. He advocated the manufacture of what is known as coalite—high-grade gas and tar rich in oils. We have yet to learn that the gas companies who have experimented with this system are satisfied with it; but we do know that the inhabitants of one of the towns are far from satisfied. Few, I think, will agree with the professor that the solution of the smoke question will be by the manufacture of gas of high quality and coalite; but I do agree with him that the public require rousing from what he described as their lethargy regarding the smoke nuisance; and, as the Americans say, it is "up against" gas undertakings to combine and undertake this duty.

#### PURIFICATION METHODS.

Purification methods continue to improve and to be much better understood. All of us—especially those who still use lime—must regret that no further experiments have been made for the purification of gas on the Claus system.

#### NAPHTHALENE.

Many gas-works have reported that they have overcome naphthalene troubles. I am glad to say that since December, 1908, we have not had at Cambridge one single complaint attributable to naphthalene; whereas previous to our introducing the Glover carburettor, we had occasionally as many as thirty stoppages in one day. Having at his command so many successful methods of overcoming the nuisance, no gas manager is justified in not trying one or other of the systems, if he is having trouble with stoppages from this unstable hydrocarbon.

#### FIRE-CLAY GOODS.

Much has been said of late regarding the material used in the manufacture of our fire-clay goods. It may interest you to know that in the horizontal house which most of you inspected this morning one setting has worked 1626 days—having been in use since 1904, and let down on four occasions. Another setting has been in use since the same year, having worked 1540 days, and let down also four times. Other settings, built at a later period with material from the same firm, are in a worse condition to-day although they have worked only 1100 days. This difference I attribute more to the setting of the retorts than to the material. The investigation on the qualities of refractory materials opened by the Institution of Gas Engineers cannot fail to do much good; for the first cost of the material in our retort-stacks is a secondary consideration to its quality.

#### COMMERCIALISM.

At no period in the history of the gas industry has more attention been required from gas managers to the profitable disposal of our chief manufactured article—gas—and the secondary products—coke, tar, and ammoniacal liquor or sulphate of ammonia. The conservation of our existing business, and its development in the future, occupies much more of our time than was the case in days gone by. We can congratulate ourselves that, notwithstanding keen competition in every department of our business, gas undertakings continue to prosper and grow. In the year 1882, there were 500 statutory undertakings, with a capital of £50,261,118, manufacturing a total of 72,583 million cubic feet. To-day, there are 790 gas undertakings, with a paid-up capital of £130,708,693, manufacturing 189,918 million cubic feet. This great increase has, of course, been due to various causes, but principally to the large number of cookers that have been introduced, and to the enormous development of the slot-meter.

Formerly, gas companies' officials were wont to be twitted for their want of enterprise. But to-day I do not think that any other industry in our country shows more enterprise than the gas industry; for, not only have we introduced slot-meters for the sale of gas to our customers in pennyworths, but we hire out almost any article that can be used for the purpose of consuming gas, and do everything reasonably possible to meet the needs of the public.

#### GROWTH OF THE SLOT-METER.

It is a little difficult to see how the growth of slot-meters and cookers can continue in the future as it has done in the past. Our districts are already well supplied with them, and in the future the expansion in these directions must necessarily be on a diminished scale. There is one field, however, for our commodity which still offers scope for exploitation; I refer to the heating of our dwelling-houses, shops, &c., by means of gas fires and stoves. Public feeling at the present time is just awakening to the necessity for preventing the smoke nuisance. The London County Council tried last session to get Parliament to move in the matter, and deputations have waited upon the President of the Board of Trade with reference to the subject. I venture to think that the gas companies of this country are destined to play a very important part in the solution of this question, and that the heating of our homes, as well as the lighting and cooking in them, will be done by means of gas.

#### GAS-FIRES.

Much investigation has been carried out within the past two years, and gas-fires have been improved enormously within that period. Last season alone the improvement was marked, and the increased demand for gas-fires was greater than in any past year. The Institution of Gas Engineers and the Leeds University are to be congratulated on the work done by the Research Committee. Personally, I am not certain that the gas-fire as at present designed is likely to be the gas-fire of the future. In my opinion there must be some considerable alteration in its appearance before long; and, in this connection, I think the Society of Architects ought to be approached with a view to enlisting their co-operation in deciding on the form that the gas-fire will ultimately take. At the present time, the main essential required for the solution of the heating problem is a cheap supply of gas of fair heating power. The public must be able to employ gas in large volumes at a low cost before we can induce them to instal gas-fires for all-day use and throughout every room in their house.

#### GAS v. COAL.

Professor Graham, of Manchester, stated in a lecture "that gas at 1s. 6d. to 2s. per 1000 cubic feet could compete for all-day use with coal;" but whether or not this is a correct estimate must depend on the cost of the coal. One of the difficulties in meeting this demand for cheap fuel lies in the fact that we are compelled to manufacture a gas of fairly high illuminating power to meet the requirements of those consumers who are not sufficiently wise to use incandescent burners for lighting purposes.

#### TWO QUALITIES OF GAS.

The late Mr. Bryan Donkin, in 1902, at a meeting of the shareholders of the Crystal Palace District Gas Company, made the rather startling proposal that gas companies should manufacture two qualities of gas—a lighting gas and also a low-grade gas for power purposes, so that manufacturers would be induced to build factories in the vicinity of the gas-works where they could get a cheap supply of gas for power and industrial purposes. To-day, in view of our wider experience in the carbonization of coal and coke, and of the comparatively smaller cost of a second distributing system under high pressure, such a proposal is not so impracticable as it was a few years ago. The thought naturally arises that if we are compelled to maintain gas of high illuminating power for lighting purposes, a dual distributing system should enable us to capture also the domestic heating business. In addition, however, to a second distributing system, we should require practically a new gas-works; and the additional expenditure of capital would be a serious consideration. I am inclined to think that what will occur, in spite of Professor Armstrong's advocacy of high-grade gas, will be that gas companies will supply gas of lower illuminating power, and the few consumers using flat-flames will be compelled to adopt incandescent burners.

Some corporations have shown that they are quite alive to the desirability of having a purer atmosphere for their cities, and to the possibilities of securing this by means of a cheap supply of gas. Glasgow is one of the most enterprising of these corporations. Before 1882, the illuminating power of the gas supplied in Glasgow was 25-candle power. In 1882, it was reduced to 20 candles, in 1901 to 16 candles, and in 1907 the No. 2 "Metropolitan" burner was prescribed as the testing-burner. This year Parliament has reduced the standard to 14-candle power without opposition. At the present time the Corporation are holding an exhibition of appliances for the abatement of smoke.

#### ILLUMINATING POWER AND CALORIFIC STANDARDS.

If gas undertakings had been sufficiently alive to the interests of the public, we should not to-day be agitating for a uniform standard for the testing of the illuminating power of gas. Such standard would have been abolished altogether, and a calorific standard would have been the test in use. The illuminating power standard of to-day is applicable to only a small part of our consumers—viz., those using old-fashioned naked flat-flame burners—who constitute something like 10 per cent. only of those using gas for lighting. For all other purposes, the heating quality of the gas is the true index of its value. The public require to be educated on these questions; but unfortunately, in spite of the immense issues at stake, there are no funds available for propaganda work in the direction of enlisting their interest and support.

#### NO. 2 BURNER BILLS.

Last session 57 gas companies promoted three Bills in Parliament for the substitution of the No. 2 "Metropolitan" burner for the various standards at present in vogue throughout the country. The Bills successfully passed through the House of Lords and through the Committee stage in the House of Commons. They have, however, received opposition from a small number of corporations; and it is a significant fact that the principal opposition has emanated from those carrying on electricity undertakings in competition with gas companies. Parliament has prescribed the burner in the Acts of all undertakings who have recently applied to Parliament (some 97 in number); and it is only reasonable to expect that the Burner Bills now pending will become law in the beginning of 1911.

#### HIGH-PRESSURE LIGHTING.

High-pressure lighting continues to make considerable headway both in England and on the Continent. The Sub-Committee of the Bradford Corporation recently reported that the Berlin



Municipal Council had spent £50,000 a year for the last three years in replacing their old lamps—both gas and electric—with new high-pressure inverted gas-lamps. They have decided to continue these improvements at the same rate for the next four years, at the end of which period there will be no electric public street-lamps left in Berlin. In London, also, this system has been largely adopted for street lighting; and in some of the best streets in Westminster (including Regent Street and Piccadilly) gas lighting is replacing electric lighting. Other forms of inverted burners and inverted lamps have commended themselves to the public; and shopkeepers all over the country are recognizing that outside gas-lamps are the cheapest and best means for the efficient lighting of shop windows. They enable the shopkeeper to display his goods to greater advantage and without risk of fire.

#### FREE MAINTENANCE.

Much has been said regarding the question of free maintenance of incandescent burners; but up to now there are few gas companies who have adopted any such costly scheme. Personally, I am an advocate for the free supervision of consumers' incandescent burners, gas-fires, &c. My experience is that consumers will not keep their burners in the necessary efficient state to procure the best light possible; and it is exceedingly disheartening to find that, after a good installation of incandescent gas lighting has been made, the burners are neglected and, for the want of a little attention, what should have been a good advertisement has become rather the contrary. It is, therefore, in the interests of the consumer that every incandescent burner in use should be inspected periodically. It is a large concession to make to the consumer; but I am certain it must be faced at an early date.

#### COMMERCIAL SECTION MEETINGS.

The profitable disposal of the secondary products of gas manufacture is necessary for the success of a gas undertaking; and nothing but sound commercial management can secure this. A word of appreciation is due to our Commercial Sections for the good work they have done in this respect. Personally, I am of opinion that more real benefit is gained by members attending these informal gatherings than can be derived from our more formal District Association meetings.

#### PROFIT-SHARING.

Much time and thought are given to the purchasing of coal, to the installation of up-to-date appliances in our gas-works, and to the sales of gas and coke, &c. But there is one great factor on which we largely depend for the success of our undertakings; and that is the human element. The sum paid annually by this Company in salaries and wages amounts to £13,000. This is a large proportion of the total expenditure; and until Sir George Livesey taught us what could be done by co-partnership, gas companies did little more than see that the workman did his allotted work. My Directors recently inaugurated a scheme of profit-sharing; and I am hopeful it will encourage workmen to put heart and brain into their work, and so make the scheme a success in their own interest as well as that of the Company.

#### ADVERTISING.

I have already mentioned the desirability of money being raised for the purpose of educating public opinion regarding the smoke abatement question, and the possibility of gas-fires being largely instrumental in the solution of this question. Another matter in which co-operation of gas undertakings is necessary is advertising. Recently "advertisement articles" on behalf of the electrical industry have appeared in the daily press. These articles were unjustifiably laudatory; and the statement that electricity was as cheap as gas could only be justified if the very worst form of gas lighting were compared with the most recent and up-to-date modern electric lamp. Many people, however, seeing the statements printed in the form they were, believed them true; and so indifferent were the gas companies that the statements were practically unrefuted, and what should have been the business of every gas company was undertaken by nobody.

There are no less than 133 millions of capital invested in the gas industry; and it would be interesting to know what amount is spent in advertising. It is not sufficient to depend on local advertising. Every gas undertaking throughout the country is interested in what appears in the London daily papers and magazines; and, while credit is due to the London Companies for what they do in the way of bringing before the public the advantages of using gas for various purposes, it is not equitable that gas undertakings throughout the country should gain the advantage of such enterprise on the part of the London Companies, and pay nothing towards it.

Money is badly wanted for safeguarding the interests of our industry as well as for research work; and no time is to be lost in enlisting the active support of our directors and committees; for, unless they recognize the need for co-operation, little advance will be made in the collection of the necessary funds.

#### THE FUTURE OF THE PROFESSION.

A recent advertisement for an assistant produced the large number of 110 applications for the post. From the number of applications, it is evident that the professional supply is greater than the demand; and it is equally evident that all these embryo engineers will not find posts as managers for many years to come. The qualifications of many of the young men were of a high order. Yet I predict that in gas engineering, as in other walks of

life in this country, a still higher standard of education and training will be called for from men who aspire to climb to the top of the profession. Character, however, must ever remain the chief essential for success in life. The youth who is honourable, trustworthy, and industrious, and who is endowed with common sense, must ultimately surpass his more brilliant competitors, who may lack the qualities of rectitude or the capacity to apply their theoretical knowledge to every-day problems.

#### THE SUITABLE WORKER.

I am glad to see that the question of training gas-fitters has been taken up by the Manchester District Institution of Gas Engineers and by some of the larger of the companies. No one who has had experience of the distribution side of our business can fail to realize how important it is that everyone of our employees who is called upon to meet gas consumers should be thoroughly versed in all that pertains to the welfare of the industry. Our meter inspectors and collectors come into contact with every consumer in our districts four or eight times every year. They, therefore, ought to be the fingers on the consumers' pulse—interpreting and anticipating their requirements, and reporting promptly to head-quarters what they consider necessary to satisfy reasonable needs.

I think that gas managers too often fail to realize that their subordinates have not the same opportunities for acquiring knowledge on gas distribution subjects that they themselves have. We hear the reports of Research Committees—on gas-fires, for instance—and we understand the various improvements that are being made in all appliances; but what steps do we take to ensure that our knowledge is conveyed to the man who is responsible for the recommending of a gas-fire or for its fixing? I fear that too often the answer will be that the fitter has to find out for himself how the appliances act, without understanding the why and the wherefore of their construction.

Last winter, at Cambridge, we had some lectures on gas-fires and geysers. The lectures were very kindly given by representatives of makers of such articles; and the whole of the outdoor staff, as well as the show-room attendants, were present. The employees were interested; and questions were answered after the lecture, with, I am sure, considerable benefit to everyone present. Something of this nature, with the co-operation of manufacturers, could be carried out in every town, with but little trouble or expense.

During the past winter, also, my Directors paid the fees of sixteen of our youths to attend a plumbing class at the Technical School here; and I am hopeful that the course will be continued during the coming winter. I think that, to ensure that our boys are properly trained, their fees must be paid. I regret to say the young lads of the present day do not seem to have sufficient ambition to improve their knowledge by their own exertions and at their own expense; and if gas companies are to have a highly-trained body of workmen, they must take the necessary steps to train them during working hours.

It would be a great advantage if our Technical Press would publish a series of articles in simple language bearing upon the different subjects that gas-fitters should know more or less, in the form of lectures to working gas-fitters, to be afterwards published in cheap book form. At the present time, there is no text-book that can be put into the hands of our young men; and it is rather a serious matter for a gas manager to have to face the providing of lectures or demonstrations for the education of his workmen. A little magazine has recently been issued to supply this want; and it is sufficiently cheap to enable gas companies to place it in the hands of most of their workmen. One question I am glad to see discussed is that of "Unaccounted-for Gas;" and I hope that experiments will be carried out to demonstrate whether a lead joint is the best one for jointing pipes for the supply of gas. Recently I heard of a case where a joint withstood over 2000 lbs. of water pressure, and yet failed to prove tight with less than 20 lbs. of gas pressure; and I quite anticipate that companies who are depending on cast-iron mains and lead joints for high-pressure distribution will, in course of time, find their unaccounted-for gas go up enormously.

#### CONCLUSION.

I feel that this address has already been unduly long. There are many points in it that I should have liked to enlarge on, and other points on which I have not been able to touch at all. My chief difficulties have lain in the selection of the subjects which I hoped might interest you, and in the lack of the necessary literary ability to present them to you in an attractive manner. Nevertheless, I hope that, in spite of the very brief treatment I have accorded to some of the heads, I may have here and there provided food for thought; and it now only remains for me to thank you cordially for your patient and appreciative hearing.

At the conclusion of the address,

Mr. R. G. SHADBOLT (Grantham) said this was a happy stage at which to express their thanks to the President for the address he had presented to them. If anything were needed to confirm the selection of Mr. Auchterlonie as their President, the address would meet all requirements. It showed him to be a man in front in everything connected with the industry in which he was engaged, one who was in touch acutely and actively with every phase of the industry, from the point of initial manufacture to the point of policy in commercial matters, together with the more rational treatment of his workmen. The features of the address



marked Mr. Auchterlonie as well worthy the positions he held both in Cambridge and as President of the Association.

Mr. F. PATERNOSTER (Felixstowe) seconded the motion.

#### GAS PUBLICITY.

Mr. W. E. PRICE (Hampton Wick) remarked that, as a visitor to the meeting, representing the Southern District Association of Gas Engineers and Managers, he should be sorry if he missed the opportunity of saying a few words in praise of the address of the President. It was an address which bristled with thoughts and ideas. There were one or two points to which he (Mr. Price) would like to refer. As probably most of those present knew, he was particularly interested in one of the questions dealt with by the President. That was gas advertising; and he wished to take this opportunity of saying how much some of them were feeling and appreciating that the time had arrived, and indeed had long since arrived, when something should be done by the gas industry to bring before the public the fact that gas lighting, gas heating, and gas cooking were at any rate not second to any other means that could be used for these purposes. He was afraid the gas industry, generally speaking, had been sitting still, and letting the rival do the work of advertising. Some of them had been getting together, and were trying to bring this matter to a head on behalf of the gas industry. He hoped those present would be pleased to hear this, though he was unable at the moment to tell any definite story as to what would be done in the near future. However, the matter was having serious consideration; and he thought they might be safe in accepting the information that before long they would hear that a move had been made. This was a matter that everyone present would have to bring home to his Board of Directors, because it was a matter involving £ s. d. If the Committee who had the matter in hand brought the scheme to an issue (which he had no doubt they would do in the very near future) this would be one portion of the work. But the greater portion would be what they would individually have to do, and that was to approach their Boards of Directors, and get the wherewithal to carry through the scheme. The sum that would have to be spent on this movement would be not less than £20,000 a year. This only meant about 2s. 6d. per million cubic feet of gas made. If gas undertakings would support the movement to the extent of 2s. 6d. per million cubic feet, £20,000 would be collected; and then, instead of seeing the front page of the "Daily Mail" illustrated by pictures of electric lamps, they would be able to show with equal prominence what the gas industry could do with gas lighting, heating, and cooking. He hoped members would think over this matter, and be ready to bring it before their Directors when the time came, which he was certain would not be long.

The motion regarding the vote of thanks to the President was heartily passed; and the PRESIDENT briefly acknowledged it.

#### THEORY AND PRACTICE IN ENGINEERING.

The PRESIDENT said the next item on the agenda was a lecture on "Theory and Practice in Engineering" by Mr. J. B. Peace, M.A. This gentleman was one of his own Directors.

Mr. PEACE remarked that he was glad to have the opportunity of welcoming the members to the college, of which he was one of the officers. He then proceeded to deliver the lecture which is reproduced on this and succeeding pages.

At the conclusion of the lecture,

Mr. THOMAS GLOVER (Norwich) proposed a vote of thanks to Professor Peace. He said it was quite seemly and right that in a university town there should be on the Board of the Gas Company a member of one of the colleges. But it was quite unexpected by most of the members of the Association that they would have the honour of hearing a member of a Board of Gas Directors lecture in the way Mr. Peace had done that afternoon. It had been exceedingly kind of Mr. Peace to go to the trouble he had done in preparing his lecture, and to come to their meeting to deliver it. The members were materialists—confirmed materialists he was afraid; and it was right they should be occasionally brought back to theory, and to know the base principles upon which all scientific processes were founded. But they were materialists; and he was afraid many of the beautiful theories they had imbibed in their early days had been crushed out of them by having to produce balance-sheets. They had now merely to go on picking up a few scraps of scientific knowledge, and be brought back to the base principles occasionally when they were favoured as they had been by Mr. Peace. So he hoped, in spite of the fact that they had not all been able to follow the lecture quite in such an intelligent way as they might have done had they been students at the University and attended lectures there regularly, yet they would take back some ideas which would help to bring "heaven back to them," and make them idealists again—at any rate, to some small extent. They were all conscious of the fact that their process of gas making was accompanied by great waste. Professor Peace had been telling them about the heat balance in steam and gas engines; and this reminded him (Mr. Glover) how their process of gas making was accompanied by shocking waste of heat. Look at the beautiful heat lost in the process of drawing the coke, and through the volumes of water used in cooling the gas down to recover the ammonia. It was good that they should occasionally be brought back to view these things as they existed.

Mr. W. B. FARQUHAR (Ilford) seconded the motion.

The PRESIDENT said he was personally indebted to Mr. Peace for what he had done for the Association that afternoon.

Mr. PEACE, in his acknowledgment, said it was very kind indeed of the members to have listened to him so patiently. As

they had come on this occasion to one of the seats of learning, he had thought that it would be worth while to give them some abstract notions on the subject of engineering. Although he had to theorize, he ranked himself as a practical man, as he had to deal in his various capacities with very practical things.

#### PLACE OF NEXT MEETING.

On the suggestion of Mr. F. PRENTICE (Ipswich), seconded by Mr. H. WIMHURST (Sleaford), the place of next meeting was left to the discretion of the Committee.

#### A VOTE OF THANKS.

Mr. J. H. BREARLEY (Longwood) moved, seconded by Mr. C. F. RUGGLES (Leighton Buzzard), that a hearty vote of thanks be passed to the Master and Fellows of Emmanuel College for their kindness in allowing the meeting to be held in the new Lecture Hall of the college.

#### DINNER.

In the evening, the members and visitors dined at the Lion Hotel, with the President in the chair. Those who were the hosts at the luncheon, together with the representatives of local municipal life and of the University, were the guests at the dinner. The toast list was a comprehensive one; and during the evening the Chorister Glee Singers of King's College Chapel rendered charmingly some beautiful quartettes, duets, and songs.

## THEORY AND PRACTICE IN ENGINEERING.

By J. B. PEACE, M.A., of Emmanuel College, Cambridge.

[A Lecture delivered before the Eastern Counties Association of Gas Managers, Sept. 23.]

When your President invited me to address you to-day, he left me quite unfettered as to my choice of a subject. Had he suggested that I should open a discussion on any of the current technical questions of gas engineering and management, I should have considered that he had fallen short of his normal sanity of judgment, and I should not have treated his suggestions with the respect which the uniform sagacity of his advice to his Board has very properly earned. Having thus a free hand, I put down as the title of my lecture something which is at least—to use your own words, Mr. President—sufficiently comprehensive. But I will confess that I had hopes of treating my subject from the point of view of problems which, though less familiar to myself, might be more closely connected with the special work of a gas engineer than are some of the illustrations I shall have to lay before you. Unfortunately, during the past few weeks the leisure I had anticipated has shrunk out of existence, as there gradually accumulated on my table a pile of some hundred and fifty copies of the famous Form 4. You will, therefore, perhaps be willing to allow me to address you as members of the great army of engineers who practise "the art of directing the great sources of power in Nature for the use and convenience of man," and not as belonging to any particular regiment in that army.

Echoes still linger of the old quarrel between the professor and the practical man, between the rule of the book and the rule-of-thumb; but it is seldom that they become clamorous, except when discussion turns upon methods of education and training. No doubt, we shall always find among engineers men who regard the work of the lecture-room and the laboratory with something like contempt; and we may be very certain that we shall never lack a professor here and there with a mission for telling practical men how to manage their business, though it is well to remember in this connection that such indiscriminate combativeness as is disclosed (say) by Professor Armstrong in his recent attack on our methods, is more a personal characteristic than a professional one. The gas profession at any rate has surely buried these contentions once for all in recognizing, as it has done so magnificently, that the endowment of a professorship is the most fitting memorial to the memory of Sir George Livesey—the most practical man of you all, and certainly one of the most scientific.

These ancient feuds and distinctions have always seemed to me particularly barren, because they do not go to the root of the matter. In every branch of the engineering profession—in fact, in every field of industry—the distinction is not between the man whom circumstances or inclination have placed in the lecture-room or the laboratory and the man who similarly finds himself in the manager's office or the engineer's shanty. It is between the man who tackles his job, whatever it may be, in the scientific spirit (alive to the freshness and interest of the problems that continually face him) and the man who accepts the routine of his work with no wider outlook than that of the labourer who sees each morning so many yards of trench to be excavated.

In every art and in every science the spirit of inquiry, of research, is the one essential condition of advance. Without it, the old routine, sufficient in its time, lingers on to find itself helpless in the face of fresh demands and of new conditions. There has never been any lack of this spirit in the engineering profession. The spread of organized research, the growth of technical education, the development of highly skilled specialization are the product of the greater pace at which we live, of the more insistent demands of the community we serve; but they are manifestations of the same spirit as that which inspired the pioneers of the past. We are sometimes asked to believe that the order of the past was the mere rule-of-thumb, and that in these later



days a new and scientific race of engineers had set themselves with experimental engine and testing machine to create a new heaven and a new earth. But the laboratory is the servant of the real engineer, and not his master. No one can view the triumphs of earlier generations of engineers without recognizing that experiment and induction were ever present with them, that reason of the highest order was continually brought to bear on their designs, and that we in our day will do well to follow their lead in preparing new methods of attack for new problems.

The engineering profession, however—justly proud of its achievements in the application of science—is sometimes forgetful of the debt that it owes to the pure scientist, to the man (be he mathematician, or chemist, or physicist) whose search after knowledge has been prompted by the pure love of it, and who perhaps has hardly given a thought to the practical application of his results. There are many men “who spurn soft delights and live laborious days,” and for no great reward, in the pursuit of knowledge, and who find complete satisfaction in the pursuit. Man does not live by the satisfaction of his material needs alone; there are other promptings, spiritual, rational, and emotional, to which he does well to give heed. The intellectual traditions of the Ancient Universities have in a peculiar degree fostered the search after knowledge, even when the limitations of their position and constitution have hampered the expression of it; and it is for this reason that it may be not uninteresting, not unimportant, on such an occasion as this to ask you to consider in what degree these researches may be found to justify themselves to us by their practical application.

For consider where we are. It was in Cambridge that Newton developed his famous Laws of Motion, on which has rested the whole structure of Applied Mechanics as we know it, and established the principle of order in the physical universe by proving that the planets in their courses conform to the same dynamical compulsion as does the stone that is dropped from the hand. It was in Cambridge, in this very College, that just one hundred years ago Thomas Young recast the whole of our conceptions of the nature of light, by completing the proof of the now accepted theory that the passage of light consists in the transmission of a pulse or a wave through the all-pervading ether. It was, without doubt, in the pond which you can see from the windows of this room that he carried out those experiments in the interference of waves in water which led him to the explanation of many of the most beautiful and delicate of optical phenomena. It was in Cambridge that Clerk Maxwell developed the mathematical theory of electricity—laying, in conjunction with Faraday, a foundation on which all future work has been built. Lord Kelvin, though his life-work was carried on in Glasgow, dated from Cambridge the earliest of that remarkable series of scientific papers which marked his conquering advance through so many wide regions of the theory of heat, of electricity, and of hydrodynamics. It is here and now that Sir Joseph Thomson is carrying out those researches into the ultimate constitution of matter which promise in the long run to give a fresh key to every sort of problem connected with gases and vapours.

These men, of course, are men of genius. Cambridge makes no claim to any monopoly in such men; but it does claim that in the realms of mathematical and physical science it has contributed to the growth of knowledge in larger measure than any other centre of study and research. And that is why this seems to me an appropriate place to consider whether this piling-up of knowledge, this search after truth for its own sake, has any bearing on the practical rules and principles which come to the hand of all of us whose work it is, in whatever department, to share in supplying the common everyday needs of the world.

It is well to recognize that men such as I have named do not ask for justification at our hands. In his Presidential Address to the Mathematical Section of the British Association at Sheffield only a week or two ago, Professor Hobson laid emphasis on this, and claimed that the pursuit of the highest developments of mathematical reasoning is an end in itself. “The prejudice,” he says, “that Pure Mathematics has its sole *raison d'être* in its function of providing useful tools for application in the physical sciences, is by no means extinct.” And in urging some grounds of justification for the expenditure of time and energy on the abstract problems of Pure Mathematics, he goes on: “The fact that abstract mathematical thinking is one of the normal forms of activity of the human mind—a fact which the general history of thought fully establishes—will appeal to some minds as a ground of decisive weight. A great department of human thought must have its own inner life, however transcendent may be the importance of its relations to the outside. No department of science, least of all one requiring so high a degree of mental concentration as Mathematics, can be developed entirely, or even mainly, with a view to applications outside its own range.” And this plea we must accept; the pure mathematician, like the musician, the painter, or the poet, is an artist, and the subject of his art is the intangible and the abstract.

It must not be imagined, however, that the mathematician either overlooks or despises the acknowledged fact that his aid has been in the past, as it will be in the future, indispensable to the progress of the arts, and in particular to those arts which mainly concern the engineer. Indeed, as Professor Hobson points out, the field of application is widening; and mathematical methods are being forced into the service of Chemistry, of Biology, and of Economics. And what I wish to do to-day is to call your attention to one or two special problems, which I have

chosen as much for their intrinsic interest as for their value as illustrations, and to point out that in each the important step in advance was determined by the fact that the pure mathematician had furnished the necessary apparatus for investigating, in general terms, what had become too complicated for the unaided exercise of the faculties of observation and deduction.

Let us look then at one or two instances of what mathematics has done for us. One of the most striking developments of modern engineering is the advance that has been made the last 20 or 30 years in the design of ships. Formerly a shipbuilder could forecast from a wide experience what power he must supply in order to drive a ship of known type at a required speed. In dealing with a ship which diverged widely in size or in design from known types, his estimate of the relation between speed and power was often little better than trained guesswork. Now-a-days, by means of experiments on models, he knows before he sends his plans to the ship-yard exactly what power he must supply; and he can make with confidence a close prediction of the vessel's performance. Now the validity of the argument from a model to a full-sized ship depends on a purely abstract course of reasoning on the dynamical behaviour of similar systems moving in similar circumstances and acted on by corresponding forces. The shipbuilder who makes the model and experiments on it, has no need to know, and probably does not know, this course of reasoning; but it forms, nevertheless, the foundation and justification of his method.

In this particular problem, indeed, theory is still ahead of practice. More than 30 years ago, Osborne Reynolds showed that by means of models large enough to be used as launches, and supplied with the proper power, exact determination of the manœuvring qualities of the full-sized vessel could be made. Thus if a model of a battleship were made on a scale of (say) one-twentieth, and were supplied with power in the ratio of the cube of the linear dimensions—that is on a twentieth scale, with one eight-thousandth of the power of the ship, the manœuvring qualities of the ship and the model would, as to distance, be in proportion to their lengths and as to time would be as the square root of their lengths. Thus if the model, driven by, let us say, 4 H.P., with a certain angle of rudder, were able to turn through a certain angle, say, in 20 yards, then the full-sized ship with engines developing 32,000 H.P. and with the same amount of rudder would turn through the same angle in 400 yards. And if the evolution in the case of the launch occupied 10 seconds, then the time taken by the ship for the corresponding evolution, being proportional to the square root of the length, would be about 45 seconds. An example such as this, when reduced to actual numbers, shows how powerful an experimental method has been put at our disposal by the pure mathematician.

The construction of big guns supplies another useful example. Suppose we take a hollow circular cylinder, with thick walls, and closed ends, and apply a heavy internal pressure, tending to burst it. The distribution of stress in the metal of the walls, diminishing from the inner surface to the outer, can only be determined by solving a differential equation embodying the fundamental laws of elasticity. It was a common experience of the early makers of guns that it was easy to reach the bursting pressure; and they hit on the device of shrinking on hoops. The effect of this, though certainly it was not clearly recognized, was that the tube itself was set up as it were in compression; so that when subjected to the heavy internal pressure, the metal had a good deal of compressive stress to run off, as it were, before it felt the pull of the bursting tension. The problem of shrunk-on hoops, or of an outer cylinder shrunk on the whole length of the inner, could be dealt with by an extension of the mathematical argument applied to the simpler case; and the analysis has been extended to the case of winding on wire under tension, by which means the same effect is now obtained.

Take another illustration of the practical value of mathematics. Consider the motion of the heavy trunk-piston of a large gas-engine running at several hundred revolutions per minute. About the middle of its stroke, we have a body weighing, it may be, several hundredweight, and travelling at a speed of something like 20 feet per second. In less than one-fifth of a second, you find this heavy body travelling at the same speed, but in the opposite direction. It requires the exercise of a very large force to reverse so great an amount of motion in so short a time; as would be very apparent if we allowed the piston to leave the cylinder and attacked it on emergence with some sort of gigantic cricket bat. And the force which has to be applied to the piston, whether it is supplied by the energy of the explosion or by the energy of the fly-wheel, must have a kick-off against something, and that something is ultimately the bed to which the engine is bolted down. And if at one end of the stroke the pull on the engine-bed is in one direction, then at the other end of the stroke the bed will experience an equal pull in the opposite direction. If no provision is made to meet these forces, the engine-frame will be racked and pushed and pulled until it is either shaken to pieces or is torn from its bed. In the case of a locomotive running at high speed, these forces, if unbalanced, will affect both its grip on the rails and its draw-bar pull; and if the engine has the usual arrangement of two cranks set at right angles to one another, there will also be couples tending to sway the engine alternately to right and to left in a horizontal plane.

The problem of balancing the disturbing forces which arise in running machinery, was not of very great importance in the slow-running movers of the mill-engine type; but it became a

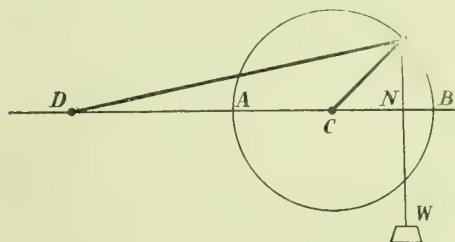


pressing one when the need arose for high speeds, in order to get high powers developed in small bulk—particularly for torpedo boats, for electric light plants, and for express locomotives. The forces we are considering increase in proportion to the square of the speed; so that in an engine running at 400 revolutions per minute they will be twenty-five times as great as in an engine, with the same weight of piston, running at only eighty revolutions per minute. In this case, the engineer had no time to wait for the mathematician to come to his aid. The mechanical principles underlying the problem were sufficiently well understood to suggest that if at any one instant one part of an engine were exerting a force tending to thrust the engine in one direction, it would be well to provide that some other part should at the same instant be arranged to give rise to a force tending in the opposite direction. Many costly experiments were made, and with considerable success, before the problem became the subject of any very thorough analytical investigation; and even then many weary pages of mathematical reasoning were devoted to particular cases which, in the nature of things, were never likely to arise. But it is now possible to say, with some assurance, what can be done in the way of balancing and what cannot be done, and in what direction to seek the best compromise between such disturbances as cannot be overcome.

Now this problem, as such, has probably never claimed the attention of any professed mathematician. It has been tackled by the humbler folk whose work it is to apply to such questions the weapons they find to their hand; but it is none the less true that it is the labour of the pure theorist that has made possible even an approximate general solution of the question.

The mathematical investigation of the motion of systems in vibration affords one of the most beautiful examples of the application of analysis. In the case of simple systems—such as the spring of a steam-engine indicator, or the elastic suspension of a galvanometer—the equations which arise are not in themselves of great complexity; but their correct interpretation requires some power of handling and applying general results. In an ordinary indicator, the pressure of the steam or of the exploding gas pushes up the indicator piston, with its pencil gear attached, against the resistance of the spring. When the pressure rises slowly, it will at any instant just balance the resisting thrust of the spring; and the pencil will give a correct record. But the ordinary indicator piston, small though it be, cannot take up its motion instantaneously; so that when the pressure rises very rapidly, its thrust no longer balances the thrust of the spring, but is partly occupied in getting the piston and its gear into motion. Thus at the beginning of the trace on the indicator card, we shall find the pencil record lagging behind the actual pressure which we are trying to measure. Now an indicator piston and spring if suddenly jerked into motion and left to themselves, would go on vibrating; and this same vibration will persist in the circumstances we are considering. Thus the pencil record, instead of showing a smooth line of rapidly rising pressure, will appear as a wavy line first below, then above, and then again below the correct pressure-line, and so on.

Oscillations set up in this way generally persist during expansion; and they are, of course, quite familiar to anyone who has examined high-speed diagrams taken with an ordinary steam-engine indicator. These oscillations are set up by the sudden rise of pressure, and whether they will persist along the expansion line or not depends on the position and velocity of the piston at the instant the pressure rise is checked. Professor Hopkinson, in his pamphlet on vibrations, points out that slight changes in the strength of the mixture used in a gas-engine may affect the rise of pressure sufficiently to convert a wavy diagram into a comparatively smooth one.



The investigation of motions of vibration opens up a wide field, in which no advance can be made without recourse to mathematics. I will venture to trespass on your patience with a further example. The simplest form of vibration is what is called simple harmonic motion. Imagine a string PW hanging vertically from an overhung crank-pin P, and so weighted that it remains vertical as the crank rotates. This it will only do if the speed of revolution of the crank is kept low; but for the purposes of our definition any speed will do, so long as it is kept constant. When this is so, the horizontal motion of the string, which is the same thing as the motion of the point N across the diameter AB, is what is called simple harmonic motion. The point N oscillates between A and B, making one complete travel of its path, back and forward, in the time which the crank takes to make one revolution. This time is called the period, or the periodic time, of the motion. All its circumstances as to displacement and acceleration are simple, and easily decided from the uniform circular motion of the pin P.

Now attach to the crank-pin a connecting rod PD, and let the crosshead D oscillate in the line of stroke. The motion of D

will in many respects resemble that of the point N. The length of its path will be the same, and it will stop and turn when N stops and turns—that is, at the dead-centres. But the two motions are not identical. At the dead-centres, the distance between D and N is just the length of the connecting-rod; but in any intermediate position, as appears at once from the figure, it is something less than the length of the connecting rod. And the difference between the two motions thus appears as a small quantity which goes through its complete range of values twice in each revolution of the crank. For the purposes of rough approximation, the motion of the crosshead is taken as identical with the motion of N, and the longer the connecting-rod the nearer this is to the truth. But in many problems—especially those connected with the balancing of engines—this approximation is not close enough. Some account has to be taken of the difference we have just been discussing; and this is most simply represented by assuming this difference follows a similar harmonic law, with the important difference that its period is just half that of the principal motion. This represents very closely what we have described; and it is expressed by saying that the motion of the crosshead is the sum of two simple harmonic motions. For one of these motions the range is the stroke of the engine, and the period is the duration of one revolution; and for the other the range is something much smaller, and the period is half the duration of one revolution. From this combination of motions, the circumstances as to velocity and acceleration of the piston can be easily deduced in a form to which the equations of motion can be readily applied.

The motion of the crosshead, in such a case as this, can also be investigated by graphical methods of great simplicity and beauty; and as the constructions involved are rigid and not approximate, the accuracy of the results depends only on the scale of the drawing and the skill of the draughtsman. But when the forces under discussion arise from the motion of several cranks attached to one shaft, the graphical methods become cumbersome; and for any general deductions we are forced back on analysis, which is made possible by the breaking-up of the motion as I have described it. I have dealt with this case, however, not because the motion of reciprocating pistons is in itself an important subject of investigation, but because it furnishes for my present purpose a familiar example of the general analysis of periodic quantities. It is, in fact, a particular application of perhaps the most powerful weapon with which the mathematician has furnished the world of physics and engineering.

I should like to try, before we leave the mathematical portion of my paper, to give you some idea, in language as non-mathematical as I can find, of what is meant by Fourier's analysis of Periodic Functions.

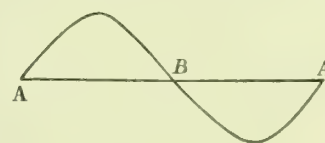
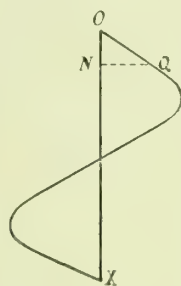
A periodic quantity is one which in a certain definite period of time goes through a definite sequence of values, coming back to the value it started with, and which in the next equal period of time, and in each succeeding equal period, repeats the same sequence in the same order. This sounds somewhat formal and long-winded; but you must forgive a little precision here and

there. The simplest example of a periodic quantity is the harmonic displacement of the point N, which we have been discussing. Let us draw a vertical line OX, and take distances along it measured down from O to represent intervals of time measured from the instant when the crank CP is vertical. Thus I take the length OX to represent a whole period, and ON, which is one-eighth of OX, to represent one-eighth of a period, and the length of the line NQ is the corresponding length of CN when the crank has moved through one-eighth of a revolution. Setting-off these distances corresponding to equal steps round the complete circle, we get the curve as drawn, which is the displacement curve for simple harmonic motion drawn on a time-base, and is what is called a sine-curve.

Any periodic quantity, if it follow the simple harmonic law—be it a velocity, an angle, an electromotive force, a temperature, or what you will—can have its fluctuation represented to a time-base by a curve identical with this one. The velocity of the point N, for instance, starts at zero at the left-hand dead-centre, passes through its greatest value when N passes over C, comes to zero, and is reversed at dead-centre B; and, taking for convenience our time-base horizontal, we have its periodic curve as in the figure, again a simple sine-curve. You will notice that

our starting-point is now the dead-centre A, and not the mid-position as in our displacement curve.

What now about the velocity of the crosshead D? This moves as we have seen in a periodic manner. But its motion is not a simple harmonic motion; and we can easily see that it must move faster than N at first when the distance DN is diminishing, and slower than N when DN is lengthening out again. If we determine this velocity, as we can do, and represent it on the same time-base as the velocity of N, we shall find the trace as shown in the curve marked D; the curve marked N being the sine-curve representing the velocity of N. These curves cross exactly at the quarter-points—that is, at the dead-centres, and when the crank is vertical. At any particular instant (represented by the point T)





the instantaneous velocities of N and D are respectively  $TR$  and  $TQ$ , and the difference is  $QR$ . Set-off now a distance  $TS$ , equal to this difference  $QR$ , and do the same all along the curve—thus



plotting a curve whose height at any point represents the difference between the two velocities. This difference curve, shown in dotted lines, is found to be very close to a simple sine-curve, which, however (and this is the important point), goes through two complete fluctuations in one original period.

Now Fourier's great theorem, as applied to cases such as we are considering, is that any periodic quantity, however irregular the outline of the curve which represents it, can be dissected into a series of simple harmonic quantities, each represented by its own simple sine-curve, and each having a period which is some simple fraction ( $\frac{1}{2}$ ,  $\frac{1}{3}$ , and so on) of the complete period in which the original quantity carries out its complete fluctuation. And the theorem also shows how to determine the relative importance, as to magnitude, of the different harmonic terms whose sum goes to make up the quantity in question.

It is not too much to say that wide fields of accurate knowledge, and knowledge of a practical kind, in mechanics, in heat, and above all perhaps in electricity, must have remained closed to our attack but for the power of this particular method of analyzing periodic quantities. Among its greatest triumphs is the analysis of the tides, which showed the way to the construction of the tide-predicting machine, in which the fluctuations of all the various causes which influence the periodic rise and fall of the tides are properly taken into account.

There is another important class of fluctuating quantities at which I should like to glance very briefly. If a pendulum be set swinging, and left to itself without the power of the spring or weight to keep it going, it will gradually be brought to rest by the friction of the air. A galvanometer needle set swinging by the passage of a quantity of electricity through the coils of the instrument, will continue to swing backwards and forwards for some time; its angle of swing gradually diminishing according to a definite law. In these cases, the frictional resistance which gradually extinguishes the motion is usually proportional to the velocity of the motion at each instant; and when that is so the law according to which the gradual slowing-down takes place can be accurately investigated. A somewhat similar problem, depending on quite different physical circumstances, but involving analysis of the same general nature, relates to the gradual wiping-out of periodical variations of temperature applied to the surface of a body. There is, for instance, at the surface of the earth a fluctuation of temperature of which the period is one year, as well as a fluctuation of which the period is twenty-four hours. Temperature records have been taken at different depths below the surface of the earth; and these records show exactly what the theory of transmission of heat accounts for. In such a case, naturally, if the records do not agree with the theory, so much the worse for the theory. It is found, for instance, that the more rapid fluctuation (the daily one) penetrates to a slight depth only, while the fluctuation of a longer period is in evidence at a much greater depth. And according to the mathematical theory, we find that, if other things are the same, the depths at which the fluctuations of temperature become so small as to be unrecognizable are proportional to the square root of the period of the fluctuation. The ratio of the periods in question is 365 to 1; and the ratio of their square roots is about 19 to 1. So that if the daily fluctuation just died out at a depth of a foot, we should expect to find the annual fluctuation just recognizable at a depth of about 20 feet. And although the actual depths mentioned are chosen simply for convenience, this is about the relative depths to which the two influences are able to pierce.

Another feature, also in agreement with and predicted by theory, is that the fluctuations are not only quickly reduced in vigour as we descend, but they are retarded in time. Thus, in the experiments I have referred to, it was found that 3 feet below the surface the range of temperature from one year's end to the other was about  $16^\circ$ , and the temperature was highest about the middle of August; whereas at a depth of 24 feet the range was rather less than  $4^\circ$ , and the highest temperature occurred early in November.

The mathematical investigation of this problem applies equally to the circumstances of transmission of heat through the walls of



an engine cylinder. In considering the question of the condensation on the walls of a steam-engine cylinder, and the question of the passage of heat through the walls of a gas-engine cylinder, the nature of what is called the temperature gradient just below the inside skin of the cylinder is an important practical matter. Take the case of a gas-engine cylinder, and assume that the outer surface is kept at a constant and moderately low temperature by the water circulation. Let us call this temperature  $t$ , and at first suppose that the inside walls are kept at a constant and higher temperature, which we shall call  $T$ . The temperature gradient

through the metal will then be a straight line—that is to say, the drop from  $T$  to  $t$  will take place uniformly through the thickness of the walls. If  $AB$  in our figure represents the thickness of the walls, then the temperature line is the straight line  $PQ$ , where  $A$  represents the temperature  $T$  and  $B$  the temperature  $t$ .

Now let us suppose, as being more in accord with facts, that the temperature on the inner face is a fluctuating one, and assume that its fluctuation is a simple harmonic one, and that  $T$  is its mean value, it goes (say) up to  $T + \theta$  and down to  $T - \theta$ . This pulse or wave of temperature is transmitted into the metal; and as I have just pointed out the equation of transmission of heat can be formed and the circumstances at any depth completely determined. The result, of course, depends on several factors—the density of the metal, its conductivity, and its specific heat on the one hand and the frequency of the surface fluctuations on the other. We find that we can represent the distribution of temperature at any instant by superposing a wavy line of the straight gradient which we have drawn, and that the height of the waves of temperature falls rapidly as we penetrate into the metal. This is represented in a general way by the wavy dotted line which is drawn from the instant at which the surface temperature is just at its mean value  $T$ .

If we take cast iron as the metal of our cylinder, and one-fifth of a second as the period of fluctuation (which corresponds to an engine speed of 300 revolutions per minute), we find that at a depth of three-sixteenths of an inch the extreme range above or below the steady gradient temperature is about one two-hundred-and-fiftieth of the range at the surface—that is to say, at this very small distance from the surface the fluctuation is practically wiped out. We also find that the wave-length measured into the metal is about one-fortieth of an inch.

The general equations of the flow of heat, on which the solution of the problem depends, are also applicable to other problems. Exactly the same equations are used in handling the problem of the transmission of signals through a submarine cable. I mention this as an example of what constantly occurs in the application of mathematics to practical problems. The form of analysis required by one set of circumstances in one field of science is found to fit a totally different set of circumstances in some distinct, and it may be, remote region.

The examples I have discussed may serve to indicate how in one particular field the work of the pure scientist—in our case the mathematician—is brought to bear practical fruit. And the same general relation holds good in other departments. The pure scientist, searching after wide generalizations, and pushing further and further the limits of knowledge, discovers new modes of attack, new relationships between unconnected facts, new bases for further advance. We, in dealing with the applications of science to practical needs, make free use of whatever in his methods or results seems likely to assist us in solving our own particular problem.

This division of labour has great advantages. In any practical problem of even moderate complexity there are present factors of widely varying degrees of importance. Any attempt at a general solution of the problem will give equal prominence to all these factors, and will probably give no indication of their ultimate relative values. And any attempt to simplify the analysis may involve the neglect of terms which, though analytically objectionable, are practically important. But the practical man knows which factors are important and which are unimportant; and often by a wise neglect, which may scandalize his more learned brother, he can reduce the problem to a form from which practical results of value can be obtained.

In passing from this part of my subject, I have but to express the hope that the examples I have dealt with may be sufficient to show that engineering practice owes a very real debt to pure theory, and that the mathematician, though his purpose is not our purpose and his thoughts not our thoughts, may still be recognized and welcomed as an ally.

In other fields of research (as for instance in Physics or Chemistry) we find a much more direct and obvious relation between the work of the pure scientist and that of the practical man. Both deal with the tangible and the concrete, both express themselves in the same language, and use, with some reservations, the same methods and units of measurement. Many researches of real scientific value and importance have had their beginning in some question suggested by a practical need, and more than a few scientists, starting on some track of pure investigation, have found it lead them to a definite practical result of immediate application.

Some pure scientists we know and many engineers; but when we try to place men like Lord Kelvin, or William Siemens, or John Hopkinson in one class or the other, we see that any suggested line of demarcation must be vague and shifting. In many branches of engineering, there is much close co-operation between research and practice; and as instances of this I may mention the work done by bodies like the British Standards Committee or the Gas Explosions Committee of the British Association. And in order to illustrate one or two important aspects of the co-operation between theory and practice on the physical side, I propose to occupy a few minutes of your time with some considerations relating to the Theory of Heat.

We are all of us interested—some no doubt more directly than others—in the application of the great natural stores of energy to the production of directed and controlled mechanical work, and more particularly in the utilization of the energy which is stored



in coal. If we compare for a moment the various forms in which energy is found, or in which we can store or transmit it, we find some curious results. As a unit of comparison let us take the horse-power-hour—that is, the work done in an hour by an agent working at the rate of one-horse power, or, what is the same thing, by a 60 H.P. agent working for one minute. If we wish to store this energy in water with a free available fall of (say) 100 feet, about 9 tons of water are required. A waggon weighing about  $7\frac{1}{2}$  tons possesses this amount of kinetic energy when it is running at 60 miles an hour. Everyone carries a small store of energy in a coiled-up watch-spring. To store one-horse-power-hour in steel springs, without overstraining the metal, would require something over 60 tons of steel. If we expend this amount of energy in raising the temperature of water, it is only enough to raise the temperature of 10 gallons about  $25^{\circ}$  Fahr. But if we supply the proper amount of oxygen to 1 lb. of good coal, so that it is completely burnt, it will develop heat sufficient to raise six times this amount of water through the same rise of temperature. If, therefore, we wish to try our energy in the least bulky form, we shall not seek to acquire rights over a waterfall, but will put our money into coal.

On the other hand, if the energy is required for any form of mechanical work, we shall at once recognize that the energy in our coal presents itself in a much less handy form than does the energy of a head of water, or a wound-up spring, or a cylinder of compressed air. The energy locked up in the chemical arrangement of the coal and the oxygen must first be developed in the form of heat; and in this form its only impulse is to spread itself about, to run off to regions of low temperature, and thus to lose all its availability for ultimately producing mechanical work. In comparing energy in the form of heat and energy stored in a head of water, or in a spring, or in compressed air, Reynolds has used a rather striking analogy. He likens the former to the energy of a mob; the latter to that of a disciplined army. Consider an agitated mob of (say) a thousand men, rushing aimlessly hither and thither, each individual possessing a definite amount of kinetic energy in virtue of his motion, but the crowd as a whole having no common tendency except to melt away in all directions. Contrast it with an equal number of men, each having the same amount of energy as before, but all moving in disciplined order in a definite direction. The one is a directed and effective source of power, the other is not. The energy of heat then, notwithstanding the enormous advantage it has in bulk, starts out to supply mechanical work under a very definite handicap.

The combination of boiler and steam-engine (the typical agent for the conversion of heat into mechanical work) had reached a very advanced stage of development before it was recognized that the disproportion between the energy of the fuel and the useful output of the engine was in great measure inevitable. There is a form of observation, not so often employed in laboratories as it might be, which for brevity we may call the statistical. It consists in fencing-off some particular object of observation, and taking count of what goes in and what comes out. The typical observer in this manner is the man who having been told off to report on a refrigerating plant summarized his observations by saying that coal went in and ice came out. His report did not contain all that might have been said, but it did single out a very significant fact. Let us build our imaginary fence round a steam-plant, consisting of boiler, engine, and surface condenser. We must leave openings for the supply of coal, air, boiler feed, and circulating water, and we must supply exits for the furnace gases, the ashes, the air-pump discharge, the circulating water after it has passed through the condenser, and the engine-belt which delivers the useful work.

Now, when everything has reached a steady state, we have to form a balance-sheet and compare what goes in with what comes out. We shall have several accounts to balance. In the first place, we shall find that we can set off the weight of the entering coal and air against the weight of the ashes and the chimney discharge; and we shall find the circulating water the same in amount at exit as at entry, and the air-pump discharge will balance the boiler feed if we assume that all glands and joints are steam-tight. These several items make up a complete balance so far as matter is concerned. Then as regards energy, on one side of the account we have the energy which the coal and its proper amount of oxygen, entering in the air, are able to develop in combustion; and on the other side we have the energy represented by the rise of temperature of our two streams of water and of the stream of coal and air which goes in cold and comes out, at the chimney top, warm, and the energy which is delivered by the belt, which we suppose measured on some form of dynamometer. To take very rough and round figures, we shall find that of the energy supplied in the fuel about one-quarter goes up the chimney, about one-tenth is delivered by the belt, while the remainder—that is roughly two-thirds—is represented by the rise in temperature of our streams of water. Of these streams, the circulating water carries off probably from fifteen to twenty times as much as the air-pump discharge.

In a gas-engine we may develop about one-third of the thermal energy of the gas; the remainder going into the exhaust-pipe or to the circulating water. But, on the other hand, the thermal energy of the gas is very much less than that of the coal from which it is formed.

Probably the most favourable conditions for economy in a steam-plant considered as a whole exists on board ship. With everything in their favour, the best of large marine engines deliver

to the shaft perhaps 15 per cent. of the energy fed through the stoke-bold. Something about 20 or 25 per cent. goes up the smoke-stack; and the rest—say, 60 per cent.—is pumped into the sea in the circulating water. The 15 per cent. delivered to the shaft also ultimately reaches the sea; for it is spent in overcoming the resistance of the water to the motion of the ship, and is dissipated in the heat of skin-friction.

The old theory was that heat was something indestructible, which could do work when passed down the scale of temperature—much as water or other heavy matter can do work when passed down the scale of height; and that a heat-engine was a contrivance for so arranging the descent of the heat as to make possible the useful mechanical application of the work done by it. The development of the steam-engine probably suffered little from the bad theory at its back, partly because limitations imposed by the nature of materials make the theoretical efficiency an unattainable ideal, and partly because James Watt, by what may be called sheer engineering instinct, had grasped what experience has shown to be the essentials of the problem. Nevertheless, when it was recognized that the heat given out by a working substance is less than that taken in by it, by an amount exactly equal to the mechanical work it has done, the working substance being returned to its original state, a fresh impulse, and a very fruitful one, was given to the whole problem of the utilization of the energy of our natural stores of fuel.

The science of thermodynamics, as based on the actual relation between thermal and other forms of energy, was developed with extraordinary rapidity about sixty years ago, mainly by Clausius, Rankine, and Kelvin; and the general conclusions which they formulated have since then become an integral part of all modern theory in physics and chemistry. The laws which they established have been of great direct value in such problems as the flow of gases and vapours; and through them the development of the steam-turbine has been much less of an empirical advance than is generally supposed. But it has to be admitted that they do not give us anything which might be called a complete theory of all the very complicated actions which go on, for instance, in a steam-engine cylinder. The laws of thermodynamics in some degree stand apart, almost remote, from actual operations—indicating a theoretical perfection of which the most efficient engine must fall lamentably short. And I think the tendency to throw general theory into a mathematical form has something to do with this apparent remoteness.

We are assured, and the logical completeness of the proof is remarkable while the validity of the experience on which it rests is unquestioned—we are assured that when our source of power is a thermal one, we must draw on it for very much more than we can hope to convert to our use. We also know that the inevitable waste of energy bears the same proportion to the supply as the absolute temperature at which the working substance leaves our engine bears to the temperature at which it enters it. But we are not definitely told what it is in the nature of things which necessitates this limit on our powers of exchange. I wish in closing merely to indicate one or two considerations on this point.

In the first place, we know that if we can get heat from our source into our working substance it will give it just those powers of expansion and of thrust which will enable us to overcome some external mechanical resistance; and we also know that, other things being equal, this elastic thrust is greater the higher the temperature. This means that we have to prepare our working substance, get it as near as we can to the temperature of our source, before we can economically pass the heat into it; and this entails the expenditure of work. Then again as the working substance expands, doing the useful work required of it, it falls in temperature, and quickly reaches a state in which it can no longer exert useful thrust. Then we have to get rid of it; and this usually entails throwing away a large amount of the energy supplied. We cannot, for instance, pump low-pressure steam, as from an engine-exhaust, back into the boiler, against the high-pressure existing there, without condensing it and thus losing a vast amount of the energy it still retains. In short, a heat-engine is not like a gun. It has got to bring its bullet back again and load itself for the next shot; the man at the trigger supplying only the powder. Or, to take another analogy, the effective value of a working substance must be reckoned on the same basis as the earning capacity of a coal-waggon, in which the trip back to the mine has to be set off against the trip out.

In all processes concerned with the transformation or application or transmission of energy or power, one simple law stands supreme. No energy is destroyed. A little is delivered; much is wasted. And the engineer who, by thought and observation, enables his fellows to transfer one per cent. from the column headed "waste" to the column headed "delivered," is fulfilling the highest aims of his profession.

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The Autumn General Meeting of the Midland Association of Gas Managers will be held at the Grand Hotel, Birmingham, on Thursday, the 27th prox.

In the mining and chemical industries groups in the restored British Section at the Brussels International Exhibition, the Glenboig Union Fire-Clay Company have an exhibit which is practically identical with the one in the old section; and the Gaslight and Coke and the South Metropolitan Gas Companies show chemical products.



# SCOTTISH JUNIOR GAS ASSOCIATION.

## EASTERN DISTRICT.

The opening meeting for the session of the Eastern District Division of the Scottish Junior Gas Association was held in the Heriot-Watt College, Edinburgh, on Saturday afternoon. There was a very good attendance; and Mr. H. RULE, of Kelty, the retiring President, expressed satisfaction at seeing so large a number of members. He remarked that as the years went on it was gratifying to know that the demand for gas was rapidly increasing, and that there was a bright future for the gas industry. It was the duty of all those who were engaged in the gas profession to stimulate the demand, and direct all their energies towards this end. The time had now come when he must quit the presidential chair; and he had much pleasure in asking Mr. Dunlop, the new President, to take his place. He was sure that Mr. Dunlop was well fitted for the position; and if the members would extend to him the hearty co-operation and support they had given to past Presidents, the session they were entering upon would be the most interesting and successful the Association had had.

Mr. W. DUNLOP (Kirkcaldy), the new President, on taking the chair, said his first duty was the pleasant one of presenting the Association medal to the Past-President. Mr. Rule had been an active member, an energetic Secretary, and a popular President.

Mr. RULE briefly returned thanks for the gift.

## PRESIDENTIAL ADDRESS.

The PRESIDENT, in the course of his address, said: Since our inception, seven years ago, the sessions have proved most successful; and I sincerely hope that the one we are just entering on will prove as successful as the preceding ones. On comparing the membership at present with previous years, I find that there has been a slight falling off—due principally, I think, to some members obtaining posts in other districts, and the failure of their successors to take advantage of the benefits which membership in our Association would afford them.

It occurs to me, in looking over records of the various Junior Associations, that the chemical side of our industry has scarcely got the attention from juniors that it justly deserves. By the chemical side of our industry, I mean the ascertainment by chemical tests of the efficiency of each part of our plant. In every-day routine, we are apt to forget that our modern appliances are the result of careful study of the chemical properties of the materials involved; and as we are changing our methods, it necessarily follows that a system of testing must be kept up. When we consider how much a chemical process the manufacture of gas is in a modern works, and the number of ways in which chemistry can be brought in to help us, it is rather surprising that so little testing is done, even in medium-sized works. A simple test for sulphur in a coal will sometimes suffice to condemn it, and thus save the necessity of making further tests as to the yield per ton, &c. It is not sufficient to test our coal when the contracts are made—it should be periodically tested, so as to see that the quality is being maintained.

Some time ago, I made a series of tests on a "Walker" washer, to ascertain under what conditions the greatest efficiency could be obtained from this part of the plant; and, as a result of my tests, I found that, by increasing the rate of flow of the liquor through the washer, greater efficiency in respect of the elimination of sulphuretted hydrogen was obtained, while carbonic acid was at least equally well eliminated. One reason for the more efficient results may be that, by having a good flow of liquor passing through the washer, there would be less chance of gas getting through the upper chambers without having come into immediate contact with the washing liquor than if only a slight flow was passing. When I made the first test, the liquor was passing through the washer at the rate of 10 gallons per hour; and in the subsequent tests, I increased the rate until it reached 50 gallons per hour. I aimed at having the conditions as nearly as possible the same in all cases; the rate of flow of the liquor alone being changed. That is to say, I made a test with the low rate of flow; and when I again found that the temperature of the liquor, the temperature of the gas, the make per hour, as well as the percentage of impurities in the gas, were about the same, I altered the rate of flow and made another test. In the subjoined table, each result is the average of three determinations in the case of each rate of flow.

Tests at Inlet and Outlet of Washer.

| Inlet.                 |         |                                    | Outlet.                |         |                                    | Eliminated.            |         |                   | Rate of Flow. Gls. | Liquor. Inlet. | Deg. Twad. Out-let. |
|------------------------|---------|------------------------------------|------------------------|---------|------------------------------------|------------------------|---------|-------------------|--------------------|----------------|---------------------|
| Grs. H <sub>2</sub> S. | Grs. S. | Per-cent- age of CO <sub>2</sub> . | Grs. H <sub>2</sub> S. | Grs. S. | Per-cent- age of CO <sub>2</sub> . | Grs. H <sub>2</sub> S. | Grs. S. | CO <sub>2</sub> . |                    |                |                     |
| 510.0                  | 480     | 3.5                                | 153.7                  | 430     | 3.1                                | 56.3                   | 50      | 0.4               | 10                 | 4.3            | 10                  |
| 503.6                  | 474     | 3.2                                | 444.4                  | 418     | 2.9                                | 59.2                   | 56      | 0.3               | 20                 | 4.5            | 8.8                 |
| 520.6                  | 490     | 3.4                                | 455.8                  | 429     | 3.0                                | 64.8                   | 61      | 0.4               | 30                 | 4.5            | 7.5                 |
| 495.2                  | 466     | 2.9                                | 421.8                  | 397     | 2.5                                | 73.4                   | 69      | 0.4               | 40                 | 4.5            | 6.4                 |
| 534.4                  | 503     | 3.1                                | 449.4                  | 423     | 2.8                                | 85.0                   | 80      | 0.3               | 50                 | 4.25           | 5.8                 |
| 505.7                  | 476     | 2.6                                | 413.3                  | 389     | 2.2                                | 92.4                   | 87      | 0.4               | 55                 | 4.5            | 5.5                 |

In working the washer, the liquor is pumped from the stock-

tank to a tank immediately above it, from which it flows down through the washer and back to the stock-tank. It will be noted that, though the Twaddell of the liquor in the bottom chamber was reduced from 10° to 5.5° Twaddell through the increased flow, the strength of the stock liquor was maintained.

In these days of rush, it is not often that a year passes in a gas-works without some alteration or addition to the plant taking place; and it becomes all the more necessary, therefore, that we should have an intimate knowledge of what is taking place in our works, and what effect any contemplated alteration or addition may have on the already existing plant.

Say a tar-extractor has to be put up, let us consider for a moment what effect this is likely to have. The gas will be robbed of its tar-fog and some hydrocarbons; and, consequently, less tarry matter will go forward to the washer and scrubber, which to some extent will increase their efficiency. But other conditions will arise. It will be found that there will be an increase in the amount of carbonate of ammonia crystals in the condensers. Whether this is due to a more active combination of ammonia and carbonic acid gas, or to less aqueous vapour going forward, which would prevent the formation of crystals, I am not in a position at present to say. I am inclined to favour the latter hypothesis, however, as the crystals make their appearance most in the last three columns of the condensers. The condensers, being relieved to a great extent of the condensation of tarry matters, will be more active in bringing down aqueous vapour; and by the time the gas reaches the last three columns, there will be considerably less moisture in it, and conditions will be present most favourable for crystallization to take place. These crystals may even be found well forward in the manufacture pipe, and sometimes accumulate to such an extent on the seat of valves as to interfere with their free working. In addition to carbonate of ammonia crystals, the naphthalene will come down more readily, and instead of troubling us in the mains and services will make its presence more apparent inside the works—principally at the seal-pots of the condensers and the inlets of the holders; and this necessitates a close watch on the plant to see that no chokes take place. A slight increase in the back-pressure at the inlet of a holder usually denotes that naphthalene has collected at this point. I have found that a choke here is best cleared by first pumping the water-trap dry, and introducing a bucket of benzol, followed by enough hot water to fill the stand-pipe. The benzol floats on the surface of the water, and in its passage up the pipes dissolves the naphthalene; and it will be found, on again pumping the water-trap dry, that the stand-pipes will be perfectly clear. A periodical steaming of the condensers and manufacture pipes will do much to prevent any accumulation, and allow the gas to pass freely through the various processes.

That an Everitt tar-extractor does much to reduce the number of complaints due to choked services, cannot be gainsaid; but the figures which can be produced regarding its efficiency are very variable—ranging from a removal of 50 per cent. of the naphthalene to an actual increase. What tests I have made have shown an increase in the amount of naphthalene at the outlet. Information obtained from other places where there is an extractor of this type in operation confirms the statements I have made regarding the conditions which arise. It seems rather strange that a 50 per cent. elimination should produce increased troubles through accumulation of the substance supposed to be removed. I am inclined to think what really takes place is that naphthalene is set free from other hydrocarbons with which it has been associated, and is for this reason more liable to be deposited in the works.

While on the question of new apparatus, I would just like to mention incidentally that recently a Bryan-Donkin steam-regulator was installed at Kirkcaldy. When first started, it proved to be troublesome to regulate. The bell seemed to oscillate too freely with large variations from vacuum to pressure. A careful examination of all the working parts was made to see that no looseness existed, and that every motion of the bell was imparted to the steam throttle-valve. After all the loose parts and the connections between the bell and the steam throttle-valve had been made perfect fitting, and the air-valve on top of the outer casing carefully adjusted, a chart was obtained equal to any I have seen produced where a retort-house governor was in use. In working a regulator of this type, it is most important that the air adjustment be carefully set.

At no time in the history of our industry did the method of carbonization present so much interest to the gas profession as at present. The idea of carbonizing in vertical retorts has long been in the minds of gas engineers; and the progress made in this direction by our sister industry—the Scottish oil trade—has been keenly watched. In the early days of the oil industry, the shale was retorted in the same type of retort as was in general use in the gas-works at that time; and it was not till the year 1850, when Mr. Young took out a patent, that any special form of retort was in use for the distillation of shale. Since then, the retorting of shale has passed through an evolutionary process very similar to what has taken place in the gas industry, though the objects of the various changes have not been the same. The principal factor in the evolution of the shale-retort has been the increased yield of sulphate of ammonia; while in our own industry the factor has been increased yields of gas per ton of coal. The first mention of vertical retorts in gas making that I can find was in 1863; and this was in connection with a suggestion to produce gas for heating purposes, and supply it at a cheap rate. The proposal was frustrated by the refusal of Parliament to grant the



necessary powers, on account of the opposition of the local gas company. Some of the advantages of the vertical retort I should say are: Less loss of gas from the opening of retort-doors, increased amount of gas produced per square foot of floor area, freedom from dust and noise, and (if the experiences of the shale-oil industry count for anything) longer life of our settings.

The question of the smoke nuisance is being much discussed by our municipal and public bodies; and it is just possible that, in the near future, Parliament may compel these bodies to take the matter seriously in hand. The inevitable result of this would be a greatly increased demand for the commodity we produce.

At the close of the address,

The PRESIDENT intimated that the next item on the programme was to have been an address by Mr. J. Falconer King, of Edinburgh; but the Secretary had received a letter from him, which would be read to the members; and seeing that Mr. King was not to be with them, the Secretary wrote to Mr. J. W. Napier, of Alloa, pointing out to him the position they were in; and Mr. Napier had kindly consented to make a few remarks upon the address, which would then be open for discussion.

The HON. SECRETARY (Mr. W. Geddes, of Granton) read Mr. King's letter, written from Tours, in which he asked whether they could not arrange to dispense with his attendance at the meeting. He said he should like very much to be present at some of their gatherings during the coming winter—not necessarily to intrude in any way, but rather to see how they were usually conducted, and to learn if he knew enough of the subjects dealt with to be able to take part in the discussions. The Hon. Secretary also announced the receipt of a telegram from Mr. Wilson, of Glasgow, expressing regret that he had been prevented from being present. This was a pity, as Mr. Wilson had taken a very deep interest in the Association ever since its inception.

Mr. J. W. NAPIER (Alloa) then addressed the members. He began with the remark that his presence there was somewhat fitting, in so far as he was essaying to fill the position which was to have been occupied by Mr. Falconer King, his old master. It was from Mr. King that he received his education in chemistry and his start in life. He wished it to be clearly understood, however, that he had not prepared any special matter, but that he simply desired to criticize, and if possible enlarge upon, some of the points taken up by the President in his address. The Association was evidence of the activity and the vitality existing in the gas industry. An industry which did not possess within itself a youth, could not be on a sure foundation, because necessarily the shoes of those who passed, as time went on, must be filled. There was one aspect of their business which perhaps had not had their attention so much as might be desirable. He referred to the commercial aspect. Gas managers were nothing now if they were not commercial men. The engineering side of the business was necessary, so far as building the works was concerned; and the chemical side also, so far as regarded efficiency and economy in working the plant. But they might take it from him that when they entered into a position of responsibility for the management of gas-works, the commercial aspect obtruded itself very largely indeed. The President had referred to the importance of making tests. The constructional part of a gas-works was most important, so far as the capital account was concerned; but he would essay this statement, that the commercial side was the part which was most important, so far as the economy of working the materials was concerned. If they took, for instance, the question of purification, there they had essentially a chemical action going on; and unless they were familiar with the conditions, and the temperature necessary to bring about efficient purification, results might accrue which would be very damaging indeed. In connection with oxide of iron, he would wish to put forward the opinion that it ought to be bought upon a proper basis. They knew that a paper manufacturer, when buying pulp, bought it upon a chemical analysis of the amount of moisture present; and the chemical manufacturer, in buying caustic soda, purchased it upon the basis of the amount of sodium oxide contained in it. Why should gas manufacturers not buy oxide of iron upon the basis of its percentage of real purifying material—viz.,  $\text{Fe}_2\text{O}_3$ . He thought this could be arranged perfectly well. If they bought at a rate per cent. of efficient  $\text{Fe}_2\text{O}_3$ , they would be able to compare the several quotations brought before them on an equal basis, and determine which was the most valuable, quite apart from any quotation which might appear to be most favourable, but which, on analysis of the substance, might be found to be less valuable. The President had referred to tests with a washer, and had shown that, where the rate of flow of the liquor was increased, the greater efficiency was obtained in the absorption of sulphuretted hydrogen and carbonic acid. This was just what they would expect. In the case of a brush scrubber, the rate of flow of the liquor was perhaps not so important as the speed at which the brushes were driven. He had found that if the speed of the engine driving the scrubber were increased, the amount of ammonia found at the outlet diminished. In the matter of the efficiency of the scrubber, a test for the amount of ammonia passing was very important. The usual qualitative test with turmeric paper was fairly satisfactory, but only up to a certain point. In his opinion, tests should be made from time to time by passing a measured volume of gas through standard acid, and calculating the amount of ammonia in grains per 100 cubic feet of gas. They would find that if the brushes became clogged with tar or pitch, and the temperature of the liquor was from 70° to 73° Fahr., the efficiency of the scrubber

had become less, and the amount of ammonia passing had considerably increased. He had observed lately, in his own works, when the scrubber was not acting, that the efficiency of the purifiers very much increased. Naturally, he concluded that this was brought about by the scrubber, which was not at work allowing a considerable amount of ammonia to pass, and therefore making the oxide in the boxes alkaline. They knew that the oxide frequently showed an acid reaction; and the proper way to treat it was simply to put in a little liquor to make it alkaline again. As regarded tests in sulphate of ammonia manufacture, he had these carried out regularly; and they were most valuable. For example, he took a portion of the waste gases leaving the saturator, passed them through a coil immersed in a barrel of water, and tested the condensed products for free ammonia. The object of this test was to ascertain if the saturator was in proper working condition. The condensed products from the heater were similarly tested for free ammonia, in order to ascertain whether the ammonia tubes were leaking. These tests were very easily carried out per gallon of liquor. The President had referred to trouble in regard to the stopping of the holder inlet and outlet pipes. In the past year, he had found the holder pipes partially choked; and the trouble was easily got rid of by placing 50 or 60 gallons of benzol in them, and connecting up steam to the ordinary pumping-pipe, whereby the benzol was gasified and the naphthalene gradually dissolved away. The conception which the President had formed as to the advantage of a number of gas-works combining for the sale of bye-products was one which had concerned gas companies for many years; but he ventured to say that if the system of selling residuals were made on a sliding-scale, they would be able to get the advantage of the changing market values of them. For example, during the present year the price of pitch had gone up considerably, and therefore they would be benefited; whereas in the case of a contract made for a whole year, despite the rise in value of the article, the advantage would, of course, not be obtained by them. Regarding the question of the adoption of vertical retorts, a new aspect of this matter had come before them in the charging of horizontal retorts full. He was satisfied that where a retort-bench had to be renewed, the adoption of vertical retorts was the best course; but he was further satisfied that where the capital account had to be considered, and the bench was not ready for scrapping, with machine charging and filling the retorts full results almost equally as good would be obtained. They would not, however, be so good with respect to labour, because with vertical retorts, and dealing with a large bulk of material with a minimum of work, the costs per ton must be very low. The President had referred to the influence of a day consumption as regarded holder capacity. At Alloa it was now eighteen years since the holder capacity was enlarged, and yet the manufacture had increased three times. At present the daily maximum was about 650,000 cubic feet, with a holder capacity of only 300,000 cubic feet; and yet they did not experience any trouble, simply because the hour-to-hour output of gas was more equally divided over the day. Another matter, which had just occurred to him, had reference to the accuracy of statistics as to the measurement of gas. He thought that the Junior Association might well take upon themselves the duty of starting right in regard to this matter. They all knew that in very few gas-works were corrections made for temperature and pressure in the measurement of gas. The effect of the temperature being above the normal was to increase the volume of gas; and this frequently happened where steam was used with oxide of iron purification. For the last three or four years, he had made daily observation of temperature and pressure, and had corrected to the standard the volume of gas manufactured. This enabled him to have data comparable one year with another. The data were also valuable in connection with the question of leakage. About three years ago, he caused a thermometer to be inserted in one of the street-mains, and observations made during the month of December showed that the gas was actually being transmitted to the consumers' meters at a temperature as low as 33° Fahr. The temperature during the summer months frequently rose to a little more than 60° Fahr. In preparing their statistics, they made a correction between the difference in volume of the gas as measured by the station meter under standard conditions, and the volume as measured by consumers' meters. For this purpose they determined an average temperature of 45° Fahr. over the whole year. The difference in volume, as corrected, amounted to 4,181,000 cubic feet on a make of 127 millions, and was equal to 3·30 per cent. In this they had evidence that accuracy was desirable, in regard to this matter, if their data were to be anything like correct. He could only add that it was a great pleasure to him to be present, and to know that the Association was entering upon another session with an enthusiasm which betokened well that it was doing good work.

The PRESIDENT said he was sure the members had all benefited by the remarks Mr. Napier had made. The question that he brought up last—as to leakage—was very important. He (the President) did not think there was sufficient done in the gas industry to get at the root of the leakage question. He moved that they thank Mr. Napier for the address he had given them.

Mr. D. BISSET (Edinburgh) said he quite agreed that in large works regular chemical tests were absolutely necessary. The testing of the flow of gases was a very important matter. He thought a great deal could be done by foremen in observing the condition of the ovens and the waste-gas flues. The figures given by the President as to the working of the washers were



similar to those obtained in their own works. The time would come when the bulk of the impurities in gas—sulphuretted hydrogen and carbonic acid—would be extracted at this part of the apparatus; and, in his opinion, a caustic liquor might be used to extract practically the whole of them, so doing away with purification in large boxes. The co-operative method of dealing with tar distillation looked very simple; but he did not see that it could be carried out. He was afraid the jealousy of the individuals would prevent the companies combining. The President had spoken about sharing the profits. What about sharing the losses? Then they would require to risk a lot of capital in putting down large works as permanent as gas-works. Further, it would be necessary to put the material upon the market as a finished article, because if only crude material were sent the distillers would have to buy it.

Mr. J. MITCHELL (Dundee), referring to finding crystals in the seal-pots, said that at Ardrossan they installed an Everitt tar-extractor between the condensers and the exhausters. It was not put in for naphthalene purposes, but for other tarry matter at the purifiers; and it remedied this. They did not get any tar in the oxide of iron; but they had the same trouble as the President, in the frequent finding of crystals in the seal-pots of the condensers. They also had some in the scrubber. As the tar-extractor was between the condensers and the exhausters, they had to use steam, which robbed the gas of tarry matter that had previously acted as a lubricant. Sometimes the exhauster became rather warm, and they had to put in some of the patent cylinder oil, which was merely creosote; and in this way they got over the difficulty.

Mr. T. W. HARPER (Dundee) complimented the President on two records which he had sent round for examination. They were really very fine, taking into account that he had no retort-house governor. In Dundee, where they had a Bryan-Donkin governor, he had taken off records a little better, but not much, than these. Besides the Bryan-Donkin governor, they had two which they made themselves. In these, they reduced the water space between the air-bell and the side, by which there was much less oscillation. If the engine ever happened to race, they had a shorter period for the steadying-up of the governor. Tar-extractors helped them to get quit of naphthalene; but, as Mr. Napier said, this could easily be done away with by putting in benzol. In Dundee, they adopted the same method as Mr. Napier. The President mentioned testing for carbonic acid in waste gases. He knew big boiler installations in connection with which they had put in carbonic acid recorders; and since then they had obtained a great saving in fuel—amounting, in some cases, to about 15 per cent.

Mr. R. B. WADDELL (Dunfermline) said that they had no trouble with the exhausters in working the retort-house governor in the ordinary way.

Mr. HARPER considered it was not fair to a retort-house governor to have a bye-pass working against it. He had such an arrangement; but he cut out the bye-pass, and gave the governor full justice. After this, its working was perfect.

Mr. J. R. MOYES (Granton), referring to the suggestion about combination in tar distilling, said there were so many large distillers that they practically held the market; and the combination would have to fight them, which he did not think would be at all judicious.

Mr. H. E. DORAN (Granton) asked Mr. Napier if he meant that gas managers ought to get a thorough commercial, as well as an engineering, training.

Mr. NAPIER replied that his reason for mentioning the matter was that he thought it would be well for them, if they could get some gentleman well qualified to do it, to bring the subject before them. They would find, when they came to be interested in managerial methods, that the commercial side was the most important. Therefore they should endeavour, in another session, to get someone to deal more particularly with the commercial aspect of their business.

The PRESIDENT thanked the members for the way they had received his address. After the tar-extractor was put in, it was observed that crystals began to accumulate in the seal-pots and in the dip-pipes of the condensers. At first, he was of opinion that they were naphthalene; but the crystals were soluble in water, and he ultimately found that they were carbonate of ammonia. He thought their presence was due to the condensation which took place. They found them at the outlet. Co-operative tar-distilling was put into his head by the fact that this method of working was practised in some places. In New Zealand, the dairy farmers worked in co-operation, on the basis he had indicated; and they found it satisfactory. The idea of the sliding-scale was certainly the best to adopt at present; but they had not the advantage of competition in getting rid of bye-products. It was with a view to getting full value for them that he thought of co-operation. Benzol would certainly clear away a naphthalene choke in gasholder valves. The method of using it referred to by Mr. Napier and by Mr. Harper, however, would carry the naphthalene forward into the holder, from which it would be taken on to the mains and services; whereas, if the work were done in the way he had indicated in his address, the naphthalene would be removed, and not give any further trouble. It might take longer to accomplish the clearing of the choke, but in the long run the trouble was altogether removed. In every test he had made, he had found an increase of naphthalene at the outlet of the Everitt tar-extractor. He thought this was due to

the picric acid test. He did not think the picric acid test was so reliable when they were dealing with crude gas as it was when they were dealing with gas partly freed from tarry matter; and in this way the increase might be accounted for.

#### NEW MEMBERS.

The HON. SECRETARY intimated that, as the result of the circulars he sent out, they had obtained ten new members, which was fairly good work. The members cordially endorsed the opinion.

#### THE ADVANCEMENT OF MEMBERS.

The PRESIDENT said that since their last meeting there had been some changes among their members. They regretted that Mr. Herring was leaving them. He had taken a great interest in the Association since its inception, and had contributed handsomely to their library. Mr. A. Masterton, the first President of the Association, had obtained well-deserved promotion from the Edinburgh and Leith Gas Commissioners. Mr. A. Morton Fyffe had gone from Dundee to Nelson; Mr. J. Mitchell from Ardrossan to Dundee; and Mr. J. D. Keillor from Lochgelly to Ardrossan. Just before the end of last session, they had Mr. J. Dickson's promotion from Kelty to Forfar, and Mr. H. Rule's from Falkirk to Kelty. It was very pleasing to see that their members were making their way and their mark in the world.

The HON. SECRETARY intimated the receipt from Mr. A. Morton Fyffe, for their library, of two volumes upon mechanical engineering, by Professor Johnson, of the Technical College, Glasgow.

**Brussels Exhibition Awards.**—In the notice of the Brussels Exhibition which appeared in the "JOURNAL" for the 28th of June in connection with the visit of the Société Technique, it was mentioned that Mr. George Wilson, of the Hague, Brussels, and Coventry, had in the Dutch Pavilion an excellent show of both wet and dry gas-meters. We learn that he has been awarded for it a Diploma of Honour, which is of higher value than the Gold Medal. Taking into consideration the large section of gas-meters, gas appliances, &c., the award is considered to be remarkably good.

**Manufacture and Taxation of Gas-Mantles, &c., in Germany.**—The imposition of taxes on matches, gas-mantles, electric lamps, &c., in Germany last year, has led to a separate return being made in the revenue statistics of the Empire of these classes of goods. The first set of figures published refers to the six months, from Oct. 1, 1909, to March 31, 1910. The tax on matches during that period yielded 7,079,008 marks (= about £347,010). The gas-mantles made numbered 61,380,188, while 20,784 were imported; and the tax thereon yielded 1,526,952 marks (= about £74,850). The taxes on electric lamps, arc carbons, &c., yielded in the same period 5,194,339 marks (= about £254,624).

**Use of Motor Vehicles by Gas Companies.**—The current number of "Progressive Age" contains an illustrated article on this subject. As the result of a canvass of a limited number of gas companies in the United States, statistics were obtained which showed that 76 companies have in use 165 automobiles, 68 motor trucks, and 150 auto-cycles—in all, 383 vehicles. For speed, the gasoline car is stated to be the more desirable; and many companies having both electric and gasoline trucks appear to prefer the latter. The Consolidated Gas Company of New York have the largest number of automobiles—thirteen; the Detroit City Gas Company having twelve, the Boston Consolidated Gas Company nine, and the Rochester Railway and Light Company eight. With a few exceptions, the other companies have three, two, or only one.

**North of England Gas Managers' Association.**—The half-yearly meeting of the Association will be held next Saturday, in the Lecture Theatre of the North of England Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne, under the presidency of Mr. J. Lewis, of Newcastle. According to the circular issued by the Hon. Secretary (Mr. Herbert Lees, of Hexham), the morning will be devoted to a visit to the Elswick Ordnance Works of Messrs. Armstrong, Whitworth, and Co.; and the meeting will be held at noon. The business will consist of the submission of names of candidates for membership and the delivery of the President's Inaugural Address. In the early afternoon, the members will have a trip down the river, and dine together in the Bath Hotel Assembly-Rooms, Tynemouth.

**A Large Gas-Engine.**—According to a paragraph in the Engineering Supplement to "The Times," one of the largest four-cylinder vertical gas-engines ever built is one of the Nash type, recently completed by the National Meter Company, Brooklyn (N.Y.), for the Phoenix Tube Company of that city. It is directly connected to a 200-kilowatt direct-current generator, and will be used for general power and lighting purposes. The engine and generator together occupy a floor space of 23 ft. 4 in. by 7 ft. 6 in., and the height of the engine above the floor line is 11 ft. 3 in. The weight of the engine alone is 46 tons. Its cylinders are 18 inches diameter and 18-inch stroke; and the crank-shaft is 9 inches diameter. There are two entirely independent systems of ignition, both electro-magnetic, which can be used separately or together. Two spark-plugs are provided in each cylinder; and when both are used at the same time, there is practically no chance of miss-fire, even with gas of poor quality.



## REGISTER OF PATENTS.

### Electrically Lighting Gas-Burners.

DELAGE, M., and WOOG, P., of Paris.

No. 17,486; July 27, 1909.

This invention relates to a method of electrically lighting upright incandescent gas-burners by means of induction sparks; the sparking taking place at the head of the mantle between two electrodes whose distance apart is maintained unalterable (except by special manipulation) by an insulating plug adapted to facilitate the removal of the mantle and its supporting gallery without at the same time altering the distance apart of the electrodes or the substantial position of the plug with respect to the new mantle when put in position. Though the part obstructing the removal is easily movable, the arrangement is such that the part can be easily replaced in the same substantial position without trouble.

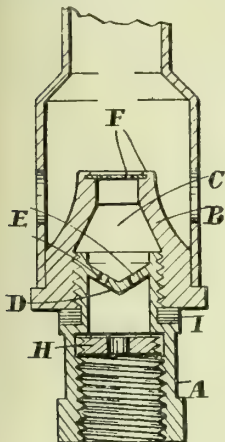
The arrangement is not further described by the patentees apart from a lengthy specification illustrated by six sheets of detail drawings.

### Atmospheric Gas-Burners.

NIESER, E., of Gloucester Road, Kensington, W.

No. 19,174; Aug. 20, 1909.

This invention refers more particularly to connector devices or thimbles of the kind described in patent No. 17,632 of 1907; the object being "to economize the use of gas and produce a better combustion of gas and air at the burner or burners, with a more equal pressure, thus giving a better and steadier light."



### Nieser's Atmospheric Gas-Burner.

As shown, the usual thimble or tubular connector A that engages with the nipple B of the burner forms the chamber C with an inverted cone D with a chamber or recess at its outer or burner end. In the inverted conical portion are a plurality of small holes E at an angle so that the gas will issue in fine streams which will break up against one another, thereby retarding the flow of gas, which is then more readily able to take up the air when passing through the nipple of the burner F to the air-tube above.

Another feature consists in the arrangement within the central bore of the thimble connector of a perforated disc or baffle-plate H in place of the usual wire gauze. This assists in breaking the first impact of the gas pressure, and at the same time prevents the entry of *débris* to the small holes of the inverted cone. The plate is screwed into the nipple, and rests against a shoulder about midway of its length.]

Where the nipple connector is attached to the burner spit, an integrally formed lead or other soft metal washer ensures the making of a gas-tight joint at this point.

### Generating or Producing Gas.

CAMBRIDGE, A. S., of Christchurch, New Zealand.

No. 19,639; Aug. 27, 1909.

This invention relates to water-jacketed gas-producers for use in generating gas to be supplied to internal combustion engines or like heating purposes. The apparatus is so constructed that the air for combustion is passed over the water in the jacket and down through the fuel. There is an inner chamber for the reception of the fuel; and an outer surrounding chamber for the reception of water. Tubes lead through the walls of the inner chamber into the outer chamber, and others lead therefrom so as to extend above the water within the outer chamber. In this way, air circulating over the water passes through the tubes to enter the inner chamber at different positions. The chambers are arranged to receive hollow plug-valves, so that the admission of air through the tubes entering the sleeves and extending above the water within the outer chamber may be properly regulated.

### Compressing Gas or Air for Lighting or Heating Purposes.

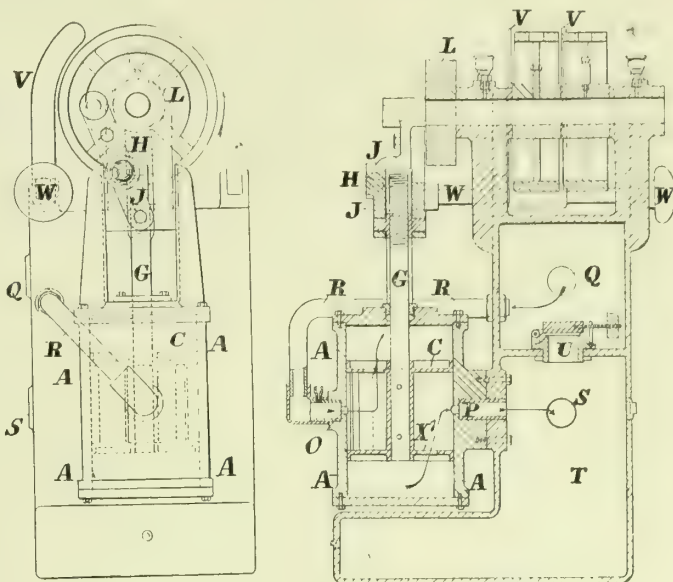
FLETCHER, E., of Tottenham.

No. 20,031; Sept. 1, 1909.

This invention has reference to apparatus in which the supply of compressed gas or air (or a mixture of both) is fed to the reservoir or to the burner at any predetermined pressure. It has for its objects to improve the apparatus described in patent No. 26,719 of 1908, "whereby gas or air, or a mixture of both gas and air, may be compressed, and caused to flow in one direction only without the use of valves, and to render the apparatus more effective, and to maintain a more constant pressure in the reservoir, or at the point of combustion."

The cylinder A is provided with an inlet port O and an outlet port P. Q is the inlet from the source of supply, whence the gases are conducted to the inlet port through the pipe R. S is the outlet from the reservoir T. U is a bye-pass connecting the inlet chamber with the reservoir T; suitable means being provided whereby any excess of gas or air in the reservoir at any predetermined pressure will be permitted to pass away into the chamber communicating with the source of supply, whence it again passes through the compressor. V is a fork connected to the striking rod W, whereby the belt is transferred from the loose to the fast pulley, or *vice versa*.

When motion is imparted to the disc crank L, the connecting rod J is caused to descend, during which movement its angle, relatively to the piston-rod, is changed, thereby imparting a radial movement to the projection H, which is transmitted, through the rod G, to the piston C.



### Fletcher's Gas and Air Compressing Plant.

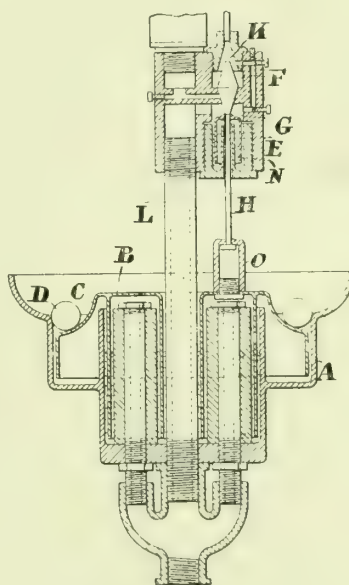
By these means each end of the cylinder will be open to the emission port during each of its periods of compression—thereby maintaining a practically constant flow of compressed gas or air (or both) to the reservoir T, while the inlet port O will be open to each end of the cylinder during the period of suction—communication between the chambers E F and the upper and lower ends of the cylinder being provided through the ports X X<sup>1</sup>.

## Gas-Burner Valves.

BLAKE, E. W., of South Croydon.

No. 21,126; Sept. 15, 1909.

This invention relates to valves for use in connection with gas-burners provided with pilot lights—especially to valves controlled by variations of gas pressure and provided with means whereby, when the supply of gas is passing to the main burner, the pilot light is extinguished, and *vice versa*.



### Blake's Gas-Burner Valve.

The illustration shows one form of the valve applied to a controller of the kind described in patent No. 14,973 of 1909.

A is the container of the controller, and B is a bell having an inclined or curved neck C for receiving the balls D designed to roll off the bell when the latter reaches a certain height, so that it can afterwards be operated by gas at a lower pressure than that required to lift it. E is the valve casing having the two chambers F G through which the valve spindle H passes. Upon the spindle are mounted the two valves in the form of cones placed base to base; the valves being arranged to co-operate respectively with a seat between the chambers F G, and with another seat K at the top of the upper chamber in communication with the pilot burner. The main supply of gas is introduced through the pipe L into an orifice in the lower chamber G; and, when the cone valve is lifted by the rising bell B, it escapes from the chamber G into the burner-tube. When the cone valve is in its lowermost position (as shown), gas from the lower chamber G passes through the passage M to a passage opening into the valve-seating K.

When the cone valve is lifted by the bell B in the usual way, the flow of gas to the bye-pass is closed; while the passage is open to permit gas



to flow to the burner. When, however, the cone is closed upon its seat (as shown), the upper valve is removed away from its seat K; so that gas flows from the lower chamber G directly to the pilot burner—the main supply of gas being cut off.

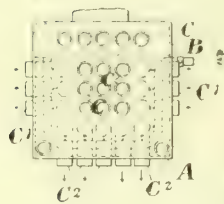
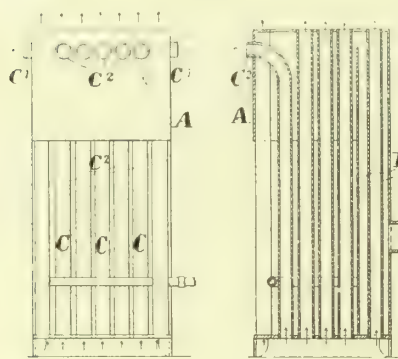
The valve-rod H, which passes through the lower part of the casing E of the valve, is sealed by a mercury seal N. The rod is controlled by the bell B in the following way: The bell is formed at its upper part with a cylinder O, into which the lower end of the spindle depends; the said spindle inside the cylinder being provided with the collar or head against which the contracted end of the cylinder wall acts. The cylinder is of such a length that it is capable of moving a certain distance independently of the valve-rod, in order to allow of the movement of the bell B without operating the valves. When, however, the bell has risen to a certain position, its top comes into contact with the collar or head upon the valve spindle, thus raising the latter so as to close the bye-pass valve and open the main valve to the burner. On the other hand, when the bell drops, it moves a certain distance before pulling down the valve-rod; the inoperative stroke of the bell, in both the upward and downward direction, being for the purpose of enabling the balls D to be removed from the bell and replaced on it before the valves are actuated.

### Gas-Stoves.

ROBINSON, T., of Kilburn, N.W.

No. 24,446; Oct. 25, 1909.

According to this invention, above the grate of the stove is a hood A, closed at the top, front, and sides, and open at the bottom. At the back of the grate is a down-flue B, the front of which forms the back



Robinson's Gas-Heating Stove.

of the grate and extends upwards into the hood, to within a short distance of its top, so as to leave a communication to the flue, which at its lower part communicates with the chimney. Vertically placed air-heating tubes extend from below the grate up so as to be heated by the gas-fire and through the hood; some of the tubes, C, passing through the top of the hood, some, C1, passing through the sides, and some, C2, through the front. The tubes are open at their lower and upper ends, and may be covered with fire-resisting material at the part on which the gas-flames impinge, or which passes through the grate containing fire-clay balls heated by the gas-flames. D represents the bunsen gas-burners, which are arranged so that the jets impinge against the air-tubes.

The heated gases from the burners pass directly into the hood A, where they give up a portion of their heat to the metal top, sides, and front. They then pass over the back of the grate, which forms a mid-feather or partition in the hood, into the down-flue B, where they give up a further portion of their heat to the walls of the flue, and at the lower end of the flue they pass to the chimney.

The operation of the air-tubes is as follows: As they become heated by the gas-flames, currents of air are induced to pass up them from below; the air entering unheated and pure at their lower ends, and being directed laterally and upwardly into the room at their upper ends (where the tubes may be bent outwardly, as shown) "hot and uncontaminated with the fumes from the gas-flames, so that a very beneficial heating effect is obtained."

### Counting Apparatus for Meters.

STROMBERG, A., and WILLIS, G. M., of Chicago, U.S.A.

No. 2275; Jan. 29, 1910.

This invention relates to a counting apparatus for meters or the like, in which the operation of the counting wheels is effected by a weight-actuated driving member, which, after being raised under the action of the meter, is caused to drop to its initial position under influence of gravity. The power necessary for driving is reduced to a minimum by the raising as well as the drop movement of the member for driving the counting wheels being caused to take place along a rectilinear course. This driving member is by preference in the form of an arbor engaging with the counting wheels by means of a worm or the like, and rotated from the meter shaft. The arbor is axially raised during its rotation by means of a spiral cam and a supporting roller; and once in each revolution the arbor falls, owing to the cessation of the support of the cam, and acts as a rack upon the engaging worm wheel. Thus the only power required for driving is reduced to that which is necessary for the rotation and raising of the arbor, which is very small.

### Atmospheric Gas-Burners.

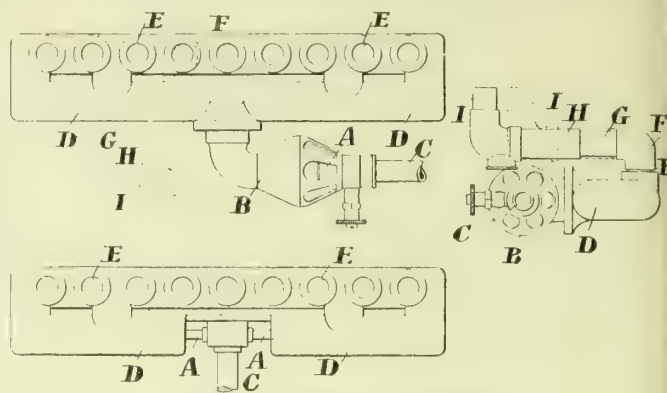
TILLEY, F. C., of Kingsland Road, N.E.

No. 25,006; Oct. 30, 1909.

This invention relates to the atmospheric gas-burner described in patent No. 23,810 of 1904, and is intended to form "a patent of addition thereto."

The illustrations show a plan of the burner with one gas-nipple and

air inlet, a feed-pipe of oblong shape with one of the bends, tubes, and burners in dotted lines; also a burner with two gas-nipples (the bends, tubes, and burners being removed), and an end view showing the bend, tube, and burner—full lines extended, dotted lines not extended.



Tilley's Atmospheric Gas-Burner.

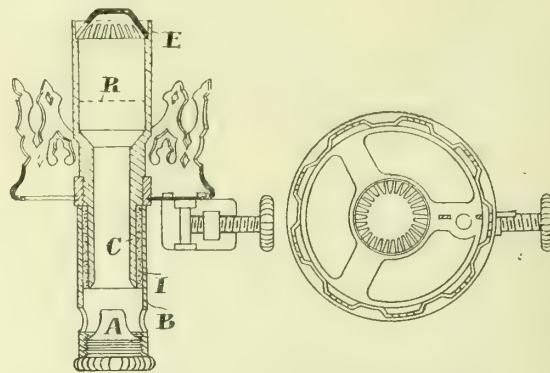
The gas-nipples A and air-mixing chambers B are connected to the gas-supply pipe C and the feed-pipe D, one side of which is provided with screw-threaded holes E, to which are connected bends or angles F, carrying the telescopic tubes G H (which, in this case, are not provided with air inlets), each one of which carries a burner I proper. In some cases the gas-nipples may be connected to the supply pipe, and the air-mixing chambers formed in or of the feed-pipe itself (as in the second form shown). The bends or angles are movable with regard to the feed-pipe, so that the telescopic tubes can be placed at any angle desired for their burners to be positioned in the same manner as in the earlier patent. The mixture of gas and air is in this way created before it reaches the telescopic tubes, and not in the telescopic tubes as in the 1904 patent.

### Incandescent Gas-Burner.

SÜSSMANN, H., of Berlin.

No. 27,869; Nov. 30, 1909.

In upright burners for incandescent gas-light, the tube which carries the burner-crown and the burner-head is commonly fixed on the nozzle tube, the patentee remarks, so that the heat which is conveyed to the tube of the burner-crown, in consequence of radiation and conduction, is carried away in an outward direction. It has also been suggested to insulate the tube carrying the burner-head from the nozzle-tube in such a manner as to prevent the conduction of heat from the flame to the nozzle-tube. The object of his invention is to produce an upright burner for incandescent gas-light, in which the heat conveyed to the metal parts by radiation and the conducting properties of the metal are utilized for heating the mixed gases.



Süssmann's Incandescent Gas-Burner.

In the arrangement shown, the tube B is screwed on the nozzle A, and carries the upper part of the burner-crown in such a manner that the burner-tube C is inserted into the nozzle-tube. The burner-tube is closed at the top with a gauze, below which a sieve R may be fixed. From the fact that the burner-tube C is not pushed over the nozzle-tube in the usual manner, but inserted into the nozzle-tube B, it is said to result that "the mixture of gas and air comes into direct connection with the burner-tube heated by the flame through radiation and the conducting properties of the metal; and in consequence the heat is utilized in an advantageous manner." In order to diminish or avoid the transmission of heat from the burner-tube C to the nozzle-tube B, there is placed between the two tubes an insulating mass I, in the form of a tube of some material of bad conductivity; and to assist the absorption of heat, the burner-tube C may be provided at the upper end with a rim E projecting beyond the gauze top.

### Gas-Washers.

DAVIS, G. K., of Manchester.

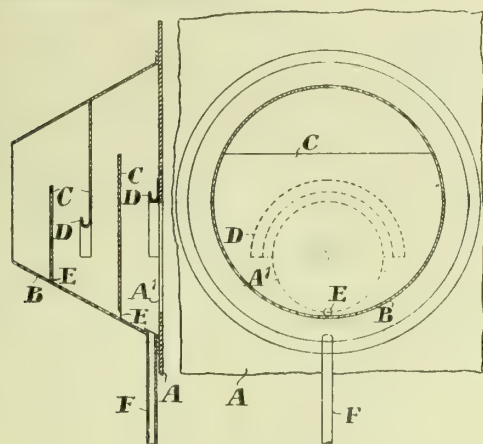
No. 4543; Feb. 23, 1910.

This invention relates to gas-washers of the kind described in patent No. 2113 of 1909 [see "JOURNAL" Dec. 28, 1909, p. 891].

In the employment of washers of this type, it has been found that where the volume of gas to be treated is great a proportion of the spray produced by the fanners in each chamber is carried by the gas into the succeeding chamber. In the ordinary treatment of gas with water, this transference of spray from one chamber to another causes no great inconvenience; but where gas is washed with liquor to absorb a certain constituent—that is, where the gas and washing liquors are caused to



flow in contrary directions through the several chambers, and where the liquors in the chambers are prevented from commingling, the transference of spray from chamber to chamber is a disadvantage, inasmuch as in course of time the liquors in the several chambers tend to become of one uniform strength.



Davis's Gas-Washer.

In the present invention, the gas is prevented from carrying forward the spray by the provision, in connection with the lateral apertures in the transverse partitions, of spray arresters, which collect the spray so carried forward at the entrance to each chamber, and return the collected spray to the liquor at the bottom of each chamber.

A longitudinal section of a spray arrester, made according to the invention (designed to be fitted to a circular aperture), also a vertical section are shown.

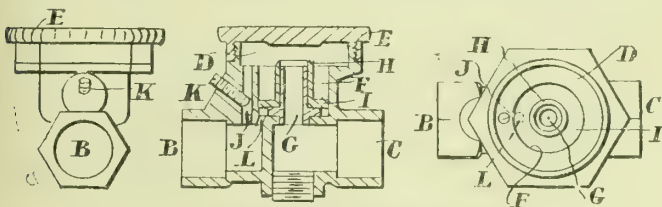
A represents a portion of one of the transverse partitions, and A<sup>1</sup> is the aperture through which the gas is caused to zig-zag through the washer. B is a short truncated cone eccentrically fitted around the aperture, and preferably with the latter at the lower part of the cone, which is secured to the partition by its base or end of larger diameter. The diameter of the small end of the cone is advantageously (as shown) equal to that of the aperture in the washer partition. C are the baffles fixed at right angles to the axis of the cone, and forming with it segmental passages for the gas, arranged in staggered form. D are channels to convey the entrained spray to the sides of the cone, so as to prevent the gas from carrying forward such spray as would fall vertically across the apertures. E are holes at the bottom of the lower baffles for permitting the entrained spray to run down the cone into the pipe F, which is sealed in the liquor lying at the bottom of the chamber.

### Gas-Regulator.

WILLIAMS, G. A., of Stoke Newington, N.

No. 7651; March 29, 1910.

This gas-governor is of the class in which a floating disc is employed, secured to a sleeve working on a tubular guide through which the gas passes to the discharge, and placed in a chamber—either sleeve or guide (or both) being perforated. The object aimed at is to simplify the construction of regulators of this class, which have heretofore been combined with a plug or like cock, so that the effective area of all the passages may be controlled, and in which the upper end of the sleeve of the disc comes into contact with the under-surface of the outer cover of the disc chamber in order to regulate the quantity of gas passing.



Williams's Gas-Regulator.

The outer case (as shown) is provided with inlet and outlet passages B C. D is a chamber provided with a screw cap E, and at the bottom of which is formed a circular cavity F. Secured in the bottom of the cavity is one end of a tubular guide G, down which the gas passes to the outlet. Slidably mounted upon the guide is a sleeve H, attached to which is a disc I, which accurately fits within the cavity, but which is of such dimensions that it can move freely in it in either direction. Communicating at one end with the gas admission and at the other with the chamber D is a passage J, the cross sectional area of which can be regulated from the exterior by a stud K, screwed into the projection formed upon one side of the casing. In order to facilitate its operation, it is set at an angle so as to be more readily accessible than if arranged at a right angle. L indicates a second passage, which at one end is also in communication with the gas inlet and at the other communicates with the bottom of the cavity F, so that the disc I is thus subjected to gas pressure upon both sides. Accordingly as the pressure upon one side or the other varies, so the disc travels up and down or remains stationary upon its guide. The upper end of the sleeve of the disc is chamfered off; and as the pressure varies the end of the sleeve is brought nearer to, or is removed further from, the inner surface of the cover of the chamber. By this means, the variation in the pressure, acting upon the disc, controls the flow down the hollow guide, and a "substantially constant amount of gas is permitted to pass through."

## CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

### Blue Water Gas v. Carburetted Water Gas.

SIR,—Kindly allow me to say a few words with regard to the article, on "Blue Water Gas v. Carburetted Water Gas," published in your issue of the 23rd ult.

The writer of the article seems to lay stress on the point that both the blue and the carburetted water-gas plants, figures of which he quotes, are possessed by the Amsterdam Gas Department, and that therefore it is a good case for comparison. If, however, it is borne in mind that the water-gas plants are situated at two distinct works, as far apart as some stations belonging to different companies in London, and also that the staffs of these particular works are to a certain extent independent of each other, the advantage claimed by Mr. Van Rossum du Chattel seems hypothetical. For the purposes of his comparison, Mr. Van Rossum du Chattel must therefore rely upon two sets of figures given to him by two sets of men, just as has been the case with other published statistics; while upon the attitude of the men in charge of the plant, a great deal depends.

As regards the figures given, a point that calls for some explanation is the reason for the consumption of coke for generators in the blue water-gas plant increasing so considerably. If a plant can be worked for a whole year with an average consumption of 30 cwt. of coke of indifferent quality, as stated in the report, per 100,000 cubic feet of gas, as was the case in 1906, it is sufficiently proved that the plant, if properly used, should maintain this output; and the increased consumption in the following years must be due to some external reason. This may be that the blue water-gas plant has been used a good deal for experimental purposes. The coke consumption in the carburetted water-gas plant has been relatively steady, with the exception of the year 1908, when it was very high—35·8 cwt. per 100,000 cubic feet. It is, moreover, quite as mysterious why in 1909 nearly double the amount of fuel was consumed for boilers in the blue water-gas plant as compared with 1906.

A very important point is the charge made for carburation. As everything here depends on the relative prices of benzol or benzine and oil, it would be interesting to know what quantities of benzine and oil were used in every year, and what the prices were.

The next remarkable figure given by Mr. Van Rossum du Chattel is the cost of repairs; and, knowing that the "K. & A." plant working for over three years at Uxbridge has had practically no repairs since it was installed, it seems strange that the cost of repairs to the blue water-gas plant at Amsterdam was equal to, or even higher than for, the carburetted water-gas plant. But the experimental work may account for a considerable proportion of this cost. Why, also, should 9d. be required for gas for lighting the blue water-gas plant and only 5d. for the carburetted water-gas plant?

Referring to the interest and depreciation charges, I cannot understand why 4 per cent. depreciation and 4 per cent. interest should be more for the blue water-gas than for the carburetted water-gas plant. It is well known that the capital outlay for a blue water-gas plant is less than for a carburetted plant; and I may state that this is conspicuously the case with the "K. & A." plant. As matters stand at present, these figures for depreciation and interest are unacceptable to any gas manager intimately acquainted with the blue water-gas and carburetted water-gas plants. Such figures must be lower for the blue water-gas plant than for the carburetted plant. From my knowledge of such prices under normal conditions, the cost for the blue water-gas plant should be from 25 to 50 per cent. lower than for the carburetted water-gas plant. In his report for December, 1906, which appeared in "Het Gas," Mr. Van der Horst (Mr. Van Rossum du Chattel's predecessor) states:

The total cost for 100,000 cubic feet of gas at the Amsterdam Gas-Works for benzolized blue water-gas was £6 9s. 7d., against £6 13s. 8d. for oil carburetted water-gas. The figures for interest and depreciation relate to the total capital for buildings, mains, machinery, and plant; and there is included in this total figure the expenditure for boilers and boiler-house, both of which are double the actual requirements of the blue water-gas plant. It also includes the mains and pipes laid to and in the retort-house in order to bring blue water-gas to the outlets of the hydraulics. Their influence on the price of the blue water-gas therefore gives an unjust idea of their amount, and can, as soon as the shortly mentioned and less complicated arrangement is followed, be reduced by at least 50 per cent. If we should have been in the same fortunate position as the Eastern Gas-Works (carburetted water-gas plant), where for the whole works a spacious boiler-house was already in existence, and only an increase in the number of boilers was required, the capital outlay would remain within still narrower limits.

The figure mentioned above by Mr. Van der Horst, of £6 9s. 7d. for the blue water-gas, includes the sum of £1 0s. 11d. for interest and depreciation, which, if reduced 50 per cent., as he states should be the case, would leave the cost of the blue water-gas at £5 19s. 1d., as compared with £6 13s. 8d. for the carburetted water-gas.

From the article in question, it would appear that benzine is used for carburation and not benzol, which latter is the usual enricher in this country; and in this connection it is worthy of note that the late Manager of the Amsterdam works concluded in 1906 that benzine did not fall out, and that the new Manager in 1909 came to exactly the opposite conclusion. May it be suggested that the later supply of this enricher is of a less suitable quality, as the specific gravity is higher than that of commercial petrol?

Moreover, the question of the cost of fully enriching blue water-gas to an equality of illuminating power with the bulk output is local, and only concerns the few gas undertakings where it is practised. The more general use of blue water-gas is as an admixture with coal-gas of an uneconomical richness, according to the most advanced modern practice with uncarburetted gas. Ten per cent. or even 12 per cent. of blue water-gas can be added to a fine coal-gas to the positive improvement of the combustion, rendering the flame more intense and cleaner burning; and this proportion can be doubled with the addition of a



very small quantity of benzol or petrol, certainly without any risk of condensation.

In conclusion, I should like to point out that the latest designs of the "K. & A." apparatus for producing both blue and carburetted water gas show great reduction in first cost and space occupied, without loss of efficiency. It might be of interest to Mr. Van Rossum du Chattel to know that quite a number of works in England at the present time are making blue water gas only in plants originally installed for the production of carburetted water gas.

H. E. SMITH, Engineer and Manager,  
The "K. & A." Water-Gas Company, Limited,  
39, Victoria Street, S.W., Sept. 22, 1910.

### Tar Prices.

SIR,—With reference to your trade correspondence in last week's "JOURNAL," I must take exception to many of the statements—first that there are no outside ports quoting less than 40s. per ton. This is absolutely incorrect. Business has been done at 36s. net on the east coast; and I had offers of the best quality pitch at 37s. 6d., and could not find buyers. Also sales have been made in London at 37s. 6d. to 38s. per ton. With regard to the price of 40s. 6d. per ton f.a.s. Liverpool and 39s. 6d. f.a.s. Manchester, for a fortnight now I have offered to friends of mine in Manchester a fair quantity of pitch at 37s. 6d. f.a.s., with an indication that 37s. would be accepted, and they have not done business, nor do I think they can.

I agree that creosote is steady. But sales have certainly been made at under 2½d. in bulk; and I know of one sale of half-a-million gallons at 2½d. f.o.b. I understand that creosote is being offered in the States today at under the equivalent of this price, f.o.b. England.

To speak of solvent naphtha as being worth 11½d. naked cannot be correct, seeing that business has been done at 1s. (casks included), delivered London, which is certainly as dear as any centre in the kingdom; while as regards the heavy oils a very large contract was let in London last week at 2½d. per gallon for one of the best makes.

Also with regard to the prices for tar. These certainly do not average 20s. to 26s. 6d. Even at the ports, 26s. is the outside price for tar; while important contracts have been let lately at 19s. to 23s.

54, Leadenhall Street, E.C.,  
Sept. 26, 1910.

M. MACINTOSH WILLIAMS.

## LEGAL INTELLIGENCE.

### A BOGUS GAS COLLECTOR COMMITTED FOR TRIAL.

At the Old Street Police Court, a few days ago, the story of a young man who, posing as a collector for the three London Gas Companies, went about rifling prepayment gas-meters, and disconnecting them under the pretence of "necessary repairs," was told when Henry George Atwell, 24, was charged with stealing moneys, amounting to £2 10s., the property of the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies respectively, on whose behalf the prosecution was conducted by Mr. Humphreys, Mr. Pasmore, and Mr. Young. Previous to the hearing, the accused was identified by upwards of twenty witnesses from different parts of London, whose houses he had visited and robbed.

The evidence given showed that the prisoner's methods were practically similar in each case. He called, representing himself as an inspector or collector of the Company supplying the district in which he might be; and, after stating that he had called in consequence of complaints received regarding the fittings, he would ask to be allowed to look at them. When faulty fittings were pointed out, he would apply a little white lead, and always finished by "inspecting" the meter. He would then empty the money-box attached to it; counting out the money in the presence of some one in the house, "so as to see that there was no mistake," and in some cases returning a few pence to the consumer as "bonus." In the greater number of instances, he disconnected the meters; and it was owing to his faulty connections that he was eventually found out. The police were then communicated with, and they were able to effect the prisoner's arrest.

The accused pleaded "Guilty," and asked to be dealt with; and his father also appealed to the Magistrate. Mr. Cluer, however, said the prisoner must go to the Sessions.

### Robbing Slot-Meters at Derby.

At the Derby Borough Police Court last Wednesday, William and Margaret Bonnington, man and wife, were charged with loitering on various dates with intent to commit felonies, and with being found on enclosed premises. Prisoners pleaded guilty; and the Chief Constable said their habit had been to obtain the keys of unoccupied houses and visit them. They had always returned the keys; and in no instance had there been any attempt to take possession of the houses. But in every case they had tampered with the drawer in the slot gas-meter, and the money inside had been taken out. Up to February last, the man had been employed by the Midland Railway Company; but since then he had been out of work. On Aug. 26, bailiffs seized their goods for rent; so that there could have been no pressing necessity for them to take a house, because they had no goods. They were watched by detectives in consequence of complaints, and were found in a house, an entrance to which had been obtained by forcing the back window. The woman was outside; and as the detectives approached her, they heard the man come up the cellar steps, and say, "There's nothing in it." After witnesses had been called, the Chairman of the Bench said both the public and the Gas Company must be protected from such offences. They were inclined to believe that Mrs. Bonnington had acted upon the guidance of her husband. Bonnington would be sentenced to a month's imprisonment with hard labour on the first charge, and a further period of one month on the second charge; but Mrs. Bonnington would be fined 20s. in each case, with the alternative of 14 days, one sentence to follow the other.

## MISCELLANEOUS NEWS.

### AFFAIRS OF THE MID-OXFORDSHIRE GAS COMPANY.

#### Report by the Assistant Official Receiver.

Meetings of creditors and contributories in the Mid-Oxfordshire Gas-light and Coke Company, Limited, were held at the London Bankruptcy Court last Friday, when the report of the Assistant Official Receiver (Mr. W. J. Warley) on the Directors' statement of affairs, as at the date of winding-up, was presented. Prepared by the Secretary (Mr. E. C. Saphin), it furnished the following particulars:—

#### As Regards Creditors.

| Gross Liabilities. | Liabilities.                                                                                                                                                                      | Estimated by the Officers of the Company to Rank.    |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| £21,392 16 5 ..    | Unsecured creditors (103) . . . . .                                                                                                                                               | £21,392 16 5                                         |
| 350 0 0 ..         | Creditor fully secured                                                                                                                                                            | £350 0 0                                             |
|                    | Estimated value of securities . . . . .                                                                                                                                           | 350 0 0                                              |
| 176 6 9 ..         | Preferential creditors, for rates, wages, &c. (11) deducted contra                                                                                                                | 176 6 9                                              |
| 58,530 0 0 ..      | Loans on debenture bonds (325) holders, deducted contra . . . . .                                                                                                                 | 58,530 0 0                                           |
| £80,449 3 2        |                                                                                                                                                                                   | £21,392 16 5                                         |
|                    | Assets.                                                                                                                                                                           | Estimated by the Officers of the Company to Produce. |
|                    | Cash at bankers . . . . .                                                                                                                                                         | £471 12 0                                            |
|                    | Cash in hand . . . . .                                                                                                                                                            | 33 5 10                                              |
|                    | Stock-in-trade (estimated cost £62 10s.) . . . . .                                                                                                                                | 62 10 0                                              |
|                    | Other property—Gas-works at Bampton, Bicester, Charlbury, Eynsham, Highworth, Shipton, Woodstock, and Chipping Norton; and electric light works at the last-named place . . . . . | 58,000 0 0                                           |
|                    |                                                                                                                                                                                   | £58,567 7 10                                         |

#### Book debts (1104 debtors), viz.—

|                                                            |            |
|------------------------------------------------------------|------------|
| Good . . . . .                                             | £1683 1 5  |
| Unpaid calls (two debtors), estimated to produce . . . . . | 52 10 0    |
|                                                            | 1,735 11 5 |

|                                                  |              |
|--------------------------------------------------|--------------|
| Estimated total assets . . . . .                 | £60,302 19 3 |
| Deduct preferential creditors as above . . . . . | 176 6 9      |

|                                                                                |              |
|--------------------------------------------------------------------------------|--------------|
| Estimated amount available to meet claims of debenture holders . . . . .       | £60,126 12 6 |
| Deduct loans on debenture bonds secured on the assets of the Company . . . . . | £58,530 0 0  |

|                                                                                              |              |
|----------------------------------------------------------------------------------------------|--------------|
| Estimated amount to meet unsecured creditors, subject to cost of liquidation . . . . .       | 1,596 12 6   |
| Estimated deficiency of assets to meet liabilities, subject to cost of liquidation . . . . . | 19,796 3 11  |
|                                                                                              | £21,392 16 5 |

#### As Regards Contributories.

|                                                        |              |
|--------------------------------------------------------|--------------|
| Capital issued and allotted—                           |              |
| 188 ordinary shares of £10 each (38 shareholders)—     |              |
| Issued as fully-paid . . . . .                         | £690 0 0     |
| Called up on 119 shares . . . . .                      | 1190 0 0     |
| 1282 preference shares of £10 each (106 shareholders)— |              |
| Issued as fully-paid . . . . .                         | 3500 0 0     |
| Called up on 932 shares . . . . .                      | 9320 0 0     |
| Amount paid in advance of call . . . . .               | 5 0 0        |
| Add deficiency to meet liabilities as above . . . . .  | 19,796 3 11  |
| Total deficiency . . . . .                             | £34,501 3 11 |

The deficiency account attached to the statement of affairs shows the expenses of carrying on the business from July 1, 1907, to the date of the winding-up order (June 28, 1910) as follows, omitting shillings and pence: Salaries, £840; rent, £397; rates and taxes, £644; law costs, £243; interest on debentures, £4803; miscellaneous expenditure, including postages, travelling, printing, insurance, and advertising, £1232. These items make a total of £8161; and as a total of £3251 was owing in regard to expenses of this nature at the date of the winding-up order, the actual amount due under the head of "general expenditure" is £11,412. To this total has to be added the Directors' fees from July, 1907, to the date of the order, £189; and depreciation of property (now written off by the Directors), £31,019—making a total of £42,620. The account shows that the excess of assets over liabilities on June 30, 1907, was £12; the gross profit arising from the business during the whole period from July, 1907, to the date of the winding-up order is given as £5760; transfer fees amounted to £14; the rent of the Bicester works to March, 1908, £184; and there was received from contractors, under guarantee as to gas consumption, £2149—making a total of £8119. The whole account thus showed a deficiency of £34,501.

In the course of his observations, Mr. Warley says: The winding-up order was made on June 28, 1910, upon a creditor's petition. The statement of affairs was submitted on Aug. 22, 1910, by Edward C. Saphin, the Secretary, and has since been concurred in by Charles Wheeler and William B. Martin, the Directors. The Company was incorporated on Oct. 10, 1905, with a nominal capital of £50,000,



divided into 2500 preference shares and 2500 ordinary shares, all of £10 each; its objects being to acquire several gas undertakings, with a view to economically working them under one management.

#### PROMOTION OF THE COMPANY AND PURCHASE OF WORKS.

The Company was nominally promoted by the Finance and Construction Company, Limited; the actual promoter being Mr. E. O. Preston, who also practically controlled the Company's operations throughout. The first Directors were Sidney R. Dennis and Frederick Miller, both of whom were appointed by the signatories. George Castle, Charles Wheeler, and Frederick C. Philpott were appointed Directors in March, 1906; and William B. Martin joined the Board in July, 1908. The three last-named persons formed the directorate at the date of the winding-up order. The qualification of the Directors was the holding of 10 shares each in the Company; and all were qualified. Their remuneration was fixed by the Company in general meeting at the rate of £250 per annum for the years 1905 and 1906, and thereafter at the rate of 60 guineas per annum, to be divided among them. On Nov. 14, 1905, a prospectus was issued inviting subscriptions for 10 preference shares. Applications were received for two shares, which were allotted. The minimum subscription fixed by the Articles of Association, and applicable to the first allotment only, was 10 per cent. of the shares offered; and this prospectus appears to have been issued with a view to complying with this article and obtaining a certificate to commence business.

Between November, 1905, and March, 1906, the Company entered into agreements for the purchase of several gas undertakings, as follows.

- Nov. 21, 1905.—The freehold gas-works and undertaking at Bicester for £5883 10s., and certain outstanding costs due by the vendors, the Bicester Coal and Coke Company, Limited; the purchase-money being satisfied by £2400 in special debentures and £3613 15s. 7d. in cash.
- Nov. 24, 1905.—The leasehold gas-works and undertaking at Woodstock from the Woodstock Gaslight, Coke, and Coal Company for £2425, satisfied by special debentures £1615 and cash £810.
- Nov. 27, 1905.—The freehold gas-works and undertaking at Witney, from the Witney Gas and Coke Company, Limited, for £12,000. This purchase was to be satisfied as to £4500 in special debentures, as to £5000 in cash, and £2500 in cash or preference shares and costs of winding-up the vendor Company. The Mid-Oxfordshire Company were, however, unable to complete the purchase within the time provided by the agreement, and it fell through, and the sum of £500 paid as deposit was debited to the Finance and Construction Company.
- Dec. 14, 1905.—The freehold gas-works and undertaking at Chipping Norton from the Chipping Norton Gas and Coke Company, Limited, for £7771 11s. 8d., satisfied in special debentures for £4725, and cash for £3046 11s. 8d.
- Jan. 3, 1906.—The freehold gas-works and undertaking at Bampton and Eynsham from the Bampton and Aston Gas and Water Company for £8000, satisfied in special debentures £4300, £1000 in cash, and £2700 in general debentures.
- Jan. 3, 1906.—The freehold gas-works and undertaking at Ship-ton-under-Wychwood from the Shipton-under-Wychwood Gas-light, Coal, and Coke Company, Limited, for £3000, satisfied in special debentures £2000 and general debentures £1000.
- March 1, 1906.—The freehold gas-works and undertaking at Charlbury, from Owen Walker, for £5250, satisfied in special debentures £3500, general debentures £300, and cash £1450.

#### THE COMPANY AND THE FINANCE AND CONSTRUCTION COMPANY.

The report proceeds to set forth that on March 23, 1906, an agreement was entered into between the Finance and Construction Company, Limited, and the Company, by which the former agreed to construct for the latter certain works, repair mains, discharge all expenses in connection with an application to Parliament for special powers, and pay all preliminary expenses and costs of carrying through the purchase of the undertakings above described. The consideration was fixed at £17,500. In order to provide funds to carry through the purchase of these undertakings and pay the Finance and Construction Company, a prospectus was issued on March 28, 1906, inviting subscriptions for 2000 preference shares, 2000 ordinary shares, and £15,000 of 5 per cent. debenture stock. The debenture stock, which formed part of an authorized issue of £25,000, of which £4000 had already been issued, gave a charge upon the whole of the Company's undertaking, subject to the special debentures issued or agreed to be issued in part payment of the purchase price of the undertakings set out above. The special debentures, in addition to being a first charge on the undertakings in respect of which they were issued, ranked *pari passu* with the debenture stock in the event of a deficiency of assets to meet special debentures. As a result of the issue of the prospectus, 383 preference shares, 171 ordinary shares, and £21,000 of debenture stock were issued; the debenture stock being £6000 more than the amount offered. The holders of the £4000 debenture stock were, in addition to the security already mentioned, entitled to the benefit of a redemption policy for £4000. This policy has, however, been allowed to lapse.

The purchase of the undertakings mentioned above was duly completed, except in the case of the Witney Gas-Works. The Directors state that before purchasing the undertakings, and before entering into an agreement with the Finance and Construction Company, Limited, they were advised by Mr. Joseph Quick (since deceased) that the consideration to be paid was fair and reasonable. No reports by him have been produced, though, according to the minutes, he appears to have made some. But they were sometimes made verbally. Mr. Preston appears to have been interested in several of the undertakings purchased by the Company. He has been requested to furnish all details of his interest, but has not yet done so.

A Bill was presented to Parliament in which the Company asked for special powers with regard to their undertaking. The Bill was considered by a Select Committee of the House of Commons, and on May 4, 1906, was rejected on the ground that the finances of the Company were unsatisfactory. On Dec. 11, 1906, an agreement was entered into between the Company and the Finance and Construction Company, Limited, by which the latter agreed to lay mains from Woodstock to

Bladon, in consideration of the Company releasing the Finance and Construction Company, Limited, from any further obligation to apply to Parliament on behalf of the Company for special powers, and also from any liability to refund any moneys by reason of the work agreed to be done in connection with the Witney gas undertaking not being necessary in consequence of that undertaking not being purchased. By a subsequent agreement, it was agreed that the mains should be laid between Bampton and Aston, instead of between Woodstock and Bladon.

#### ACQUISITION OF ADDITIONAL WORKS.

In 1908, the Company agreed to purchase from the Finance and Construction Company, Limited, gas-works at Highworth for the sum of £10,500, which included certain work to be done by the vendors. The consideration was to be payable as to £7000 in special debentures carrying a first charge on the particular undertaking, and ranking *pari passu* with debenture stock against the general assets in regard to any deficiency; the balance of £3500 being payable in cash or shares. Special debentures for £6990 have been issued, and some portion of the balance has been paid in cash. The Finance and Construction Company are returned as creditors for £3492 8s. 7d. on general account. The Company's Engineer (Mr. A. F. Painter) reported that the price to be paid by the Company—£10,500—was fair and reasonable.

On June 20, 1908, a further prospectus was issued by the Company inviting subscriptions for 270 preference shares and £1600 of 5 per cent. first mortgage debentures, in connection with the extension of the Bicester works. The invitation to subscribe for first mortgage debentures appears to have been made, though not disclosed in the prospectus, on behalf of the Finance and Construction Company. Applications were received for 224 preference shares and £3690 of first mortgage debentures. The debentures appear to have been part of the £7000 of special debentures agreed to be issued to the Finance and Construction Company in connection with the purchase of the Highworth works. Some of the moneys received in respect of the preference shares also appear to have been paid to that Company in reduction of the Mid-Oxfordshire Company's indebtedness.

On June 24, 1909, the Company purchased the Chipping Norton and District Electric Lighting undertaking for £10,500, which was satisfied by the issue of £7000 of special debentures, carrying a first charge on the undertaking, and ranking with the debenture stock in regard to any deficiency, and by the issue of fully-paid preference shares for the balance—viz., £3500. No agreement has been filed with the Registrar of Joint-Stock Companies with respect to these fully-paid shares. The Directors state that the electric light works were purchased by the Company in order to abolish competition. The Company's Engineer recommended the purchase at £10,500.

#### RESULTS OF THE COMPANY'S TRADING.

The Company's trading, according to the accounts, has resulted as follows:—

|                                                   |            |      |    |   |
|---------------------------------------------------|------------|------|----|---|
| From the incorporation to June 30, 1907 . . . . . | net profit | £11  | 19 | 7 |
| For the year ended June 30, 1908 . . . . .        | "          | 167  | 2  | 8 |
| " " " June 30, 1909 . . . . .                     | loss       | 1601 | 17 | 1 |
| For the period ended June 28, 1909 . . . . .      | "          | 2541 | 13 | 5 |

On May 11, 1910, the Court, upon the application of special debenture-holders, appointed Mr. W. A. Slade, of 9, Old Jewry Chambers, E.C., Receiver and Manager of the Chipping Norton Gas-Works; and on May 12, 1910, he was also appointed by the Court Receiver and Manager of the Chipping Norton Electric Light Works and the Bicester Gas-Works. The Trustees for the special debenture-holders have also entered into possession of the Woodstock works. On May 19, 1910, the Company resolved to wind up voluntarily, and appointed Mr. H. A. Stevens, of 6, Dowgate Hill, E.C., Liquidator. On July 1, 1910, the Court, upon the application of the Official Receiver, appointed Mr. R. W. Thornton, of Queen Street, Oxford, Special Manager of the gas-works at Bampton, Eynsham, Shipton-under-Wychwood, Charlbury, and Highworth.

The unsecured creditors' claims—£21,392 16s. 5d.—are in respect of cash advanced by Messrs. E. O. Preston and Co., £9029 18s. 2d.; balance due to the Finance and Construction Company in respect of contract, &c., £3492 8s. 7d.; goods supplied and work done, £5569 17s. 3d.; salaries, £203 10s. 3d.; bank overdraft, £207 9s. 9d.; application money, £5; debenture interest £2871 16s. 5d.; and Trustees' fees £13 13s. The two latter amounts should have been included in the amount due under the debentures. The fully-secured claim—£350—is in respect of moneys advanced to Mr. Slade, the Receiver of the Chipping Norton works.

The failure of the Company is attributed by the Directors to their inability to obtain statutory powers and to shortness of working capital. In the opinion of the Official Receiver, it is also due to over-capitalization and inefficient management.

#### Appointment of a Liquidator and a Committee of Inspection.

At the meeting of creditors, the Official Receiver referred to the main features of the report, and pointed out that the total of £58,530 in debentures was composed of £25,000 of general and £33,530 of special debentures. Several creditors expressed the opinion that the nature of the debenture holdings was not clearly set out in the report; and a long discussion on this matter failed to produce any authoritative statement on the subject. A creditor asked the Official Receiver if he could express an opinion as to whether or not there would be anything for the debenture-holders; and he replied that it was impossible to say what the assets would realize. There certainly would not have been anything for anybody unless the goodwill of the business had been preserved by the appointment of Mr. Thornton as Manager. Mr. Thornton had authorized him to say that, while he could not give definite figures, he could state that the business had not been carried on at a loss during his management, and there might be a small profit. The question as to the rights of the respective debenture-holders, special and general, would probably have to be settled by direction of the Court. The meeting had only to appoint a Liquidator, and, he suggested, a Committee of Inspection; and he thought that they ought to choose Mr. Thornton, who had been acting as Manager, and was quite independent of anyone connected with the Company. As Official



Receiver, he held sufficient proxies to nominate himself as Liquidator; but it was quite impossible that he could act in a case at such a distance, unless he appointed an assistant, and this would be very expensive. He therefore asked the meeting to have Mr. Thornton; and he explained that, whatever Liquidator the creditors appointed, it remained for the Official Receiver to investigate the circumstances attending the promotion of the Company and its proceedings since its promotion. Mr. Walter Moore expressed the opinion that the Official Receiver would have to look beyond the accounts furnished by the Directors and the books of the Company to get at the real position.

Mr. Thornton was then unanimously appointed Liquidator, with the following Committee of Inspection: Mr. W. Moore, Mr. A. F. Waters (representing Mr. Walker), Mr. F. Templer Depree (Chairman of Messrs. Willey and Co., Limited), Mr. S. Cartwright (representing Miss Woodleigh), and Mr. R. Swade (representing Mr. R. J. Péad).

A meeting of shareholders subsequently confirmed these appointments without discussion. The Official Receiver remarked that, as there was only £2000 to meet the claims of the unsecured creditors, there could be nothing for the shareholders.

### BRITISH GASLIGHT COMPANY, LIMITED.

#### Reduction to 1s. 10d. at Hull—Good Financial Position at Norwich—Dividends and Income-Tax.

The Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, and also the report of the Directors. The accounts were taken as read, and the Auditors' report thereon was read. In compliance with the Act of Parliament, the Norwich accounts were read; also the Auditors' report thereon. The Directors' report was as follows:—

The Directors submit the half yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £34,283, after deducting the following sums [omitting shillings and pence]: Income-tax, £2277; Hull debenture interest, £2119; Norwich debenture interest, £1779; Potteries debenture interest, £659; Trowbridge debenture interest, £105; interest on debenture stock, £2260—total, £9259.

HULL.—The gas-rental shows an increase of £34, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £988; tar and tar distilling, an increase of £469; ammoniacal liquor and sulphate of ammonia, an increase of £178. Coals have cost 12s. 11d. per ton, as against 13s. 1d. Coke has realized 10s. 3d. per ton, as against 10s. 8d.

The gas sold shows an increase of 1,849,207 cubic feet, which is equal to 0.29 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 43,126,000 cubic feet; being 1,531,000 cubic feet less than the quantity supplied in the same period of 1909.

The profit realized is £4723 in excess of the parliamentary interest. This sum has been invested; making the reserve fund £48,783.

NORWICH.—The gas-rental shows an increase of £368, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet. Coke shows an increase of £327; and tar and ammoniacal liquor, an increase of £784. Coals have cost 15s. 11d. per ton, against 17s. Coke has realized 14s. 11d. per ton, against 14s. 10d. The gas sold shows an increase of 4,425,500 cubic feet, which is equal to 1.75 per cent. The profit realized is £4971 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £555, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. The decrease is attributable to the granting of further rebates to large consumers, and to a reduction in the price charged for public lamps. Coke shows a decrease of £23; tar, an increase of £132; and ammoniacal liquor and sulphate of ammonia, an increase of £215. Coals have cost 10s. 5d. per ton, as against 10s. 9d. Coke has realized 8s. 6½d., as against 8s. 7d. per ton. The gas sold shows an increase of 394,145 cubic feet, which is equal to 0.21 per cent.

The profit realized, after writing off the sum of £3189, on account of plant thrown out of use, is £7480, which is the amount of the authorized parliamentary interest. The balance to the credit of the reserve fund account is £1448.

TROWBRIDGE.—The gas-rental shows a decrease of £151, as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £94. Coals have cost 16s. 3d. per ton, against 16s. 11d. Coke has realized 11s. 8d., against 13s. 2d. per ton. The gas sold shows a decrease of 1,016,500 cubic feet, which is equal to 3.01 per cent. The profit realized is £570 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows a decrease of £54; and residual products, an increase of £3. The profit realized is £467.

The available profit, added to the previous balance of profit and loss, amounts to £92,054. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both free of income-tax. The dividend and bonus will amount to £27,562; and leave a balance of £64,492.

The Directors who go out of office are Mr. Corbet Woodall and Mr. Robert S. Gardiner; and the Auditors are Mr. E. Knowles Corrie and Mr. William Cash, F.C.A. They respectively offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said he hoped the shareholders would agree with him when he said the report that the Directors had laid before them was in many respects very satisfactory—that was to say, it was very satisfactory when one looked at the profits earned, and at the way the stations had generally been managed with regard to finances. But, of course, it might be considered by some shareholders that the rate of increase in the business had not been what it had been in the past. This was so to a certain extent; and especially was it noticeable at the smaller stations of Trowbridge and Holywell. But these two small places were affected by particular trades in the localities—the West of England cloth trade at Trowbridge, and woollen mills at Holywell. Entirely dependent upon the state of trade at these manufactories was the increase or the decrease of the sales of gas in the two towns.

In regard to Hull, the increase was apparently very small. It was 0.29 per cent.; but if they analyzed the accounts, it was found (as was pointed out in the report) that the diminution in the rate of increase was chiefly due to the small district for which the Company supplied the gas in bulk to the Corporation of Kingston-upon-Hull. The increase was really in the large outlying district in which the Company had the sole lighting; and while the price of gas in their own district was 2s., they were obliged to sell it in bulk to the Corporation at 1s. 6d. From this it would readily be seen that the Company preferred to sell the increase in the quantity of gas consumed at 2s., rather than at the lower bulk rate. This brought him to another point. The report informed the shareholders that the Company had accumulated a reserve fund for the Hull station of no less a sum than £48,783; and the Directors thought that, having such an ample reserve in hand, they might now reduce the price of gas to the consumers. They had accordingly given notice that, as from Oct. 1, the price of gas in the whole of their district (this did not apply to that of the Corporation) would be 1s. 10d. per 1000 cubic feet, instead of 2s. For two short periods in the life of the Company, it had been at 1s. 9d.; and the Directors hoped at no very distant date, they would be able to go back to this figure which existed a good many years ago. Otherwise, too, the business at Hull was doing exceedingly well. They had been obliged to enlarge their show-room there. The Directors had taken, on a fresh lease from the Corporation, the very handsome show-room the Company had held there for a period of years; and they were leasing also a portion of the adjoining premises, because the business in the way of fittings and cooking stoves was extending considerably. He told the shareholders on the occasion of their last meeting that one of the oldest holders at their Hull station required taking down; and there was now being fitted into the tank a spiral-guided holder. This was almost completed, and would be in order for the coming winter's use—at any rate, it would be ready for testing at the end of this month.

Then concerning Norwich, things had been going favourably there; and they were now able not only to earn their parliamentary interest (which was very satisfactory), but, what was still more satisfactory, they were obtaining some of the back-dividends due to them. So that, as the report said, they had received not only the parliamentary interest, but also a profit of nearly £5000, which went to their credit. It was owing to the circumstance of the Company getting back their own, that the Directors were able to give the shareholders the bonus, the payment of which he should move presently. One of the features at Norwich was that gas cookery lectures had been taken up very strongly. At several of the district schools, there had been lectures by experts, who taught the better use of cookers attached to slot meters. There was no doubt about it that this gave a great impetus to the use of gas among the poorer people of the city. The lectures were extremely well attended, and were much appreciated. Regarding the new tank and holder to which he referred at the last meeting, the tank was completed, and the holder was now being erected, and would be finished in the course of the autumn.

Turning to the Potteries station, it would be remembered that he had frequently alluded to the moving of the works to a new site in consequence of the mining operations affecting the holders and apparatus on the old site. Now the time had come when they were going to part with the old site where the Company had worked ever since its formation in the Potteries district. They were handing the site over to the purchasers, and it would now be occupied by other people, with the exception of the Assistant-Engineer's house, which the Company had leased for a term of years, as it was very suitable for them, and close to the new works. They had, as the shareholders were aware, been writing off very large sums out of profits, and also from the reserve fund for the new works at the Potteries; but there remained a sum of £8752 outstanding on account of plant thrown out of use. This, however, would be written off during a series of half years, and would not materially affect the financial arrangements of the station.

Generally, there was nothing much else to report. It was within the knowledge of the shareholders that the Company joined with other Companies in the promotion of the Standard Burner Bills, and in prosecuting them before the House of Lords and House of Commons Committees. Notice of further opposition had been given on third reading, which had been deferred to the autumn session of Parliament. They could only wait now to see what would take place then. There was going to be an interesting event almost immediately in this country—viz., the visit of the German Association of Gas and Water Engineers. The German gas engineers always treated the engineers of other countries who visited Germany in the most hospitable and liberal manner [Mr. CORBET WOODALL: Hear, hear]; and the Company had contributed the sum of £40 towards the expenses of entertaining the gentlemen who would be over here from Germany a week or two hence. They had also contributed towards the cost of the Gas Companies' Exhibit at the Japan-British Exhibition; but he regretted that the Companies had been unable to obtain space in a more prominent part of the exhibition.

There was one thing that he, as Chairman of the Company, wished to impress upon the shareholders—that was, the question of the dividends being paid free of income-tax. As shareholders were aware who read the financial papers, there had been a great deal of discussion among the banks and some of the bigger companies as to the advisability or inadvisability of paying dividends free of income-tax. He was himself strongly of opinion that all dividends should have income-tax deducted. He thought that it impressed upon people the incidence of taxation; and he did not think the Stock Exchange made the smallest difference in the price of stocks and shares whether or not a company paid their dividends free of income-tax. Therefore, if a 10 per cent. dividend was paid, whether it was free of income-tax or otherwise, the market price of the stock was just the same. Personally, he hoped that, before the next dividend was declared, the Directors would bring before the shareholders a resolution to pay the dividend less income-tax; but he was quite certain the Directors would so apportion the dividend that the shareholders would not suffer any loss in contrast with the amount of the dividend that they received on the present occasion.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.



On the motion of the CHAIRMAN, seconded by Mr. CORBET WOODALL, a dividend of 2s. per share, with a bonus of 2s. 6d. per share, both clear of income-tax, was declared.

Proposed by the CHAIRMAN, and seconded by Mr. WILKIN, Mr. Corbet Woodall was re-elected to his seat at the Board; and, moved by the CHAIRMAN, and seconded by Major-General W. T. CORRIE, Mr. R. S. Gardiner was also re-elected.

Acknowledgment having been made by both gentlemen, Mr. KENNETH R. MACKAY proposed, and Mr. L. R. ABBEY-WILLIAMS seconded, the re-election as an Auditor of Mr. E. Knowles Corrie. This was agreed to. Then a similar resolution was moved by Mr. BERNARD F. HARRIS, seconded by Mr. A. G. BURNEY, reappointing Mr. William Cash, F.C.A., as an Auditor.

Mr. BURNEY, in moving a vote of thanks to the Chairman and Directors, remarked that, in these days of the strained relations between capital and labour—a movement which, in some competent opinions, seemed likely to be aggravated—it must be a source of much gratification to the shareholders of this Company that they had a Board in whom they could place such implicit confidence.

Mr. MACKAY seconded the motion, which was cordially passed.

The CHAIRMAN, in responding on behalf of himself and his co-Directors, said, with regard to the question of capital and labour, he could only say the Company were on the very best terms with their employees at every station. The Board were always ready to meet the men in every reasonable way, and to assist them when required. He desired to move a vote of thanks to the Secretary and the other officers of the Company, who were really the most important people, he considered, in a concern of this kind—far more important than the Chairman and Directors. It was owing to their intelligence, skill, ability, and devotion to the interests of the Company that its success was assured.

Mr. LEONARD R. WILKINSON seconded the motion, which was unanimously carried.

Mr. BROOKES acknowledged the vote and complimentary remarks on behalf of himself and his fellow officers, although he said he felt there had been a little exaggerated praise. However, he was sure the whole of the officers had their hearts in their work; and it would be a source of much encouragement to them to know they had retained the good opinion of the Directors and of the shareholders.

BELFAST GAS-WORKS EXTENSION.

The Harbour Board and the Abandonment of the Twin-Island Site.

At the Meeting of the Belfast Harbour Commissioners last Tuesday, the Secretary (Mr. W. A. Currie) read a letter from the Town Clerk (Mr. R. Meyer) on the subject of the negotiations which have been going on between the Council and the Commissioners, or their respective Committees, regarding a site for the proposed auxiliary gas-works. He said he had been directed by the Gas Committee to inform the Commissioners that the Council, at a special meeting held on the 12th inst., rescinded their resolution of the 15th of March last, selecting the site offered by the Commissioners on the East Twin Island,

and authorizing the Gas and Law Committees to acquire it. Consequently, the negotiations which had been in progress since then must necessarily be suspended. He added that the Committee recognized the courtesy and consideration extended to their representatives by the Commissioners and their officers during the negotiations.

After the reading of the letter, the Chairman (Mr. R. Thompson, M.P.) offered a few remarks on the attitude of the Commissioners during the negotiations. He said they had been perfectly neutral all through. If they were to consult their own interests only, he would say they would prefer not to have any other public body placing permanent works on the harbour estate, over which the Commissioners wished to maintain perfect control, so as to meet the future wants of either shipbuilding yards or mercantile docks. But when they were approached by the Gas Committee of the Corporation, and asked to grant them a site, they considered it their duty, in the interests of the city, to offer what they thought to be the best and most suitable one at their disposal, and offer it on the most reasonable terms. The heads of the agreement were subsequently drawn up and confirmed by the Board; and if any demand had been made by their Solicitor outside the agreement, it was not by authority of the Board. If any misunderstanding had arisen to mar the progress of the agreement, he thought the Gas Committee knew full well their way back to the Board and thus to have any supposed difficulties amicably arranged, as he would say, on behalf of the Commissioners, that their policy was never to go back on any agreement, either of a public or a private character. He thought these remarks necessary to vindicate the character of the Board from certain aspersions which were suggested at the recent meeting in the City Hall; and, having made them, he would consign the question to oblivion, and venture to hope that it might not be further raised either by the Gas Committee or their friends.

PUBLIC LIGHTING FOR DODWORTH.

Dodworth, an old colliery and agricultural village, has been furnished with a supply of gas from Barnsley for nearly forty years past, but has not hitherto had any street lighting. Now, however, the Urban District Council have adopted an absolutely up-to-date scheme; the installation consisting of the well-known "Falcon" suspended inverted incandescent lamps of Messrs. Hutchinson Bros., Limited. Some few months ago, a Lighting Committee was formed, with Mr. George Briggs as Chairman; and in due course, after visits to various other townships in the district, communications with the Barnsley Gas Company, and consultations with Messrs. Hutchinson Bros., the scheme was submitted to, and approved by, the Council. This provides for the erection of 84 "Falcon" lamps; and as the Barnsley Corporation have agreed to extend their lamps at the borough boundaries, so as to link-up with the lights of Dodworth, the scheme is a very complete one, and covers the district from end to end. The cost will be about £400, which the Council will be able to pay out of current balances, without either resorting to a loan or raising the rates.

The lighting of the first lamp was performed last Tuesday by the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 833.

| Issue.     | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                     | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.     | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                     | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|------------|--------|-------------------|--------------------|---------------------------|-----------------|---------------------|------------------------|------------|--------|-------------------|--------------------|---------------------------|-----------------|---------------------|------------------------|
| £          | Stk.   | Apl. 1            | p.c.               | Alliance & Dublin Ord.    | 83-86           | +2                  | 5 16 3                 | £          | Stk.   | May 12            | p.c.               | Imperial Continental      | 186-188         | ..                  | 4 15 9                 |
| 1,474,000  | Stk.   | July 14           | 4                  | Do. 4 p.c. Deb.           | 95-97           | -2                  | 4 2 6                  | 4,940,000  | Stk.   | Aug. 12           | 3½                 | Do. 3½ p.c. Deb. Red.     | 93-95           | ..                  | 3 13 8                 |
| 310,000    | Stk.   | May 12            | 7                  | Bombay, Ltd.              | 68½-68          | ..                  | 5 5 8                  | 1,235,000  | Stk.   | Aug. 31           | 10                 | Lea Bridge Ord. 5 p.c.    | 120-122         | ..                  | 4 18 4                 |
| 200,000    | 5      | "                 | 7                  | Do. New, £4 paid.         | 5-5½            | ..                  | 5 6 8                  | 200,242    | Stk.   | "                 | 6                  | Liverpool United A.       | 219-221         | ..                  | 4 10 6                 |
| 40,000     | 5      | "                 | 7                  | Bourne- ) 10 p.c. .       | 28½-29½         | ..                  | 5 1 8                  | 561,000    | "      | "                 | 7                  | Do. B.                    | 161½-163½       | ..                  | 4 5 8                  |
| 50,000     | 10     | Aug. 31           | 15                 | mouth Gas B 7 p.c. .      | 16-16½          | ..                  | 4 4 10                 | 718,100    | "      | June 29           | 4                  | Do. Deb. Stk.             | 104-106         | ..                  | 3 15 6                 |
| 311,810    | 10     | "                 | 7                  | and Water Pref. 6 p.c.    | 143½-152        | ..                  | 3 18 8                 | 306,083    | 5      | June 29           | 5                  | Malta & Mediterranean.    | 410-418         | ..                  | 6 8 8                  |
| 75,000     | 10     | "                 | 5                  | Brentford Consolidated    | 246-249         | ..                  | 5 0 5                  | 75,000     | 100    | June 29           | 5                  | Met. of 5 p.c. Deb.       | 100-102         | ..                  | 4 18 0                 |
| 380,000    | Stk.   | Aug. 12           | 12½                | Do. New                   | 184-186         | ..                  | 5 2 2                  | 560,000    | 100    | Apl. 1            | 5                  | Melbourne 4½ p.c. Deb.    | 101-103         | ..                  | 4 7 5                  |
| 330,000    | "      | "                 | 9½                 | Do. 5 p.c. Pref.          | —               | ..                  | —                      | 250,000    | 100    | "                 | 4½                 | Monte Video, Ltd.         | 12½-13          | ..                  | 4 5 0                  |
| 50,000     | "      | "                 | 5                  | Do. 4 p.c. Deb.           | 99-101          | ..                  | 3 19 3                 | 541,920    | 20     | May 27            | 3½                 | Newcastle & Gateshead Con | 90-91           | ..                  | 3 16 11                |
| 206,250    | "      | June 10           | 4                  | Brighton & Hove Orig.     | 215-218         | +1                  | 5 0 11                 | 1,775,892  | Stk.   | July 28           | 4½                 | North Middlesex 7 p.c.    | 153-154         | ..                  | 3 16 7                 |
| 220,000    | Stk.   | Aug. 31           | 11                 | Do. A Ord. Stk.           | 155-158         | +1                  | 5 1 3                  | 529,435    | Stk.   | June 29           | 3½                 | Oriental, Ltd.            | 138-140         | ..                  | 5 14 4                 |
| 246,320    | "      | "                 | 8                  | British                   | 45-46           | ..                  | 4 12 4                 | 55,940     | 10     | Aug. 31           | 7                  | Ottoman, Ltd.             | 6-6½            | ..                  | 6 8 0                  |
| 460,000    | 20     | Apl. 1            | 10½                | Bromley, A 5 p.c. .       | 117-119         | ..                  | 5 0 10                 | 300,000    | Stk.   | Apl. 29           | 8                  | Portsea Island A.         | 131-133         | ..                  | 5 3 0                  |
| 109,000    | Stk.   | Aug. 12           | 6                  | Do. B 3½ p.c. .           | 88-90           | ..                  | 5 0 0                  | 60,000     | 53     | Sept. 15          | 13                 | Do. B.                    | 124-126         | ..                  | 5 3 2                  |
| 165,700    | "      | "                 | 4½                 | Do. C 5 p.c. .            | 106-108         | ..                  | 5 1 10                 | 31,800     | 50     | Aug. 31           | 13                 | Do. C.                    | 117-119         | ..                  | 5 0 10                 |
| 82,278     | "      | "                 | 5½                 | Do. 3½ p.c. Deb.          | 85-87           | ..                  | 4 0 6                  | 60,000     | 50     | "                 | 12                 | Do. D and E.              | 99-101          | ..                  | 4 19 0                 |
| 55,000     | "      | June 29           | 3½                 | Buenos Ayres 4 p.c. Deb.  | 97-99           | ..                  | 4 0 10                 | 100,000    | 50     | "                 | 10                 | Primitiva Ord.            | 7½-7¾           | ..                  | 4 13 4                 |
| 250,000    | Stk.   | "                 | 4                  | Cape Town & Dis., Ltd.    | 3-4             | ..                  | —                      | 398,490    | 5      | Apl. 29           | 7                  | Do. 5 p.c. Pref.          | 58-58½          | ..                  | 4 13 8                 |
| 100,000    | 10     | "                 | —                  | Do. 4½ p.c. Pref.         | 58-6½           | ..                  | —                      | 796,980    | 5      | June 29           | 5                  | Do. 4 p.c. Deb.           | 57-59           | ..                  | 4 0 10                 |
| 50,000     | 50     | May 3             | 5                  | Do. 6 p.c. 1st Mort.      | 49-50           | ..                  | 6 0 0                  | 488,900    | 100    | June 1            | 4                  | River Plate 4 p.c. Deb.   | 97-99           | ..                  | 4 0 10                 |
| 100,000    | Stk.   | June 29           | 4½                 | Do. 4½ p.c. Deb. Stk.     | 88-90           | ..                  | 5 0 0                  | 312,650    | Stk.   | June 29           | 4                  | San Paulo, Ltd.           | 153-164         | ..                  | 5 10 9                 |
| 157,150    | Stk.   | Aug. 12           | 5                  | Chester 5 p.c. Ord.       | 109½-111½       | ..                  | 4 9 8                  | 250,000    | 10     | Apl. 1            | 9                  | Do. 6 p.c. Pref.          | 113-124         | ..                  | 4 18 0                 |
| 1,513,280  | Stk.   | "                 | 5½                 | Commercial 4 p.c. Stk.    | 105-108         | ..                  | 4 16 3                 | 62,500     | 50     | July 1            | 5                  | Do. 5 p.c. Deb.           | 51-52           | ..                  | 4 16 2                 |
| 560,000    | "      | "                 | 5½                 | Do. 3½ p.c. do.           | 101-103         | ..                  | 4 17 1                 | 125,000    | 10     | "                 | 5                  | Sheffield A.              | 229-231         | ..                  | 4 6 7                  |
| 475,000    | "      | June 29           | 3                  | Do. 3 p.c. Deb. Stk.      | 80-82           | ..                  | 3 13 2                 | 135,000    | Stk.   | Aug. 31           | 10                 | Do. B.                    | 129-231         | ..                  | 4 6 7                  |
| 800,000    | Stk.   | June 10           | 5                  | Continental Union, Ltd.   | 98-100          | ..                  | 5 0 0                  | 209,984    | "      | "                 | 10                 | Do. C.                    | 229-231         | ..                  | 4 6 7                  |
| 200,000    | "      | "                 | 7                  | Do. 7 p.c. Pref.          | 137-139         | ..                  | 5 0 9                  | 523,500    | 10     | "                 | 10                 | South African.            | 11-11½          | ..                  | 6 1 9                  |
| 492,270    | Stk.   | "                 | 5½                 | Derby Con. Stk.           | 122-124         | ..                  | 4 8 9                  | 70,000     | 10     | May 27            | 7                  | South Met., 4 p.c. Ord.   | 121-123         | ..                  | 4 8 10                 |
| 55,000     | "      | "                 | 4                  | Do. Deb. Stk.             | 104-105         | ..                  | 3 16 2                 | 6,429,895  | Stk.   | Aug. 12           | 5/9/4              | Do. 3 p.c. Deb.           | 80-82           | ..                  | 3 13 2                 |
| 148,995    | "      | Apl. 1            | 5                  | Do. 5 p.c. 1st Mort.      | 96-98           | ..                  | 5 2 0                  | 11,895,445 | "      | July 14           | 3                  | South Shields Con. Stk.   | 153-154         | ..                  | 5 3 11                 |
| 486,090    | 10     | July 14           | 12                 | European, Ltd.            | 23½-24          | ..                  | 5 0 0                  | 209,820    | Stk.   | Aug. 31           | 8                  | S'th Suburb'n Ord. 5 p.c. | 120-122         | ..                  | 4 12 9                 |
| 354,060    | 10     | "                 | 12                 | Do. £7 ros. paid.         | 178-182         | ..                  | 4 18 8                 | 605,000    | Stk.   | Aug. 12           | 5½                 | Do. 5 p.c. Pref.          | 126-129         | ..                  | 4 2 0                  |
| 16,179,445 | Stk.   | Aug. 12           | 4½                 | Gas 4 p.c. Ord.           | 105-107         | ..                  | 4 7 2                  | 60,000     | "      | "                 | 5                  | Do. 5 p.c. Deb. Stk.      | 121-123         | ..                  | 4 1 4                  |
| 2,600,000  | "      | "                 | 3½                 | light 3½ p.c. max.        | 87-89           | ..                  | 3 18 8                 | 117,058    | Stk.   | July 14           | 5                  | Southampton Ord.          | 110-112         | ..                  | 4 9 3                  |
| 4,062,235  | "      | "                 | 4                  | Do. 4 p.c. Con. Pref.     | 103-105         | ..                  | 3 16 2                 | 502,310    | Stk.   | May 12            | 5                  | Tottenham A 5 p.c.        | 141-143         | ..                  | 4 17 11                |
| 4,531,735  | "      | June 29           | 3                  | Coke 3 p.c. Con. Deb.     | 86-82           | ..                  | 3 13 2                 | 120,000    | Stk.   | Aug. 12           | 7                  | Do. B 3½ p.c.             | 112-114         | ..                  | 4 16 6                 |
| 258,740    | Stk.   | Sept. 15          | 5                  | Hastings & St. L. 3½ p.c. | 92-94*          | ..                  | 5 5 5                  | 483,940    | "      | "                 | 5½                 | Edmonton 4 p.c. Deb.      | 57-59           | ..                  | 4 0 10                 |
| 82,500     | "      | "                 | 6½                 | Do. do. 5 p.c.            | 114-116*        | ..                  | 5 12 1                 | 149,470    | "      | June 29           | 4                  | Tuscan, Ltd.              | 9-9½            | ..                  | 8 8 6                  |
| 70,000     | 10     | Apl. 29           | 11                 | Hongkong & China, Ltd.    | 17-17½          | ..                  | 5 5 9                  | 182,380    | 10     | June 10           | 8                  | Do. 5 p.c. Deb. Red.      | 97-99           | ..                  | 5 1 0                  |
| 131,000    | Stk.   | Sept. 15          | 5                  | Ilford A and C            | 145-148*        | ..                  | 4 19 8                 | 149,900    | 10     | July 1            | 5                  | Tynemouth, 5 p.c. max.    | 111-113         | ..                  | 4 8 6                  |
| 65,780     | "      | "                 | 5½                 | Do. B                     | 112-114*        | ..                  | 5 3 1                  | 236,476    | Stk.   | Aug. 31           | 5                  | Wands-1 B 3½ p.c.         | 139-141         | ..                  | 4 15 9                 |
| 65,500     | "      | June 29           | 4                  | Do. 4 p.c. Deb.           | 98-100          | ..                  | 4 0 0                  | 255,636    | Stk.   | Aug. 31           | 6½                 | worth 3 p.c. Deb. Stk.    | 73-75           | ..                  | 4 0 0                  |
|            |        |                   |                    |                           |                 |                     |                        | 85,766     | "      | June 29           | 3                  |                           |                 |                     |                        |

Prices marked \* are "Ex div." † Next dividend will be at this rate.



Rev. T. T. Taylor, Chairman of the Council, in the presence of some hundreds of people. Mr. Taylor remarked that for many years they had been looked upon as a poor, lost, benighted village; but that night, at the request of the Council, he was turning upon them a light that would remove this reproach. The scheme had not been brought to fruition without a great deal of thought and trouble; and yet he did not expect that it would please everybody. There were those who said it would be nice to have the light, but that it would increase the rates, and cause their rents to be raised. It should do nothing of the sort. There would be no increase of rates, for the bill would be paid out of the cash the Council had in the bank; and landlords would have no excuse to raise the rents of any person. Of course, there would be the gas to pay for, and the up-keep. Mr. Taylor complimented the Lighting Committee on their work, and said he considered the distribution of the lights throughout the township admirable. The lamp selected was the best gas-lamp he had ever seen, being graceful in appearance by day, and giving a brilliant light at night, without casting shadows, as the old type of lanterns in use did. It was gratifying likewise that this lamp was a local production. Mr. Briggs, in proposing a vote of thanks to Mr. Taylor, said the Committee were highly gratified with the successful consummation of their labours. The lamp chosen was the best and most perfect that could be got for the money—one that would stand all sorts of weather.

### THE "DAILY CHRONICLE" AND "COALITE."

#### Two Further Articles.

In the last issue of the "JOURNAL," there was reproduced the text of an article that appeared in the pages of our daily contemporary for the 19th inst., dealing with some "Startling Facts and Figures as to Coalite," and ending with the words: "So much for Coalite finance. We will deal in another article with the practical position and hopeless conditions which prevail at the various works of the concern."

The second article appeared in the "Daily Chronicle" for last Tuesday, and was headed

#### Is Coalite a Failure?—Derelict Works—Its Manufacture a Nuisance.

As we have previously shown, one of the most interesting facts in connection with British Coalite is the unquenchable optimism of the Board in the face of disappointments which would certainly depress most commercial men. This possibly may be due to some extent to the inspiring personality of Mr. F. Salisbury Jones, who, though not a member of the Board, appears to have been fully in the confidence of the Directors and to have taken part in the guidance of the Company.

Notwithstanding the fact that British Coalite had a debit balance on working, and that the Company had not fulfilled one of the promises of the prospectus, the Board at the date of the debenture issue were

still indulging in flights of fancy and estimates. One would have thought they had had enough of estimates to last a lifetime. The estimates this time were in connection with the batteries which were to be erected in various gas-works, each of which, it was said, would, on the basis of a working arrangement, give to the Company a minimum profit of £5000 per annum per battery. Negotiations were then going on with forty gas companies; and it was hoped to construct at least 500 batteries. All these figures, of course, looked very pretty, and bore a distinct family likeness to the prospectus estimates. But as far as we can ascertain, the Company has only two plants in operation at gas-works; and, judged by the working conditions, there appears very little prospect of anything like £5000 per annum being realized. We will deal with the condition of all the works in detail.

At Wednesfield is situated the factory which has been erected for the purpose of manufacturing plant to be used for the making of coalite. With the brilliant idea in their minds of making 500 coalite plants, to say nothing of plants for abroad, it was perhaps not surprising that the Board decided to erect a huge iron foundry. But it would have shown more discretion to have had two or three plants made by outside people in the first place; so that coalite could be practically tested without incurring enormous expense. The general policy of the Board, however, appears to have been act first and think the matter over afterwards.

#### COALITE CANNOT COMPETE.

The works have been erected at a cost of about £120,000, and comprise a large foundry, laboratory, carbonizing plant, gasholder, tar distillery, and an electro-chemical plant, part of the power scheme. The coalite plant erected here is too small to give a return upon the capital expended on the works, but quite big enough to meet the demand of the neighbourhood, which is very small. Situated as the works are in the midst of a coalfield, it is possible for coal to successfully compete, while the coal is not particularly adaptable for conversion into coalite.

To sell the coalite at a profit in outside markets is a matter of extreme difficulty owing to the heavy cartage and railway rates.

Having regard, therefore, to the absence of a big demand for coalite plants, either at home or abroad, and to the difficulties associated with the manufacture of coalite at Wednesfield, it is by no means surprising that these big works have gradually fallen into disuse; and it is now generally expected that they will be closed-down. At any rate, the manufacture of coalite there is to cease, owing to the difficulties to which we have referred. The work of the foundry must therefore depend upon the demand on the part of the gas companies for coalite plants; and they certainly do not appear to be falling over one another in their desire to obtain them.

Under the terms of the recent debenture issue, a Managing-Director was to be appointed to superintend the spending of the proceeds of the issue. An American gentleman, it appears, has been appointed to this position; and as his appointment is definitely set forth as being to superintend the spending of the money, it is to be hoped that he will

## Richmond's "A.B.C." Gas Fires.

### Gas Fire Specialists—

DURING the last few weeks we have shown in our advertisements that our "A.B.C." Series of Gas Fires have very high Radiating Efficiency; that there is continuous interchangeability fire with fire and their superiority is so well known that we need not in this advertisement again refer in detail to their merits, but the fact that so many Gas Authorities have placed them on their hire list and that one of the largest Gas Companies in the country—who adopted them for simple hire 3 years ago—have bought over 7,000 "A.B.C." Fires and to-day have not one in stock returned from their Consumers speaks for itself, and we again invite fullest inquiry, and willingly offer to send any or all of this "A.B.C." series for inspection and testing.

**36 sizes, 11 designs, and still all Standardized and Interchangeable Fire with Fire.**

**THE RICHMOND GAS STOVE & METER CO., LTD., INVENTORS**  
WARRINGTON & LONDON.

OF

Interchangeable Gas Fires, Twin Jet Burner, Oval Fuel, Non-Conducting Air-Packed Fire-Brick; Combination Duplex Tap and Gas-Air Adjuster; Specially Constructed Heat Container, &c., &c., and now Copper or Brass Sheathed Gas Fires.



see that coalite plants are not manufactured unless there is abundant evidence that they can be profitably employed. This up to date is lacking. Regarding this debenture issue, it would be interesting to know exactly the amount that was subscribed, and how much capital the new Manager has to superintend at the present time.

Quite apart from the profit, if any, which might be made on sales, one is forced to be dubious regarding the success of these coalite plants, for grave complaint has been made that they are a public nuisance; and if that be so, it is quite probable that further heavy expenditure will be necessary for more plant improvement.

#### A LAND DEAL.

The Local Authorities of Willenhall and other neighbouring districts have been complaining for some time past of the dense smoke created as the result of the Company's operations, and also of the chemicals, waste acids, and so forth, permeating the air for miles around—to the injury of health. Threats of litigation have been made. Similar complaints have been made regarding the works at Hythe. So that the popularity of coalite plants is open to much question. The land at Wednesfield, it may be mentioned, was sold by Mr. Thomas Parker, the inventor of the process, to the Wednesfield Construction Company for £5065; and the Wednesfield Construction Company sold it to Coalite Limited for £15,500. The Wednesfield Construction Company is not traceable in any of the leading works of reference; so we are unable to say who is associated with it, and why it obtained this excellent profit.

#### HYTHE OR PLYMOUTH.

No better fortune appears to have attended British Coalite in connection with its installation of coalite plant at gas-works. Negotiations, it was said, had been opened with forty companies; and the Board spoke glibly of 500 plants. Up to the present, only two have been installed; and one of these has been shut down.

Works were erected by the British Coalite Company at Hythe capable of treating 70 tons of coal per day. These have been shut down; and the Company has reverted to its former methods of high-temperature production.

The position of affairs at Hythe is of abnormal interest to British Coalite shareholders, for the plant installation at the works of the Hythe and Sandgate Gas Company is a typical example of the 500 gas plants which have been talked of by the Board.

The works were installed by the British Coalite Company, and an arrangement was also entered into with the Folkestone Gas Company to take into their mains a proportion of the gas made at the Hythe works.

Shortly after the manufacture of coalite commenced, complaints were made in the surrounding district regarding what was emphatically described as a "stench" by some, and, more picturesquely, by others as a "smell of burning feathers." Neither is a description likely to make coalite plant a popular favourite by the seaside.

Last May the Hythe Borough Surveyor reported that the "stench" had been sufficiently modified so as to be no longer a "great nuisance."

But at the same time the Town Council requested that no more coalite should be manufactured until it could be proved that it could be done without causing annoyance. This may be roughly interpreted as without suffocating the visitors.

Coalite carefully pondered the matter, and eventually replied that they did not see why they should be called upon to give an undertaking that they would not be a nuisance to the people near the works; but eventually they agreed that they would suspend operations until September. The reason for making the time-limit September was that the visitors would have left the town by the end of this month. Annoyance to natives presumably does not matter in the least. Still, the point is obvious that the manufacture of coalite is an admitted nuisance; and, this being so, what becomes of the 500 coalite plants? Are there 500 towns which will put up with the nuisance, or has more plant improvement taken place that will remove the operations from the "stench and burning feather stage?" At all events, no coalite has been made at Hythe since May; and the British Coalite Company has a large stock on hand that it would willingly sell at much reduced prices.

Many people have tried it in the neighbourhood, and have found it unsatisfactory; and although efforts have been made to push the sale at all towns within a comfortable distance, the stock remains unabsorbed, although manufacture has been stopped.

If this is an example of the installation of coalite plant at a small gas-works—and there were to be 500 of such installations according to the estimates—is there a ghost of a chance of success?

At Plymouth large coalite works have been erected in connection with the local Gas Company; but as British Coalite has no distillery there, while the demand for coalite is small and repairs and renewals to plant are heavy, it is difficult to see any profit on the deal. Plymouth, in fact, appears to be by no means enchanted with coalite; for the disposition is to reduce the plant rather than to extend it.

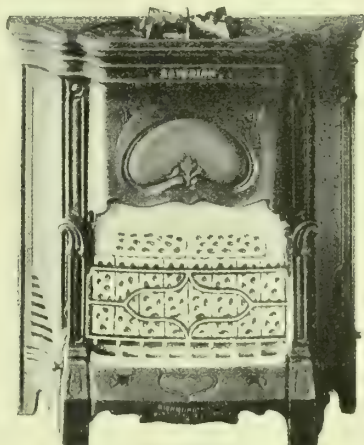
#### AUDITORS' COMMENTS.

These questions of repairs and renewals to plant and plant depreciation are of most vital importance. So much so that the Auditors of the Company were obliged to make reservations when passing the last accounts. They were passed "subject to adjustment in so far as it affects the dismantling and reconstruction of plant and machinery shown in the balance-sheet, amounting to £153,600, and to a provision for depreciation." This was a fit and proper comment to make, and one which should have been dealt with in detail by the Chairman. But, with the customary disregard for important facts which has always characterized the coalite administration, Sir William Preece dismissed the subject by observing that the Board would, of course, have due regard to the Auditors' request, and would deal with the item in question in future balance-sheets. How on earth are they going to deal with the item? With an increasing debit balance, over-valued assets, and plant standing at an absurd figure, how are they going to deal with the figure in future accounts? We can see no way save reconstruction.

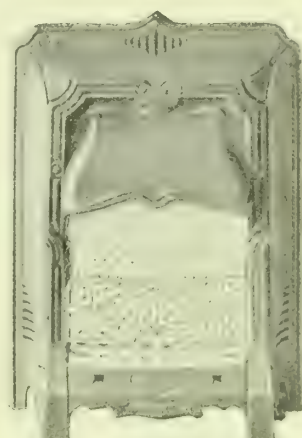
In another article we shall deal with the derelict works at Barking, and with the outlook for the Company.



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"BAYARIAN" in 4 Sizes.



"CASTILIAN" in 5 Sizes.



"EGYPTIAN" in 2 Sizes.

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Art Black,  
Art Bronze Copper,  
Porcellanite,  
Coloured Enamel,  
Hand Wrought  
Copper and Brass.



"FLORIAN" in 1 Size, 38 in. High.



This third article appeared next day, and was headed

#### Future of "Coalite"—What is (Not) Happening at Barking—Facts for the Shareholders.

As promised in yesterday's "Daily Chronicle," we give an account of the British Coalite Company's enterprises at Barking.

The British Coalite Works at Barking are another brilliant example of how not to do it. This was the grandiloquent language of the prospectus:

A large freehold site has been secured at Barking, having a valuable frontage to the Thames, and it is intended to erect immediately works capable of treating about 3 million tons of coal per annum for supply in the metropolitan area. These works will be extended as demand requires.

No less forcible in the gift of prophecy was Sir William Preece last December. At Barking the Company was to have a power station which would enable power to be supplied at a price cheaper than that charged anywhere in Europe. Niagara, even, could not touch them in price:

Within a month from now, we shall be making a million cubic feet of gas per day at Barking works alone, to be increased shortly to 3 million cubic feet; and this gas can be converted into electrical power!

Having regard to the miserable straits of the Company up to this date, and to the fact that not a promise of the prospectus had been fulfilled, one would have thought that the Chairman would have been reluctant to enter into the domain of the prophets. But nevertheless those were his expressed views. What are the facts of the case to-day?

#### DREARY BARKING.

The Company bought, at abnormal prices, land at Barking far in excess of its requirements. There are two jetties; and a large plant has been erected for coal carbonizing purposes. Many retorts were built and shut down as useless long ago; and a tar distillery promised to be completed in August, 1909, was not completed last month. The works were shut down in May, and have not been reopened since. These are the stubborn facts of to-day. A few men are employed tinkering about with the plant; the works are idle; and it appears that no attempt has been made to produce coalite there for months past. A few men appear to be employed unloading coalite, made elsewhere, from barges; and apart from this there is nothing to live for save the hope that work will be recommenced presently to meet the winter trade.

#### THE ACTUAL POSITION.

It would be well for the Board to face the facts of the case; and if they will not do so willingly, the shareholders had better force them to. Three years' experience has proved that the estimates and prophecies of those responsible for coalite are not worth the toss of a thin sixpence. There is not a single solitary promise which has been made which has come within miles of fulfilment.

Where is the estimated output of millions of tons of coalite? Where is the estimated profit? Where is the power scheme? Where is the possibility of hundreds of gas companies adopting the coalite plant? We could continue to ask questions of this character regarding every promise which has been made by the Company; and echo would always have to answer monotonously, "Where?" It is a matter for the new debenture holders, as well as for the shareholders.

#### FACE THE FACTS.

One has only to remember that the shares of Coalite Limited were once £44, and are now £3½, and that the shares of British Coalite have fallen from 22s. to about 6s., and it would be difficult to sell many at that figure, to see where the concern is drifting.

We have set the facts forth in detail; but these figures and this depreciation shriek of failure and reconstruction.

We are now dealing with the possibilities of fuel of the coalite character. It is reasonable to suppose that this class of fuel might become popular in time, and yield profits to the makers of it. But it is quite obvious that profits are never likely to be made by the British Coalite Company until a thorough reorganization of methods has been carried out. For years past, from the date of the original prospectus, shareholders have been fed with ridiculous estimates and anticipations. The present administration has been given a good run; and it has hopelessly failed to justify one single promise.

The system which was sold to the public as a proved commercial proposition is still unsuccessful.

The Company which promised big dividends can show nothing better than a debit balance; and the Board who have been so optimistic in print and in words are, from the point of view of a return to the shareholders, self-confessed failures.

The whole matter is one that requires investigation. Shareholders have not subscribed their money for the privilege of listening once a year to absurdly optimistic remarks which are proved to be wrong almost before the print is dry. The Board and the shareholders had better face facts.

#### THE PROPOSED EXTENSION OF BIRMINGHAM.

##### Outside Authorities and the Corporation's Bank Overdrafts.

Readers of the "JOURNAL" are doubtless aware that a project is on foot for the extension of the boundaries of Birmingham, and that parliamentary sanction has been sought for it. The Handsworth District Council, however, are opposed to the scheme, and have issued a report on the subject. In the course of an interview with a representative of the "Birmingham Daily Post," the Chairman of the Negotiations Sub-Committee and of the Parliamentary Sub-Committee of the Boundaries Committee of the Corporation (Mr. A. D. Brooks) stated that the essence of the scheme was an amalgamation or partnership between

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36 sizes, 11 designs, and still all Standardized and Interchangeable Fire with Fire.

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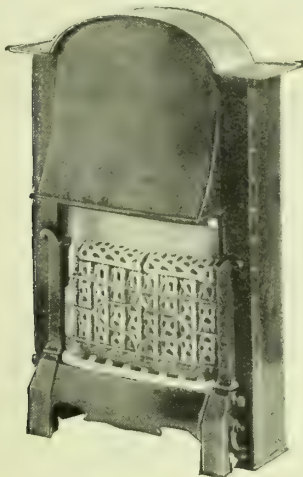
Birmingham and the other districts which physically formed part of Birmingham, on terms which should be fair to all parties. In the Provisional Order, there was a clause providing that each district should pay its own debts and liabilities up to the time the scheme came into operation, and, if necessary, should levy a rate for the purpose. The object of the clause was to bring Birmingham and the outside districts on to an equal footing in regard to current debts. Therefore, apart from these special liabilities, Birmingham had made full provision in the current estimates for all liabilities up to March 31 next, the end of the financial year, except in regard to the overdrafts on the gas and water undertakings. On the gas account, there was an overdraft on March 31, 1910, amounting to £224,000, and it had been in existence for many years. More than half of it was taken over from the old Gas Companies in 1875; and it should be made clear that those Companies, under their Private Acts of Parliament, had power to borrow moneys for the general purposes of their undertakings, including the raising of money from bankers for working capital. It was impossible that a great trading undertaking like the Gas Department could be carried on without a certain amount of liquid capital. As against the outstanding overdraft of March 31, 1910, the Corporation had, in what might be described liquid assets, £140,000 representing coal and other stores, £169,000 odd in respect of gas and fittings rentals, and upwards of £72,000 on other sundry accounts; making a total of £382,000. So there should be no apprehension in the minds of the ratepayers in regard to the matter. Business men would clearly grasp the situation that, in carrying on such a huge undertaking, it might be necessary to obtain accommodation at the bank. The stability of the gas undertaking was further assured by the fact that a reserve fund of £100,000 had been set apart, and invested in trustee securities outside the Corporation funds. Attention had been drawn to the recent decision of the High Court in the West Ham case, to the effect that the borrowing of money from a bank for the purpose of municipal trading was illegal. It was extremely doubtful, Mr. Brookes urged, whether this decision applied to the special circumstances existing in Birmingham. He thought that it was obvious, if the outside districts joined with Birmingham and received the benefit of the Birmingham undertakings, they should be prepared to share in the responsibilities which had arisen in connection with the carrying on of the undertakings.

LINCOLN CORPORATION WATER SUPPLY.

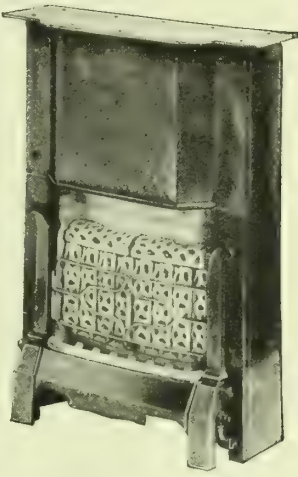
Commemoration Stone Laid at the New Water-Works.

Readers may remember that about two years ago a commencement was made with the new water scheme for the supply of Lincoln for which the Corporation had just obtained parliamentary powers. The works are situated at Elkesley, about 22 miles from the city in a westerly direction; and they comprise boreholes and pumping plant by which the water will be raised and sent to a tank at Westgate, near

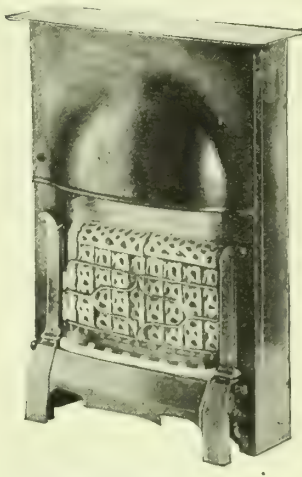
the Cathedral, whence it will gravitate to a new reservoir on Cross-o'-Cliff Hill. The scheme, which will cost about £200,000, has been prepared by the Water Engineer (Mr. Neil M'Kechnie Barron), and is being carried out under his supervision. The works were recently visited by the Mayor (Mr. C. T. Parker), members of the Corporation, and a number of officials and guests, to witness the laying of a commemoration stone in connection with the undertaking. On arriving at the site, Mr. Barron, on behalf of the Contractors, the Resident Engineer, and himself, expressed their appreciation of the presence of the Mayor and visitors. He said the Mayor, as Chairman of the Water Committee, was in full possession of all the facts relating to their scheme of water supply, and he would presently give them some very interesting particulars regarding it. He would also be able to tell them how soon it was anticipated the new water would be at Lincoln, which, after all, was the most important fact. Mr. Barron then proceeded to give a description of the buildings. In addition to the main one, comprising the engine-room, workshop, boiler-house, &c., there are three workmen's cottages at one side, and on the other is the Engineer's house, containing a Committee-room for the convenience of members of the Council, the Town Clerk, and others, who visit the works from time to time. Mr. Barron said the next time they visited the works they would present quite a different appearance, as the work was very forward, and in two months at the latest the roofs would be on, and they would commence the erection of the pumping machinery. In conclusion, he asked the Mayor to lay the stone to commemorate the occasion; and in order that he might perform the task well, and lay the stone truly, he said he had much pleasure in presenting him with a mallet on behalf of the Contractors (Messrs. Crane, of Nottingham), and a silver trowel on his own behalf. The silver plate on the mallet bore the inscription: "Presented to the Right Worshipful the Mayor, Councillor C. T. Parker, on the occasion of his laying the Commemoration Stone at Elkesley Pumping Station, September 14th, 1910, by the Contractors, William Crane, Ltd., Nottingham." On the silver trowel was precisely the same inscription with the exception that it was "presented by Neil M'K. Barron, Water-Works Engineer. The stone was inscribed as follows: "Erected in the Year 1910, in the Mayoralty of Chas. Thomas Parker. W. T. Page, Town Clerk. N. M'K. Barron, Engineer." The Mayor then performed the ceremony of laying the stone. After testing it with the spirit-level, he declared the stone "well and truly laid." He then proceeded to give the following particulars in regard to the works. He said that since they were commenced four boreholes had been completed to a depth of 600 feet. A prolonged test had been made of the quantity and quality of the water available, and it had proved entirely satisfactory. The difficult foundation work connected with the works necessary to deliver the water had now been completed, and the superstructure was rising rapidly. The buildings would soon be roofed in, enabling the Engineers to commence the erection of the powerful machinery necessary to raise the water to Lincoln. The pumping plant was entirely in duplicate, and consisted of two triple-expansion surface condensing engines, each of which would work



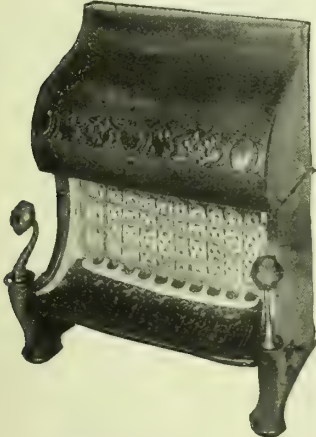
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"BAYARIAN" in 4 Sizes.



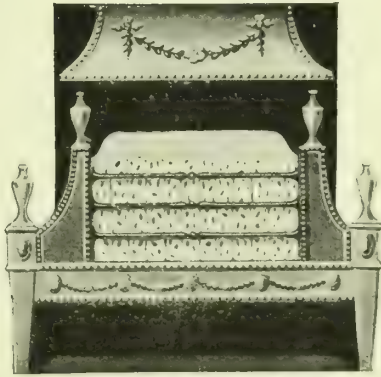
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two borehole pumps; raising the water from a maximum depth of 300 feet into tanks just beneath the level of the ground. The water would be lifted from these tanks by high-lift pumps, of which there were three to each engine, and forced through the rising main to the water-tower at Lincoln. A Venturi meter had been installed between the high-lift pumps and the rising main; the diameter being reduced to  $4\frac{1}{2}$  inches. The whole of the straightforward work on the pipe-line had been completed—i.e., 20 miles of cast-iron pipes, 21 inches in diameter, had been laid and tested. The remaining two miles was made up of special work at the crossing of rivers, and other obstacles, including the large crossing at the River Trent, where the main was carried by a new steel bridge in six spans. At the end of the main at Lincoln would be the new water-tower, 106 feet in height, containing a large steel tank holding 300,000 gallons. This tank would be for the supply of the high-level district in the vicinity of the Cathedral, and for some considerable distance around it. All the water would be pumped through this tower; and the surplus, after the supply to the uphill district had been given, would pass by gravitation through the city by means of a new main to the new large reservoir in course of erection on Cross-o'-Cliff Hill. This would hold 6 million gallons of water, or sufficient for two days' storage of 3 million gallons a day, on which basis the whole of the works had been designed. Even should a continuance of bad weather interfere with the progress of the work, he had it on the best authority that his successor would turn on the tap during his year of office—probably in September. In conclusion, the Mayor paid a tribute to Mr. Barron and Mr. Mitchell, the Resident Engineer at Elkesley, who were doing their best to carry the work to a successful issue.

A vote of thanks having been accorded to the Mayor, he invited the company to tea, in the preparation of which some of the new water was used. At the close of the repast, the party returned to Lincoln.

### NOTES FROM SCOTLAND.

#### From Our Own Correspondent.

Saturday.

The Eastern District of the Scottish Junior Gas Association made an auspicious beginning of their winter session this afternoon, when they discussed the address of the new President—Mr. Walter Dunlop, of Kirkcaldy. There was only one honorary member present, in the person of Mr. J. W. Napier, of Alloa. He had shown his great interest in the Association by coming to take the place of Mr. J. Falconer King, of Edinburgh, another honorary member, who was to have addressed the meeting, but who was unable to be present. Mr. Napier was a host in himself, and led off the discussion upon lines which made it easy for the members to keep up. A good start in a discussion is always of importance; and this Mr. Napier gave this afternoon. The readiness of the members to give voice to their opinions was a very pleasing feature of the meeting. Two other items were also exceedingly pleasing—one the addition of ten new members to the roll of the Association, and the

other the list of preferments which have come to members during the present year. The record is one at which the Association may well be gratified, and all the members should be proud to belong to it.

In the Falkirk Town Council on Monday, there was submitted a minute of the Gas-Works Committee, dated Sept. 13, in which it was stated that the rates for gas were fixed at 2s. 10d. per 1000 cubic feet for lighting (ordinary meters) and cooking; 3s. 3d. for prepayment meters and cookers; and 2s. 5d. for motive power. Bailie Bogle, the Convener, moved approval of the minute. He said the members would observe that the gas-works were this year in the best position in their history; and the Committee proposed to take 2d. per 1000 cubic feet off the price of the gas. This, combined with free cookers, made practically a reduction of 3d. per 1000 cubic feet. If it had not been for the fact that they had had to pay £700 more for local taxes, and £100 more for income-tax, they would have been able to make a much larger reduction. Twelve years ago, the price of gas was 3s. 9d. per 1000 cubic feet; now it was practically 2s. 9d. This he thought was very satisfactory. Mr. H. Russell suggested that they should remit the part of the minute relative to the price back to the Committee for re-consideration, because, so far as he could see, there should be a larger reduction. He had looked into the working analysis of last year, and there certainly was an improvement, when he compared it with former years. Unless, then, there was something he failed entirely to understand, they would be justified in making a larger reduction. If they took the year 1903-04, when gas was sold at the same rate as it was at the present time—viz., 3s. per 1000 cubic feet—they would find that in that year the price of coal per 1000 cubic feet of gas sold was 16'99d., while last year it was 14'09d. Therefore, in round figures, they had this year a reduction of 24d. in the price of coal; and they had received 3d. per 1000 cubic feet more for by-products, due to better markets. If they compared last year with the year in the history of the old gas-works when the price of gas was the same as it was at the present time, they would find that whereas in the former year, when hand-charging was used, the rate of wages was 4'056d. per 1000 cubic feet of gas sold, last year it was 2'7d. per 1000 cubic feet sold. It was nearly 2d. more in the old days. Then, again, rates and taxes last year were just over 4d. per 1000 cubic feet of gas sold; while in the year he had put it against, they amounted to 4'653d. It was, however, fair to say that interest and sinking fund contributions had increased. Last year these were 13'21d. per 1000; in the previous year, they were 11'5d. Taken all over, there was a clear gain of something like 5d.; and they were now producing a cheaper quality of gas—14-candle instead of 20 or 21 candle. On the face of these facts alone, he thought that the Committee should look into the matter more minutely. The Council unanimously sent the question back to the Committee.

The classes upon "Gas Manufacture" and "Gas Distribution and Supply," conducted by Mr. H. O'Connor, F.R.S.E., of Edinburgh, in the Glasgow and West of Scotland Technical College, were opened last night (Friday). They used to be held on Saturday evenings. This year it has been decided by the College authorities that the courses in

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BELFAST: 8, Exchange Place, Donegall Street.

Telegraphic Address: "GOTHIC." Phone No.: 74X.

MELBOURNE: 333-335, Queen Street.

Phone No.: 3716.



both subjects shall conform more closely to the syllabus of the City and Guilds of London Institute, so that the courses this year will consist of a series of lectures preparing for the ordinary grade examinations. Mr. O'Connor's class on "Gas Manufacture" in the Heriot-Watt College, Edinburgh, opens next Thursday.

### CURRENT SALES OF GAS PRODUCTS.

#### Sulphate of Ammonia.

LIVERPOOL, Sept. 24.

A fair volume of business has been transacted during the past week; and, although there has been no appreciable advance in values, makers have found no difficulty in disposing of their present output at full prices. The quotations at the close are £12 11s. 3d. to £12 12s. 6d. per ton f.o.b. Hull, £12 12s. 6d. to £12 13s. 9d. per ton f.o.b. Liverpool, and £12 13s. 9d. to £12 15s. per ton f.o.b. Leith. No new business has transpired for delivery next year; but it is reported that further orders have been placed for shipment in equal monthly quantities October, November, and December this year at prompt values.

#### Nitrate of Soda.

The market for this article is rather quiet, but very steady at 9s. 4½d. per cwt. for ordinary and 9s. 7½d. for refined quality, on spot.

LONDON, Sept. 26.

#### Tar Products.

The markets have been steady throughout the past week. Pitch has been quiet without very much business doing. But there has been very little change in prices; and what there has been is rather in the downward direction. Creosote is steady, and orders are difficult to secure. The majority of makers, however, look for better demand at an early date. Benzols are quiet. There is some demand for prompt delivery; but for forward, buyers' ideas are very much under those of makers, and business is therefore impossible. In toluol, there is little demand, and prices asked by makers are somewhat above the ideas of consumers. Solvent naphtha is steady. But orders are very difficult to secure as consumers are being pressed to buy for delivery over a long period ahead; and they naturally think that by waiting they will do better. Carbolic acid is quiet. Continental consumers decline to offer more than 1s. 0½d. per gallon; but makers on this side report having received offers at 1s. 0½d. Cresylic acid is steady, and there is a fair demand for this article. Naphthalene is steady without very much business doing. Creosote salts are in good demand. Tar is still maintaining its value.

The average values during the week were: Tar, 18s. 9d. to 22s. 9d. ex works. Pitch, London, 37s. to 37s. 6d.; east coast, 37s. to 37s. 6d.; west coast, 35s. 6d. to 36s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d.; 50-90 per cent., casks included, London, 7½d. to 7¾d.; North, 7½d. Toluol, casks included, London and North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included,

London, 1s. to 1s. 1d.; North, 11d. to 1s.; heavy naphtha, London, casks included, 11d. to 11½d.; North, 10½d. to 11d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, 44 10s. to 48 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

#### Sulphate of Ammonia.

The market for this article has been exceedingly firm during the past week, and prices have advanced all round. The Gas Companies to-day quote £12 6s. 3d. for the 25 per cent. min.; while London makes are £12 2s. 6d. to £12 3s. 9d. In Hull, £12 12s. 6d. has been declined, and £12 15s. has been paid for one of the best makes. In Liverpool, £12 15s. has been paid; and in Leith this figure is reported to have been refused for prompt delivery. Middlesbrough is quoting £12 15s.

### COAL TRADE REPORTS.

#### Northern Coal Trade.

The unrest in the coal trade has made prices very uncertain for some days; but they are now returning to something like the normal values. In the steam coal trade, best Northumbrians are from 9s. 7½d. to 9s. 9d. per ton f.o.b., second-class steams are about 8s. 9d. to 9s., and steam smalls are from 5s. 6d. to 6s. 6d. The output is now well maintained, and so far seems to be taken up fairly; but the demand for some of the Baltic ports is showing the decrease which is customary at this season of the year. In the gas coal trade, the home request is now steadily increasing; and the deliveries to the great consuming companies are much above the rate of two months or so ago. Durham gas coals vary in price according to the quality. The usual classes are from 9s. to 9s. 9d. per ton f.o.b.; while for "Wear specials," from 10s. 3d. to 10s. 6d. is the current quotation. There were no contracts of moment settled in the last few days. But some sales for export continue to be made, more especially for some of the Mediterranean ports; and the basis of the sales is about 16s. per ton for gas coal delivered at Genoa. In the coke trade, the demand is steady; but the increase of the output of gas coke is making its price easier. The current quotation for good gas coke is from 13s. 9d. to 14s. per ton f.o.b. in the Tyne or Wear.

#### Scott Coal Trade.

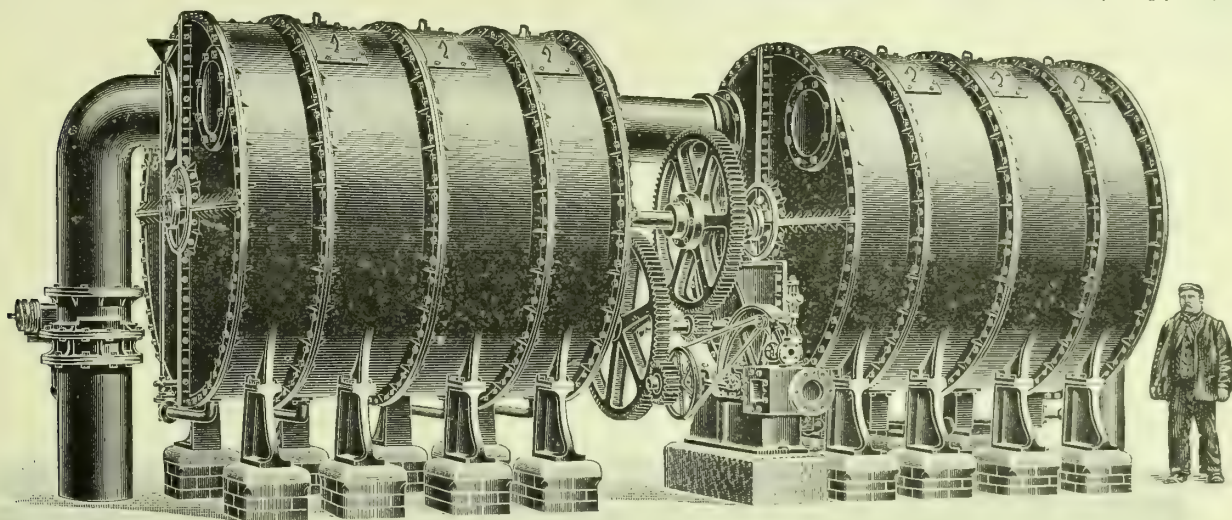
Trade continues dull; prices being very inelastic, and the foreign trade very much at a standstill. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint 9s. 6d. to 9s. 9d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 322,183 tons—a decrease of 2173 tons upon the preceding week, and of 5705 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,460,397 tons—an increase of 715,770 tons upon the corresponding period.

# ROTARY WASHER SCRUBBER.

Capacity 2,500,000 cubic feet per day,

For Gas-Works, KINGSTON-ON-THAMES.

H. W. Packham, Esq., Engineer.



MAKERS:

R. & J. DEMPSTER, Ltd.,

London Office:

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MANCHESTER.



**Oswaldtwistle Water Supply.**—The Oswaldtwistle Urban District Council have received the sanction of the Local Government Board to borrow £2396 for the contract for sand filters, &c., at the Cobbs reservoir, and £377 for the purchase of land as a site for sand filters at the Jackhouse reservoir.

**Reductions in Price.**—The Isle of Thanet Gas Company have reduced the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet as from the 1st prox. The Torquay Gas Company have lowered their price 1d. per 1000 cubic feet, with a rebate equivalent to twice the amount to prepayment consumers, as from Michaelmas.

**Gas Supply in Paris Suburbs during the Floods.**—At the time of the floods in Paris in the early months of the present year, the Paris Gas Company assisted the Company supplying the suburbs, whose works were several feet under water, in maintaining the service by furnishing them with about 281 million cubic feet of gas. The Municipal Council, as the owners of the Paris Gas-Works, have authorized the Company to charge for this gas at the rate of 3s. 5d. per 1000 cubic feet. It will consequently cost the Suburban Company about £48,000.

**Johannesburg Water Supply.**—Some of our readers may remember that the water supply of Johannesburg is in the hands of the Rand Water Board, who also serve other municipalities along the Reef and the Rand Mines. They are Krugersdorp, Germiston, Benoni, Boksburg (Roodepoort-Maraisburg), and Springs. The area supplied is 365 square miles, and the population 365,442. The water pumped per annum is 1685 million gallons. It is obtained from the Dolomite formation, and has to be raised about 800 or 900 feet to control the various districts. The pumping plant for the boreholes is electrically driven; but at the central station the motive power is a series of triple-expansion engines driving direct-acting inverted vertical pumps. Mr. W. Ingham, late Engineer-in-Charge of the Smart Syndicate Irrigation Farms, Britstown, Cape Colony, has been appointed Chief Engineer to the Board.

**Improvements at St. Mary Church Gas-Works.**—An application by the Torquay Town Council for sanction to a loan of £4250, for improvements in connection with the gas-works at St. Mary Church, was the subject of an inquiry by Mr. A. A. G. Malet, a Local Government Board Inspector, last Thursday. The Town Clerk (Mr. F. S. Hex) explained that £500 of the sum was required for a new sulphate house and workshop, £250 for meters and services, £500 for cookers, £1000 for mains, and £2000 for slot installations. Owing to the degeneration of the plant in the existing sulphate-house, which had been in use for twenty years, a breakdown was feared; and as a new house was a pressing necessity, the Council had been obliged to proceed with the matter. Mr. F. Chalmers, the Gas Manager, explained in detail how it was proposed to deal with the loan, and said the extensions and improvements were needed mainly because of the growth of small properties for the artisan class, and the consequent increase in the number of prepayment consumers.

**A Gas Debenture Stock Anomaly.**—In a letter in last Friday's "Financial Times," under the heading of "A Gas Debenture Stock Anomaly," the following remarks appeared: "The Gaslight and Coke Company and South Metropolitan Gas Company 3 per cent. debenture stocks are quoted in both cases at 80 to 82; whereas the Wandsworth and Putney Gas Company 3 per cent. debenture stock is quoted at 73 to 75. The security in all three cases is unquestionable. Why, therefore, should there be such a wide difference in the prices?"

**Mannesmann Tubes for High-Pressure Gas.**—At a recent meeting of the Burnley Town Council, it was recommended that a 5-inch high-pressure gas-main should be laid in the town; the tubes proposed to be used being Mannesmann steel tubes with rigid joints, coated with a special coating. The chief reason for adopting this class of pipe was that it was not liable to be broken by subsidence of the ground, which caused considerable trouble with ordinary pipes. Then the lead joint adopted with cast-iron pipes was susceptible to the movement of the ground, and leaks resulted; but the joint in the steel pipes was practically an extension one. They had been used with success in districts in which subsidences occurred; and in soil of a corrosive nature they were found to be more durable than cast-iron pipes. The recommendation was adopted.

**Roads Improved by Tar Spraying.**—Reference was made at the meeting of the Devon County Council last Thursday to the advantages of tar spraying the roads. According to some members of the Council, the roads are the worst in England, owing to the use of limestone and other soft material which is comparatively easy to break. Tar spraying is, however, found most beneficial where it is in use. Dr. Mackenzie said his experience was that it was most useful. It prolonged the life of the roads, and relieved a great deal of the dust nuisance. The inhabitants of the villages were in favour of its continuance. Mr. Davie, corroborating this view, said he had had the road outside his property sprayed at his own expense; and instead of being smothered with dust as hitherto, he had been absolutely free from it. It was, however, very necessary that before a road was sprayed, it should be in thorough order.

**Improved Public Lighting in Stoke Newington.**—At the meeting of the Stoke Newington Borough Council last Tuesday, the Highways Committee reported having had under consideration an offer by the Gaslight and Coke Company to instal, at their own cost, inverted in place of the existing upright incandescent burners in the street-lamps in the borough, and to maintain them in thoroughly efficient order at prices (for the supply of gas and maintenance) which will effect a saving of £250 in the present annual cost to the Council for street lighting, while the illuminating power of the lamps would be increased by 20 per cent., provided the Council enter into a contract with the Company for five years at the fixed prices quoted by them. If at the expiration of this period the contract is renewed for another five years, a further reduction in price will be made, effecting an additional saving of £103 per annum. On the recommendation of the Committee, the Company's offer was accepted.

# Hot Baths at any time.

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May we send you a specimen Booklet for perusal?

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STOUR STREET, SPRING HILL, BIRMINGHAM, and 129, HIGH HOLBORN, LONDON.



**Shop Lighting.**—In the "Trade Chat" in the "Ironmonger" for the 17th inst., "Vulcan" offered the following remarks on the subject of shop lighting: "Next in importance to window display and the presentation of interesting details about one's goods, is the lighting of the shop window. In most towns, tradesmen now have the option of using either electricity or gas; and there is no longer any excuse for leaving the exterior or interior of one's premises in a condition resembling the 'twilight of the gods.' Ironmongers who do gas-fitting as well as electric wiring, and sell fittings and accessories for both styles of lighting, should illuminate their shops partly with one and partly with the other method, so as to give the rival systems an impartial show. But whichever agent is selected, brilliant lighting inside and out should be insisted on."

**Quality of Truro Water.**—Attention is again directed to the suspicion attaching to the water supplied for domestic purposes in Truro. A sample recently submitted by the Town Council to Mr. Kitto for examination was found by him to give unsatisfactory results; and the suggestion was made that the filtration was not efficient. The Town Council, in forwarding the report to the Water Company, suggested that notices should be issued warning the public to boil the water before using it. In reply, the Company deprecated any action which would have the effect of raising a scare; and they explained that samples of the water were about to be submitted for analysis, as was done every quarter, and they proposed to put off the issue of notices until the result of the examination came to hand. It was explained that for several months past the Directors had been consulting competent authorities on questions of water supply, but had been unable to determine which would be the most suitable and efficient scheme to adopt for the improvement of the works. At their last meeting, the Council discussed at some length the Company's reply, and decided not to insist for the present on the issue of warning notices.

**North Warwickshire Water Company.**—At the annual meeting of the Company, which was held last Thursday—Mr. R. Barnes presiding—the Directors reported a further increase in revenue to the amount of £245; the number of new services laid on having been 186. In consequence of the regretted death of Mr. Joseph Quick, the Board had appointed Mr. H. G. Perryn as Consulting Engineer. He visited the works in March last, and reported that the pumping-station, machinery, reservoirs, and other works were efficiently maintained. The Chairman, in moving the adoption of the report, said it was a matter of great satisfaction that there had been an increase in the rentals which had converted a loss last year into a profit this year. In addition, there had been a saving of nearly £200 in the working expenses. The profit on the trading this year had been £1131, as against £784 last year, which was a marked improvement. It was also very satisfactory that, in the Knowle district, to which the Company extended their main some time ago, the services were gradually increasing. They had several very good applications for supplying large districts which were developing; and it was hoped the Company would soon be supplying them. The report was adopted unanimously.

**Dearer Electricity in Marylebone.**—As a result, according to the "Daily Mail," of the growing use of metallic filament lamps, the Metropolitan Electric Supply Company, Limited, have raised the price of electricity to the private consumers from 5½d. to 6d. per unit, with a reduction of 4d. on every unit above the quantity hitherto used.

**An Automatic Installation for Rainford.**—The Rainford Gas Company (Lancs.) have placed a contract with the Richmond Gas Stove and Meter Company, of Warrington and London, for the supply of complete automatic installations, including meters of Messrs. George Glover and Co.'s make. Canvassing and up-to-date literature have resulted in nearly 400 houses being fitted.

**Electricity Supply in West Ham.**—The Local Government Board have granted the application of the West Ham Corporation for a loan of £118,525 for extensions of the electricity works. It is proposed to expend, after deducting £74,600 on account of a previous application, £20,900 for a 3000-kilowatt turbo-alternator, a boiler, extension of the coal-handling plant, condenser, and switch gear. The balance will be used for new mains and services, and for motors on loan. During the twelve months ended March 31 last, the Corporation disposed of 19,156,399 units at prices ranging from 0·93d. to 3d. per unit.

**Bexhill Water and Gas Company.**—The accounts of this Company for the six months ended the 30th of June show a balance of £4557 available for distribution; and at the meeting of shareholders on Thursday the Directors will recommend dividends at the rates of £6 and £4 4s. per cent. per annum on the two classes of capital, less income-tax. This, with provision for income-tax, will absorb £3426, and leave £1131 to be carried forward. The Directors remark that the reduction in the price of gas mentioned in their report this time last year, necessarily caused a diminution in the profit from sales; and though the consumption is increasing, it has not yet produced an equivalent return. This, coupled with a heavy increase in local rates, has so far affected the result of the half-year's working as to induce them to recommend a reduced dividend, which they hope will be only temporary.

**Reduction of Price at Torquay.**—A very satisfactory report was presented at the half-yearly meeting of the Torquay Gas Company, which was held last Tuesday under the presidency of Mr. W. B. Beynon. The accounts presented by the Secretary (Mr. R. P. Kitson) showed that the receipts amounted to £13,721, compared with £14,303 before; and the expenditure was £999, against £10,283. The balance on the profit and loss account was £4404; and after deduction of the amount necessary to pay the usual dividends of 10 and 7 per cent., there remained a balance of £1008. In view of this satisfactory state of affairs, the Directors felt justified in reducing the price of gas to ordinary consumers from 2s. 11d. to 2s. 10d. per 1000 cubic feet as from Michaelmas; while on prepayment meters a rebate of ½d. in the shilling will be allowed, which is equivalent to a reduction of 2d. per 1000 cubic feet. Mr. Iredale pointed out that the reduction would represent a total sum of £900, and said that in Torquay there were 2500 slot-meter consumers.

# PURE HEAT!



"PURE HEAT" is the title of our new booklet which explains in detail how heat as pure as that from the SUN is obtainable by using our "SYPHON STOVES." It also enumerates the many convenient uses to which they may be put.

Many important improvements in finish have been made, and in every way these Stoves are thoroughly RELIABLE, EFFICIENT, AND HYGIENIC.

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ACADEMY STREET, WARRINGTON.  
Telegrams: "GASSTOVES, WARRINGTON."  
Telephone: WARRINGTON 80.



We have received from the Carron Company, of Stirlingshire, their new gas-fire booklet for the season. It contains particulars and prices of a number of gas-fires in various finishes; also of the Company's gas-heated steam radiators and hygienic induction condensing gas-stoves.

The Ryde Town Council have accepted the tender of Mr. John McKay, of Derby, at the sum of £1642, for extending the water supply of the borough at Niton, in consequence of the voluntary winding-up of Messrs. A. E. Nunn and Co. The amount named has reference to the completion of the principal works; the remainder being subject to schedule prices.

Messrs. Fletcher, Russell, and Co., of Warrington, are issuing a supplementary list of new season's gas-fires, &c., for insertion in List No. 246, so as to bring it up to date. The firm have also prepared a new fire pamphlet, a gas-radiator pamphlet, and a descriptive booklet of their new pattern water-heaters. Being well printed, and in attractive covers, these are eminently suitable for distribution among present and prospective gas consumers.

The Burnden Tar Company (Bolton), Limited, are, as from the 1st prox., entering into new works (to be known as the Hulton Chemical works, near Bolton), which have been erected with up-to-date plant for tar distilling on a large scale, and are transferring their name, together with their business connection, thereto. There are private sidings to the works; and an important feature is that the tar-stills have a working capacity of 30 tons each.

The catalogue of the New Inverted Incandescent Gas-Lamp Company, Limited, for the 1910-11 season, of which we have received a copy, shows the well-known "Nico" burners and mantles in great variety for factory, mill, domestic, and outdoor lighting. A very good illustration of the use of "Nico" burners for church illumination will be found on the last page. A large portion of the catalogue is devoted to brackets, pendants, lighting accessories and fittings, glassware, &c. The illustrations and descriptions of the Company's goods occupy upwards of a hundred large quarto pages, and reference to them is facilitated by an index.

An appeal by the Street Urban District Council on behalf of the gas consumers who use slot-meters has failed. Other consumers are to be allowed discount for prompt settlement of accounts; and Street protested against the slot-meter users being ignored—pointing out that obviously no one paid more promptly. Mr. D. E. Garlick, the Secretary and Manager to the Glastonbury Gas Department, has written: "It must be remembered that consumers by ordinary meter pay rent for meters and stoves, and pay the cost of installations, fittings, &c., within their premises. Consumers by slot-meter pay no rent for the meters; and, in the great majority of cases, the fittings and installation have been provided by the Gas Committee. Though the nominal price of gas in these cases is 4s. 7½d. per 1000 cubic feet, it is necessary to deduct the rent of the free fittings and meters; and the actual net receipt spread over a number of years works out at 4s. per 1000 feet only. Where gas-stoves are also provided free, the gas is charged at 5s. 2½d. per 1000 cubic feet; but the net return to the Gas Committee, after deducting the usual rent, again averages 4s. per 1000 feet. It will thus be seen that the consumers by slot-meter are placed in a very favourable position as compared with the other small consumers (who are charged 4s. 6d. per 1000 cubic feet, subject to a discount of 2d., for payment on or before the 10th of the month following the date on which the quarterly account is sent out); and while the Committee will do everything in their power to make further reductions in price when financial considerations permit, they do not consider that the claims of the slot-meter consumers can be said to be greater than those of customers who take their gas by ordinary meter.

#### APPLICATIONS FOR LETTERS PATENT.

- 21,152.—RICHMOND GAS STOVE AND METER COMPANY, LTD., and RANSOME, J. A., "Gas-heated air-heating and ventilating stoves." Sept. 12.  
 21,171.—SNELL, A. C., "Taps and valves." Sept. 12.  
 21,173.—WESTAWAY, J., and HELLYAR, W. A. S., "Connecting devices for gas-pipes." Sept. 12.  
 21,184.—HIGGINS, W., "Manufacture of gas." Sept. 12.  
 21,210.—MUELLER, W., "Treatment of, and recovery of, bye-products from distillation gases." Sept. 12.  
 21,222.—YATES, H. J., "Gas-controlling apparatus for heating and other appliances." Sept. 12.  
 21,286.—SUMMERS, W., "Controlling the flow of liquids." Sept. 13.  
 21,287.—FAIERS, M., "Gas-tap." Sept. 13.  
 21,313.—BILLÉ, L., "Joints for conduits." Sept. 13.  
 21,358.—YARROW, M., "Joints of pipes and mains." Sept. 14.  
 21,375.—ROSENHAIN, W., "Detecting presence of gas." Sept. 14.  
 21,391.—ROBERTS, F. & M. P., "Generation of gas." Sept. 14.  
 21,404.—HIGGINS, W., "Gas-generating apparatus." Sept. 14.  
 21,407.—PINEL, W. P., "Chimneys for mantles." Sept. 14.  
 21,409.—ROTERMUND, H., "Recovery of ammonia from gas." Sept. 14.  
 21,425.—GIRLING, A. H. G., "Clip for pipe-joints." Sept. 15.  
 21,443.—GLOVER, R. B. G., "Inverted burners." Sept. 15.  
 21,461.—SUTHERLAND, A. G., "Prepayment meters." Sept. 15.  
 21,481.—WATKINSON, J. G., "High-pressure gas-lamps." Sept. 15.  
 21,508.—LAKE, H. W., "Gas and air mixing plants." A communication from the firm Selas G. m. b. H. Sept. 15.  
 21,527.—WEATHERHEAD, F. W., "Acetylene generators." Sept. 16.  
 21,546.—PROVINCIAL CINEMATOPH THEATRES, LTD., "Holding and shading gas-lights." Sept. 16.  
 21,568.—ROBIN, J. T., "Packing mantles." Sept. 16.  
 21,604.—POLLATSCHEK, E. B., "Incandescent burners." Sept. 16.  
 21,631.—WHITFIELD, C., "Gas-producers." Sept. 17.  
 21,644.—PRYOR, H., and LONDON VERTICAL RETORT SYNDICATE, LTD., "Utilizing the waste heat of retort or other furnaces." Sept. 17.

## OUR "IRIS" FIRE

### HAS CREATED AN ENORMOUS DEMAND.

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The Cardiff Water Committee received twelve tenders for the construction of their new Llwyn On reservoir. Of these, seven were below £240,000—the lowest being £201,000. The Committee decided that the Water Engineer (Mr. C. H. Priestley) should go through the whole of the tenders and make a report to the next meeting of the Council.

From an announcement appearing in our advertisement columns, readers will see that Messrs. John E. Pritchard and Co. (successors to Messrs. Alexander, Daniel, and Co., of Bristol) will offer for sale on the 6th prox. £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water-Works Company, in lots of £100, at the reserved price of £136 each.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WORKING MANAGER (WATER-WORKS). Beaumaris Corporation. Applications by Oct. 4.  
WASTE INSPECTOR. Colne Valley Water Company. Gas LEAKAGE DETECTOR. Rhondda Urban District Council. Applications by Oct. 13.  
WORKING FOREMAN (GAS). Nixon's Navigation Company, Mountain Ash.  
DRAUGHTSMAN. No. 5289.  
DRAUGHTSMEN. No. 5268.  
REPRESENTATIVE. "Gas Works," c/o Streets.  
SHOW ROOM ATTENDANT. No. 5292.  
TRAVELLER. No. 5291.

Lectures, &c.

SIR JOHN CASS TECHNICAL INSTITUTE. Fuel, Fuel Analysis, and Gas Analysis. Syllabus from the Principal.  
SCIENCE OF GAS MANUFACTURE AND COMBUSTION. Manchester University.

Agency Wanted (Australia). "Gas," c/o W. Porteous and Co., Glasgow.

Plant, &c. (Second Hand), for Sale.  
EXHAUSTER. T. Duxbury and Co., Manchester. METERS. No. 5290.  
STATION METER. Brynmawr and Blaina Gas Company.

Stocks and Shares.  
ALDERSHOT GAS AND WATER COMPANY (BY AUCTION). Oct. 11.  
BARNET GAS AND WATER COMPANY (BY AUCTION). Oct. 11.  
BRISTOL WATER-WORKS COMPANY (BY AUCTION). Oct. 6.  
DORKING WATER COMPANY (BY AUCTION). Oct. 18.  
GREAT YARMOUTH WATER COMPANY (BY AUCTION). Oct. 11.  
HARROW AND STANMORE GAS COMPANY (BY AUCTION). Oct. 11.  
SOUTHEND WATER COMPANY (BY AUCTION). Oct. 18.

TENDERS FOR

Coal.  
LANCASTER GAS DEPARTMENT. Tenders by Oct. 13.  
Lead and Compo. Pipe and Block Tin.  
RHONDDA URBAN DISTRICT COUNCIL. Tenders by Oct. 6.  
Oxide (Spent).  
SALFORD GAS DEPARTMENT. Tenders by Oct. 6.  
Tar.  
RHONDDA URBAN DISTRICT COUNCIL. Tenders by Oct. 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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For GAS PURIFICATION.  
LARGEST SALE OF ANY OXIDE.

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**"VOLCANIC" FIRE CEMENT.**  
Resists 4500° Fahr. Best for GAS-WORKS.  
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**12 YEARS** in the Gas Business, and now "At Your Service."

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Telephone: 841 AVENUE.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.  
We guarantee promptness, with efficiency for Repairs.  
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ENQUIRIES SOLICITED.

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The Manufacture of  
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Best Percentages. For lowest Quotations to any Port,  
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Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

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**THE very best Patent Grids for Holding**  
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The M.H. GAS PLANT produces at will:—  
METHANE HYDROGEN GAS from Coke, Tar, Steam, and either Benzol or Tar enrichment.  
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

**HYDRATED OXIDE OF IRON.**  
**PREPARED from Pure Iron.**  
Twice as Rich as Bog Ore.  
Gives no back Pressure.  
The Cheapest in the Market.  
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**"GAZINE" (Registered in England and**  
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It is also used for the enrichment of Gas.  
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.  
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**SPECIALLY prepared for Sulphate of AMMONIA Makers by**  
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Address Correspondence and Inquiries to OLDBURY, WORCS.  
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**FUEL.**  
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**LIQUID, GASEOUS, & SOLID FUEL.**  
By J. S. BRAME, Lecturer on Chemistry at the Royal Naval College, Greenwich.

A Course of Lectures, Monday Evenings, 7 to 8 p.m. Commencing **Monday, October 17, 1910.**

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By C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.  
A Course of Laboratory Work, Summer Term, Monday Evenings, 7 to 10 p.m. Commencing **Monday, April 24, 1911.**

**GAS ANALYSIS.**  
By CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.  
A Course of Laboratory Work, Summer Term, Wednesday Evenings, 7 to 10 p.m. Commencing **Wednesday, April 26, 1911.**

The Courses of Instruction are arranged to meet the requirements of those engaged in Chemical and Engineering Works, or who are concerned with the use of Fuel as a Motive Power.

Detailed Syllabus of the Courses may be had upon Application at the Office of the Institute, or by letter to the Principal.

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Under the Auspices of the  
MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS  
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**A COURSE of Six Lectures will be**  
given at the Victoria University on the  
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Admission free. Tickets for the Course and Full Particulars may be obtained from the Hon. Secretaries of the above Associations.  
W. WHATMOUGH, Engineer and Manager Gas-Works, HEYWOOD;  
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**THE Secretary of the Coatbridge Gas**  
Company has to THANK the Applicants for the position of ASSISTANT MANAGER and to inform them that the DIRECTORS HAVE NOW MADE AN APPOINTMENT.

**AGENCY—Gentleman with wide and ex-**  
tended Gas and General Engineering Experience trained in England, and now well Established in the Colonies, would accept a few approved AGENCIES for Australasia.  
Address "Gas," WM. PORTEOUS AND CO., GLASGOW.

**WASTE Inspector wanted with Experi-**  
ence in Reading Water-Meters and Working Deacon's Waste-Meters.  
Apply, giving full Particulars, to the SECRETARY, Colne Valley Water Company, New Bushey, WATFORD.

**WANTED, immediately, Two or Three**  
DRAUGHTSMEN, fully Experienced in the Design of Modern Gas Plant.  
Apply, by letter, Stating Age, Qualifications, and Salary required, to No. 5268, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a competent Gas Fitter with**  
Practical Knowledge of Gas Manufacture to act as WORKING FOREMAN at a small Gas-Works.  
Apply, stating Age, Experience, and Wages required, and enclosing Testimonials, to W. MILLAR, Nixon's Navigation Company, Limited, MOUNTAIN ASH, South Wales.

**REPRESENTATIVE required to intro-**  
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**DRAUGHTSMAN Wanted in a Gas**  
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Apply, by letter, stating Age, Experience, and Salary required, to No. 5289, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a Practical Working Man-**  
ager for the Beaumaris Corporation Water-Works. Population, 2000. Gravitation Supply. Must understand care of Filters, Mains, Inspection for Leakage, and General Administration. No Book-Keeping.  
Applications, stating Salary, to be sent in by Tuesday, the 4th of October, to the TOWN CLERK, BEAUMARIS.

**WANTED by a Suburban Gas Com-**  
pany, a SHOW-ROOM ATTENDANT. Must have occupied a similar Position and have a thorough knowledge of Gas Lighting and of Gas Cookers, Fires, and Appliances.  
Apply, by letter, stating Qualifications and Salary expected, to No. 5292, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, a Traveller for an old Es-**  
tablished Company supplying Gas Companies and Corporations. Salary, expenses, and Commission. Must have Good Connection with Gas Companies in England.  
Write, stating Qualifications and previous Experience, to No. 5291, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

## RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE Rhondda Urban District Council**  
require the Services of a Man who will have to DEVOTE HIS WHOLE TIME to the work of DETECTING AND REDUCING GAS LEAKAGES throughout the area supplied by the Council.

Only those who have had a thorough Practical Experience in districts where subsidences occur need Apply.  
Applications, with copies of Three recent Testimonials, stating Age, Experience, and Wages required, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Gas Inspector," to be sent to the undersigned not later than Monday, the 3rd of October next.

WALTER P. NICHOLAS,  
Clerk of the Council.

Council Offices, Pentre,  
Rhondda, Sept. 19, 1910.



**FOR SALE—30,000 Cubic Feet an Hour**  
EXHAUSTER. Good as New. Done very little work. Maker, Bryan Donkin and Co.  
Can be seen on Application to THOS. DUXBURY AND Co., 16, Deansgate, MANCHESTER.

**FOR SALE—One Cylindrical Station**  
METER. Capacity 6000 Cubic Feet per Hour, complete with Hydraulic Valves and Bye-Pass, in good Working Condition. No reasonable Offer refused.  
Offers to D. ARTHUR PRICE, Secretary, Brynmawr and Blaina Gas Company, BLAINA, MON.

**GASHOLDERS—16 ft., 24 ft., 26 ft., and 45 ft. Diameter GASHOLDERS**, Cheap for immediate Sale. Re-erected in either Brick or New Steel Tanks Complete to Plan and Specification. Can be seen Temporarily Erected at our Works.  
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

**FOR SALE—A quantity of Second-Hand**  
Dry GAS METERS—Two-Light, 50-Light, 100-Light, 150-Light, 200-Light, and 300-Light; also 150 Wet Consumers' METERS, all by well-known Makers. Newly Repaired and Guaranteed for Two Years.  
Address No. 5290, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.  
(GAS DEPARTMENT.)

**THE Gas Committee invite Tenders for**  
the Purchase of about 1800 Tons of SPENT OXIDE.

Full Particulars and Form of Tender may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Spent Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 6th of October, 1910.

L. C. EVANS,  
Town Clerk.

Salford.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE above Council are prepared to**  
receive TENDERS for the Supply of LEAD and COMPO PIPE and BLOCK TIN, for the Half Year ending March 31, 1911.

Form of Tender may be obtained on Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.

No Form of Tender other than that issued by the Council will be considered.

The Contractors will be required to pay the Standard Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Lead Pipe, &c.," and sent to the undersigned not later than Ten a.m. on Thursday, Oct. 6, next.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,  
Clerk of the Council.

Council Offices, Pentre,  
Rhondda, Sept. 23, 1910.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

**THE above Council are prepared to re-**  
ceive OFFERS for the Purchase of the Surplus GAS TAR made at the Two Gas-Works, Porth and Ystrad, for a Term of One Year from Nov. 1, 1910 (or for such longer Term as may be contracted for with the consent of the Council).

The Tar will be delivered free into Contractor's and Council Tank Waggon.

Tenders to be sent addressed to the Chairman of the Gas and Water Committee, endorsed "Tar," and delivered at my Office not later than Ten a.m. on Thursday, Oct. 6, prox.

The Purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.

The Council do not bind themselves to accept the highest or any Tender.

Form of Tender and Specification may be obtained on Application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, Rhondda.

WALTER P. NICHOLAS,  
Clerk of the Council.

Council Offices, Pentre,  
Rhondda, Sept. 23, 1910

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

**MESSRS. JOHN E. PRITCHARD & CO.**, late Alexander, Daniel, and Co., will SELL BY AUCTION, at the Bank Auction Mart, Colston Avenue, Bristol, on Thursday, the 6th of October, 1910, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS SEVEN PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, in Lots of £100, at the reserved price of £136 for every £100 Stock.

The above £15,000 Stock is part of the Seven per cent. Maximum Consolidated Ordinary Stock, amounting to £970,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, 1895, and 1902.

The Dividend is subject to proportionate diminution whenever the maximum dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale, Apply to the AUCTIONEERS, Bank Buildings, Colston Avenue, BRISTOL; to MESSRS. EDWARD GERRISH, HARRIS, and COMPANY, Lloyds Bank Buildings, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,  
Secretary and General Manager.

Bristol Water-Works Office,  
Telephone Avenue, Bristol.

CORPORATION OF LANCASTER.  
(GAS DEPARTMENT.)

TENDERS FOR GAS SLACK.

**THE Gas Committee are prepared to**  
receive TENDERS for the Supply of Rough GAS SLACK, to be delivered on the Gas-Works Siding, Lancaster, in such Quantities, and at such times, as may be required during a period of Twelve Months, commencing delivery Jan. 1, 1911.

Sealed Tenders, endorsed "Gas Slack," giving full Particulars of the Slack offered, must be delivered to T. C. Hughes, Esq., Town Clerk, Lancaster, not later than Oct. 13 next.

Any further Information and Forms of Tender may be obtained on Application to the undersigned.

C. ARMITAGE,  
Manager.

Gas-Works, Lancaster.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

**MESSRS. A. & W. RICHARDS beg to**  
notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF £00 £10 "C" SHARES.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

NEW ISSUE OF £3500 "C" CONSOLIDATED STOCK,

AND

£3500 FOUR PER CENT. CONSOLIDATED PREFERENCE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £4000 NEW ORDINARY STOCK,

AND

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 11, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the  
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1000 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock, in Lots.  
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of CHAS. KING, Esq., decd.  
DORKING WATER COMPANY.

80 £10 FIVE PER CENT. "B" PREFERENCE SHARES.

**MESSRS. A. & W. RICHARDS will**  
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 18, at Two o'clock, in Lots.  
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MAXIMUM EFFICIENCY GUARANTEED.

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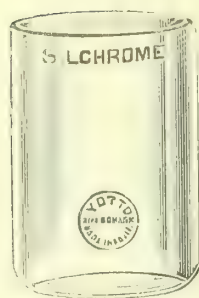
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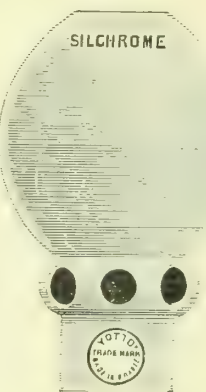
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It is an indisputable  
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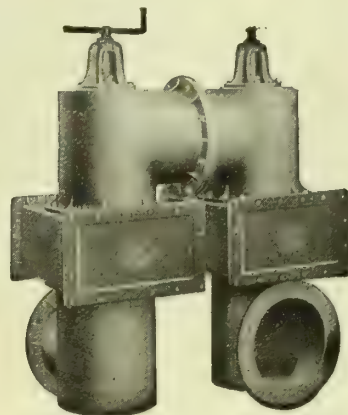
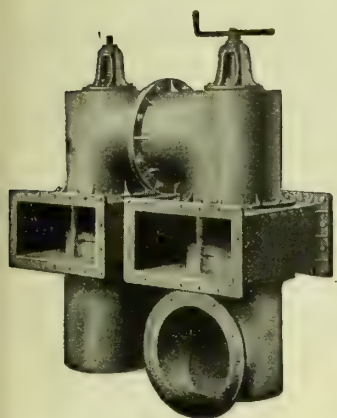
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**600 C.P. LOW PRESSURE LAMP.**

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**GAS REGULATION on the TOP of the LAMP.**

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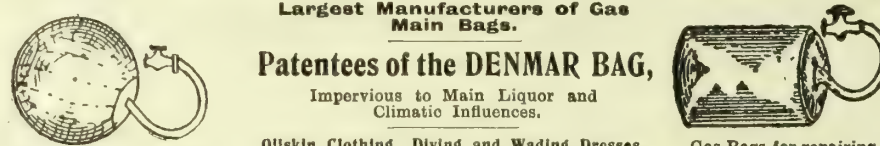


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Gas Bags for repairing Mains. All Seams Stitched and Taped.  
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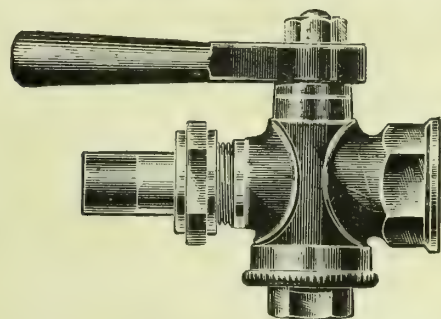
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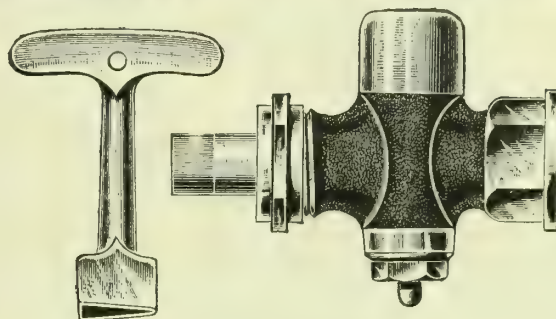
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**FULL-WAY GUN-METAL GAS-MAIN COCKS A SPECIALITY.**



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With Protecting Cap and Loose Key.

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Manufacture best quality only of every description of Inclined, Horizontal, and  
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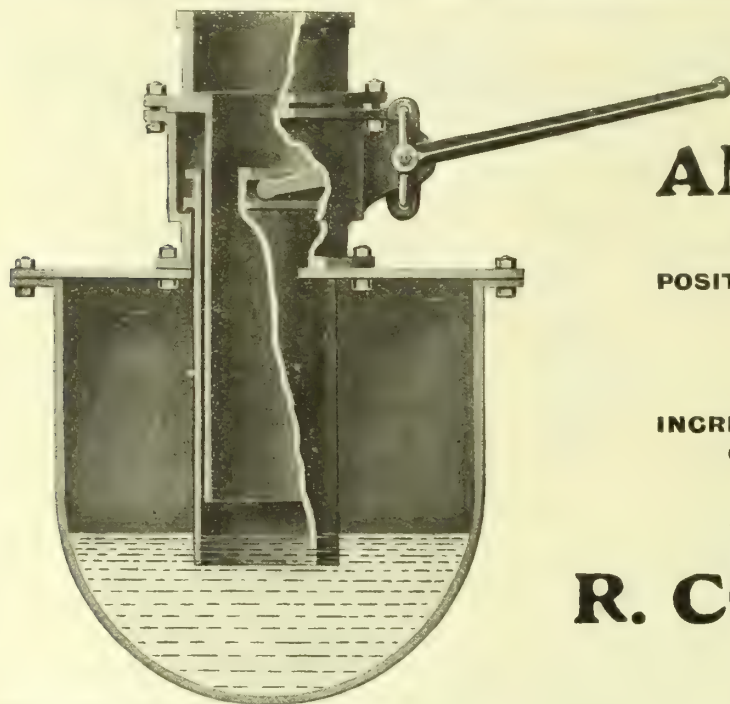
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The British Coalite Company having failed in their proceedings against us, we are now prepared to grant **Licenses**, both **at Home and Abroad**, on Reasonable Terms, to Corporations, Gas Companies, and others, for the Manufacture under our Patents of

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By our methods, results superior to other processes can be obtained.

**THE SCOTTISH SMOKELESS COAL SYNDICATE,**  
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# Welsbach

## LIGHT

### Inverted Arc Lamp, Fig. 623.

Storm Proof—  
For Exterior Lighting.

Welsbach-Kern  
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

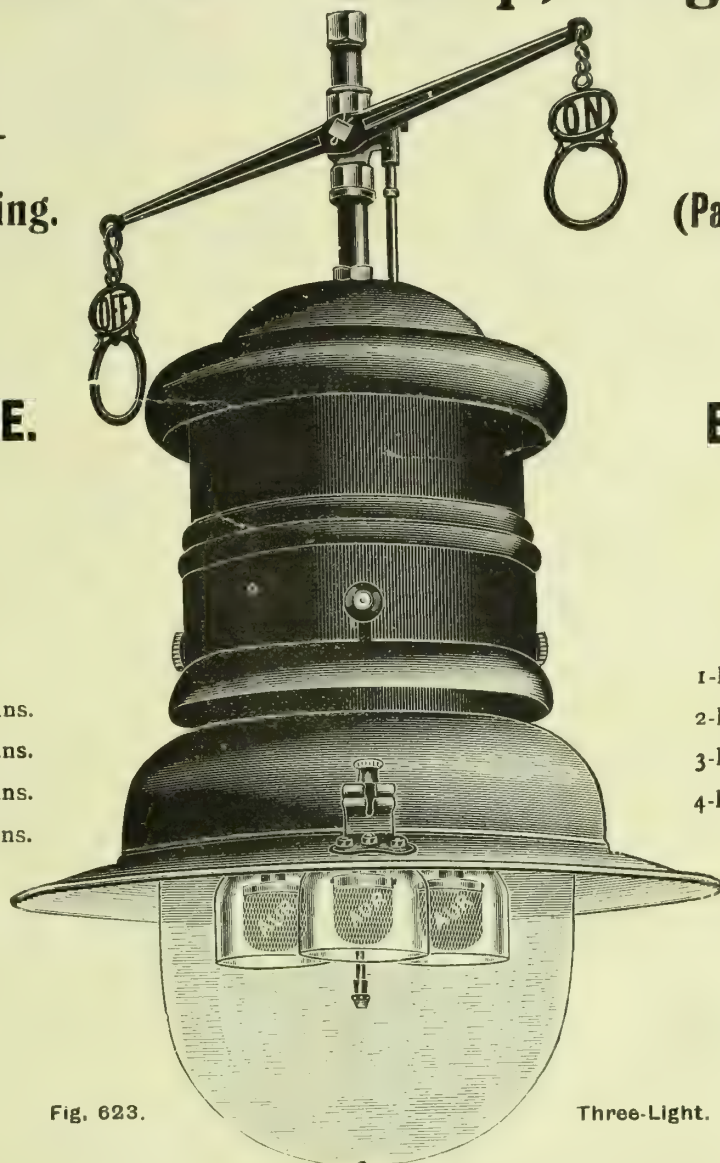


Fig. 623.

Three-Light.

Height over all.

|         |       |              |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 8 ins. |
| 2-light | . . . | 2 ft. 4 ins. |
| 3-light | . . . | 2 ft. 4 ins. |
| 4-light | . . . | 2 ft. 7 ins. |

Width over all.

|         |       |              |
|---------|-------|--------------|
| 1-light | . . . | 1 ft. 1 in.  |
| 2-light | . . . | 1 ft. 5 ins. |
| 3-light | . . . | 1 ft. 5 ins. |
| 4-light | . . . | 1 ft. 8 ins. |

**E**NAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

|         | Gas per hour. | C.P. | Steel. | Copper Case. |         | Gas per hour. | C.P. | Steel. | Copper Case. |
|---------|---------------|------|--------|--------------|---------|---------------|------|--------|--------------|
| 1-light | 4 feet        | 125  | 30/-   | 5/- extra.   | 3-light | 12 feet       | 400  | 52/6   | 6/- extra.   |
| 2-light | 8 feet        | 260  | 47/6   | 6/- extra.   | 4-light | 16 feet       | 550  | 72/6   | 9/- extra.   |

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

#### RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

|                               | 1-Light. | 2-Light. | 3-Light. | 4-Light. |                                                    | 1-Light. | 2-Light. | 3-Light. | 4-Light.          |
|-------------------------------|----------|----------|----------|----------|----------------------------------------------------|----------|----------|----------|-------------------|
| Clear Glass Globes, each      | 2/3      | 5/9      | 5/9      | 9/-      | Wired Globes, extra                                | each     | 2/-      | 2/-      | 2/9 3/6           |
| " " " In Case lots per dozen. | 19/6     | 57/9     | 57/9     | 93/-     | Parabolic Reflector, extra                         | "        | 3/6      | 6/-      | 7/6 Not made      |
| Case contains . . .           | 80       | 18       | 18       | 12       | Welsbach Mantles, 4½d. each, or 4s. 3d. per dozen, |          |          |          | subject as usual. |

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

**THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,**  
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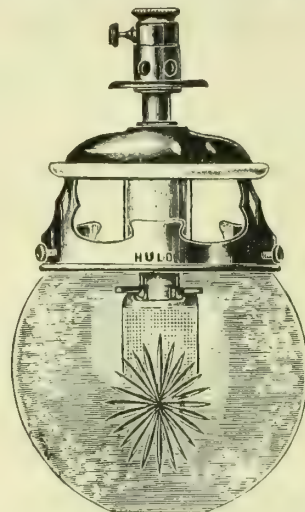
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Light.



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etc., etc.

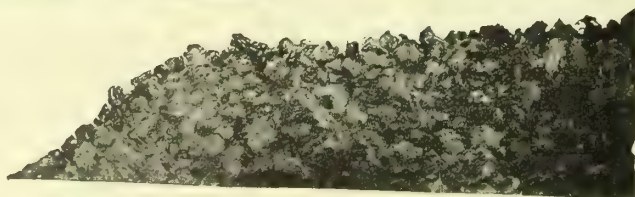
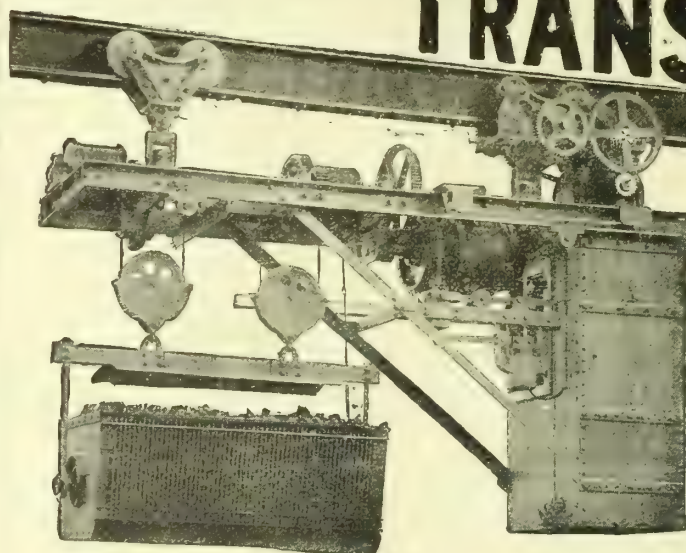
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at work and  
on order.

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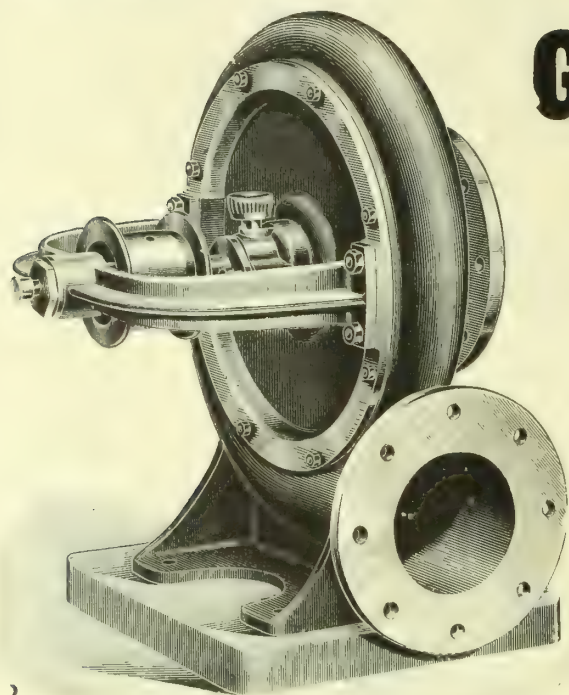
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Keith Blackman Gas Blower or Exhauster.

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**EXHAUSTERS**  
FOR BOOSTING GAS MAINS.

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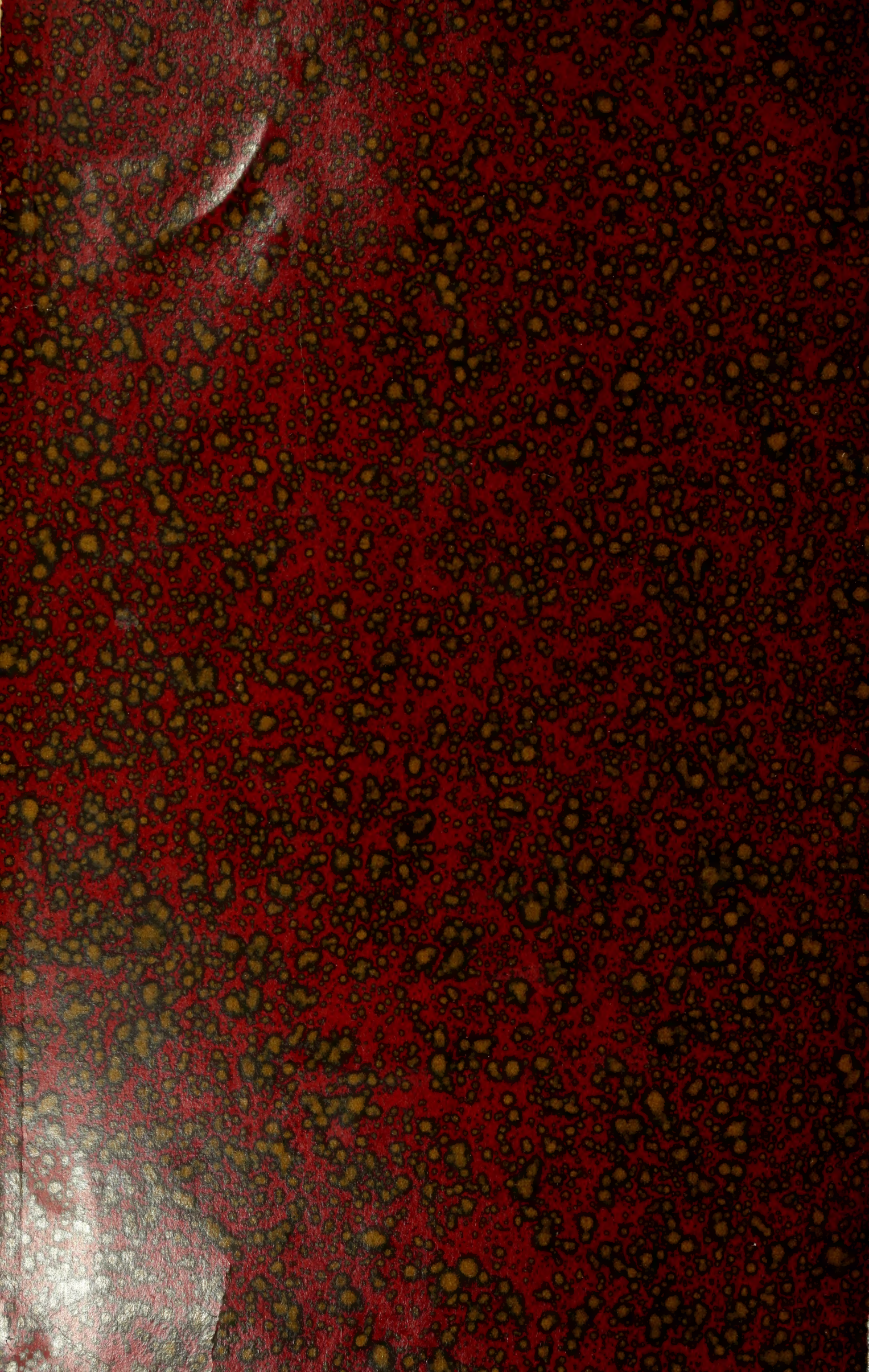


















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